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The Rise and Decline of General Laws of Capitalism†

Daron Acemoglu and James A. Robinson

Economists have long been drawn to the ambitious quest of discovering the general laws of capitalism. David Ricardo, for example, predicted that capital accumulation would terminate in economic stagnation and inequality as a greater and greater share of national income accrued to landowners. Karl Marx followed him by forecasting the inevitable immiseration of the proletariat. Thomas Piketty's (2014) tome, *Capital in the Twenty-First Century*, emulates Marx in his title, his style of exposition, and his critique of the capitalist system. Piketty is after general laws that will demystify our modern economy and elucidate the inherent problems of the system—and point to solutions.

But the quest for general laws of capitalism is misguided because it ignores the key forces shaping how an economy functions: the endogenous evolution of technology and of the institutions and the political equilibrium that influence not only technology but also how markets function and how the gains from various different economic arrangements are distributed. Despite his erudition, ambition, and creativity, Marx was led astray because of his disregard of these forces. The same is true of Piketty's sweeping account of inequality in capitalist economies.

In the next section, we review Marx's conceptualization of capitalism and some of his general laws. We then turn to Piketty's approach to capitalism and his general laws. We will point to various problems in Piketty's interpretation of the economic relationships underpinning inequality, but the most important shortcoming is that,

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† To access the Appendix and Data Appendix, visit
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though he discusses the role of certain institutions and policies, he allows neither for a systematic role of institutions and political factors in the formation of inequality nor for the endogenous evolution of these institutional factors. This implies that his general laws have little explanatory power. We illustrate this by first using regression evidence to show that Piketty's central economic force, the relationship between the interest rate and the rate of economic growth, is not correlated with inequality (in particular, with a key variable he focuses on, the share of national income accruing to the richest 1 percent, henceforth, the top 1 percent share). We then use the examples of the South African and Swedish paths of inequality over the 20th century to demonstrate two things: First, that using the top 1 percent share may miss the big picture about inequality. Second, it is impossible to understand the dynamics of inequality in these societies without systematically bringing in institutions and politics and their endogenous evolution. We conclude by outlining an alternative approach to inequality that eschews general laws in favor of a conceptualization in which both technology and factor prices are shaped by the evolution of institutions and political equilibria—and institutions themselves are endogenous and are partly influenced by, among other things, the extent of inequality. We then apply this framework to the evolution of inequality and institutions in South Africa and Sweden.

We should note at this point that we do not believe the term capitalism to be a useful one for the purposes of comparative economic or political analysis. By focusing on the ownership and accumulation of capital, this term distracts from the characteristics of societies which are more important in determining their economic development and the extent of inequality. For example, both Uzbekistan and modern Switzerland have private ownership of capital, but these societies have little in common in terms of prosperity and inequality because the nature of their economic and political institutions differs so sharply. In fact, Uzbekistan's capitalist economy has more in common with avowedly noncapitalist North Korea than Switzerland, as we argued in Acemoglu and Robinson (2012). That said, given the emphasis in both Marx and Piketty on capitalism, we have opted to bear with this terminology.

Capital Failures

Though many important ideas in social science can be traced to Karl Marx's oeuvre, his defining approach was to seek certain hard-wired features of capitalism—what Marx called general laws of capitalist accumulation. This approach was heavily shaped by the historical context of the middle 19th century in which Marx lived and wrote. Marx experienced first-hand both the bewildering transformation of society with the rise of industrial production, and the associated huge social dislocations.

Marx developed a rich and nuanced theory of history. But the centerpiece of this theory, historical materialism, rested on how material aspects of economic life, together with what Marx called forces of production—particularly technology—shaped all other aspects of social, economic, and political life, including the relations of production. For example, Marx famously argued in his 1847 book *The Poverty of*

Philosophy that "the hand-mill gives you society with the feudal lord; the steam-mill society with the industrial capitalist" (as reprinted in McLellan 2000, pp. 219–220). Here the hand-mill represents the forces of production while feudalism represents the relations of production, as well as a specific set of social and political arrangements. When the forces of production (technology) changed, this destabilized the relations of production and led to contradictions and social and institutional changes that were often revolutionary in nature. As Marx put it in 1859 in *A Contribution to the Critique of Political Economy* (McLellan 2000, p. 425):

> [T]he sum total of these relations of production constitutes the economic structure of society—the real foundation, on which rise legal and political superstructures and to which correspond definite forms of social consciousness. The mode of production of material life conditions the general character of the social, political and spiritual processes of life. At a certain state of their development the material forces of production in society come into conflict with the existing relations of production or—what is but a legal expression of the same thing—with the property relations within which they had been at work before. From forms of development of the forces of production these relations turn into fetters. Then comes the epoch of social revolution. With the change of the economic foundation the entire immense superstructure is more or less rapidly transformed.

Marx hypothesized that the forces of production, sometimes in conjunction with the ownership of the means of production, determined all other aspects of economic and political institutions: the de jure and de facto laws, regulations, and arrangements shaping social life. Armed with this theory of history, Marx made bold predictions about the dynamics of capitalism based just on economic fundamentals—without any reference to institutions or politics, which he generally viewed as derivative of the powerful impulses unleashed by the forces of production.[1]

Most relevant for our focus are three of these predictions concerning inequality. In *Capital* (1867, Vol. 1, Chap. 25), Marx developed the idea that the reserve army of the unemployed would keep wages at subsistence level, making capitalism inconsistent with steady improvements in the living standards of workers. His exact prediction here is open to different interpretations. Though Marx (1867, Vol. 1,

[1] There is no consensus on Marx's exact formulation of the relationship between the "substructure," comprising productive forces and sometimes the relations of production, and the "superstructure" which includes what we call political institutions and most aspects of economic institutions. In Chapter I of the *Communist Manifesto*, Marx and Engels wrote that "The history of all hitherto existing society is the history of class struggles." But the idea here, so far as we understand, is not that "class struggle" represents some autonomous historical dynamic, but rather that it is an outcome of the contradictions between the forces of production and the ownership of the means of production. In some writings, such as *The Eighteenth Brumaire of Louis Napoleon*, Marx also allowed for feedback from politics and other aspects of society to the forces of production. But it is clear from his work that he regraded this as second order (see Singer 2000, chapter 7 for a discussion of this). Marx never formulated an approach in which institutions play the central role and themselves change endogenously.

Chapter 25, Section 3) viewed capitalism as the harbinger of "misery, agony of toil, slavery, ignorance, brutality, and mental degradation" for working men, it is less clear whether this was meant to rule out real wage growth. Blaug (1996) states that Marx never claimed that real wages would be stagnant, but rather that the share of labor in national income would fall since Marx (1867, Vol 1., Chapter 24, Section 4) says "real wages . . . never rise proportionately to the productive power of labor." Foley (2008, Chapter 3), on the other hand, argues that Marx did start by asserting that real wages would not rise under capitalism, but then weakened this claim to a falling labor share when he realized that wages were indeed increasing in Britain. This motivates us to state this law in both a strong and a weak form. Under either its strong or weak form, this law implies that any economic growth under capitalism would almost automatically translate into greater inequality—as capitalists benefit and workers fail to do so. We combine this with a second general law of capitalism from Volume III of *Capital* and a third law, less often stressed but highly relevant, presented in Volume I of *Capital*. Thus, three key predictions from Marx are:

1) *The General Law of Capitalist Accumulation*. Strong Form**:** Real wages are stagnant under capitalism. Weak Form: The share of national income accruing to labor would fall under capitalism.

2) *The General Law of Declining Profit*: as capital accumulates, the rate of profit falls.

3) *The General Law of Decreasing Competition*: capital accumulation leads to increased industrial concentration.

Marx's general laws did not fare well. As Marx was writing, real wages, which had been constant or falling during the first decades of the 19th century, had already been rising, probably for about two decades (Allen 2001, 2007, 2009a; Clark 2005; Feinstein 1998). The share of labor in national income, which had fallen to under half by 1870, also started to increase thereafter, reaching two-thirds in the 20th century. Allen's (2009a) calculation of the real rate of profit suggests that the profit rate was comparatively low at the end of the 18th century and rose until around 1870 reaching a maximum of 25 percent, but then fell back to around 20 percent, where it stabilized until World War I. Matthews, Feinstein, and Odling-Smee (1982, pp. 187–88) suggest that these rates did not fall in the 20th century, though there is a lot of heterogeneity across sectors. (The third law's performance was no better as we discuss below.)

Why did Marx's general laws fail? Mostly because they ignored both the endogenous evolution of technology (despite his great emphasis on the forces of production) and also the role of institutions and politics that shape markets, prices, and the path of technology. The increase in real wages in Britain, for example, was in part a consequence of the change in the pace and nature of technological change, rapidly increasing the demand for labor (Crafts 1985; Allen 2009b; Mokyr 2012).

The rationalization of property rights, dismantling of monopolies, investment in infrastructure, and the creation of a legal framework for industrial development, including the patent system, were among the institutional changes contributing to rapid technological change and its widespread adoption in the British economy (Acemoglu and Robinson 2012; Mokyr 2012).

The distribution of the gains from new technologies was also shaped by an evolving institutional equilibrium. The Industrial Revolution went hand-in-hand with major political changes, including the development of the state and the Reform Acts of 1832, 1867, and 1884, which transformed British political institutions and the distribution of political power. For example, in 1833 a professional factory inspectorate was set up, enabling the enforcement of legislation on factory employment. The political fallout of the 1832 democratization also led in 1846 to the repeal of the Corn Laws (tariffs limiting imports of lower-priced foreign corn), lowering the price of bread, raising real wages, and simultaneously undermining land rents (Schonhart-Bailey 2006). The Factory Act of 1847 took the radical step of limiting working hours in the textile mills to ten hours per day for women and teenagers. The Reform Act of 1867 led to the abolition of the Masters and Servants Acts in 1875—which had imposed on workers legally enforceable duties of loyalty and obedience, and limited mobility—illustrating the role of pro-worker labor market legislation that increased real wages (Naidu and Yuchtman 2013).

Another telling example is the failure of Marx's third general law in the United States: the prediction of increased industrial concentration. After the end of the US Civil War came the age of the robber barons and the huge concentration of economic ownership and control. By the end of the 1890s, companies such as Du Pont, Eastman Kodak, Standard Oil, and International Harvester came to dominate the economy, in several cases capturing more than 70 percent of their respective markets (Lamoreaux 1985, pp. 3–4). It looked like a Marxian prediction come true—except that this situation was transitory and was duly reversed as popular mobilization, in part triggered by the increase in inequality, changed the political equilibrium and the regulation of industry (Sanders 1999). The power of large corporations started being curtailed with the Interstate Commerce Act of 1887 and then the Sherman Anti-Trust Act of 1890, which were used in the early 20th-century trust-busting efforts against Du Pont, the American Tobacco Company, the Standard Oil Company, and the Northern Securities Company, then controlled by J.P. Morgan. The reforms continued with the completion of the break-up of Standard Oil in 1911; the ratification of the Sixteenth Amendment in 1913, which introduced the income tax; and the Clayton Anti-Trust Act in 1914 and the founding of the Federal Trade Commission. These changes not only stopped further industrial concentration but reversed it (Collins and Preston 1961; Edwards 1975). White (1981) shows that US industrial concentration in the post–World War II period changed little (see White 2002 for an update).

Crucially, the political process that led to the institutional changes transforming the British economy and inequality in the 19th century was not a forgone conclusion. Nor was the rise in inequality in 19th century United States after its Civil War

an inevitable consequence of capitalism. Its reversal starting in the early 1900s was equally dependent on an evolving institutional equilibrium. In fact, while the power of monopoly and inequality were being curtailed in the United States, inequality continued to increase rapidly in neighboring Mexico under the authoritarian rule of Porfirio Diaz, culminating in revolution and civil war in 1910, and demonstrating the central role of the endogenous and path-dependent institutional dynamics.

Marx's general laws failed for the same reason that previous general laws by other economists also performed poorly. These laws were formulated in an effort to compress the facts and events of their times into a grand theory aiming to be applicable at all times and places, with little reference to institutions and the (partly institutionally determined) changing nature of technology. For example, when David Ricardo published the first edition of *On the Principles of Political Economy and Taxation* in 1817, and predicted that a rising share of national income would accrue to land, he had indeed been living through a period of rapidly rising land rents in Britain. But soon thereafter, the share of national income accruing to land started a monotonic decline, and by the 1870s real rents started a rapid fall, which would last for the next 60 years (Turner, Beckett, and Afton 1999; Clark 2002, 2010).

In short, Marx's general laws, like those before him, failed because they relied on a conception of the economy that did not recognize the endogenous evolution of technology and the role of changing economic and political institutions, shaping both technology and factor prices. In fact, even Marx's emphasis on the defining role of the forces of production, so emblematic of his approach, was often inadequate not only as the engine of history, but also as a description of history, including his paradigmatic example of hand-mills and steam-mils. For example, Bloch (1967) argued persuasively that the hand-mill did not determine the nature of feudal society, nor did the steam-mill determine the character of the post-feudal world.

Seeking 21st-Century Laws of Capitalism

Thomas Piketty is also an economist of his milieu, with his thinking heavily colored by increasing inequality in the Anglo-Saxon world and more recently in continental Europe—and in particular compared to the more equal distribution of labor and total incomes seen in France in the 1980s and 1990s. A large literature in labor economics had done much to document and dissect the increase in inequality that started sometime in the 1970s in the United States (see the surveys and the extensive references to earlier work in Katz and Autor 1999 and Acemoglu and Autor 2011). This literature has demonstrated that the increase in inequality has taken place throughout the income distribution and that it can be explained reasonably well by changes in the supply and demand for skills and in labor market institutions. Piketty and Saez (2003) brought a new and fruitful perspective to this literature by using data from tax returns, confirming and extending the patterns the previous literature had uncovered and placing a heavy emphasis on rising inequality at the very top of the income distribution.

In *Capital in the Twenty-first Century*, Piketty goes beyond this empirical and historical approach to offer a theory of the long-run tendencies of capitalism. Though Piketty's data confirm the finding of the previous literature that widening inequality in recent decades, at least in advanced economies, had been driven by rising inequality of labor incomes, his book paints a future dominated by capital income, inherited wealth, and rentier billionaires. The theoretical framework used to reach this conclusion is a mix of Marxian economics with Solow's growth model. Piketty defines capitalism in the same way that Marx does, and has a similarly materialist approach linking the dynamics of capitalism to the ownership of the means of production (in particular capital) and the ironclad nature of technology and exogenous growth dynamics. It is true that Piketty sometimes mentions policies and institutions (for example, the wealth tax and the military and political developments that destroyed capital and reduced the ratio of wealth to income during the first half of the 20th century). But their role is ad hoc. Our argument is that, to explain inequality, these features and their endogenous evolution have to be systematically introduced into the analysis.

This approach shapes Piketty's analysis and predictions about the nature of capitalism. *Capital in the Twenty-first Century* starts by introducing two "fundamental laws," but the more major predictions flow from what Piketty calls a "fundamental force of divergence" (p 351) or sometimes the "fundamental inequality" (p. 25), comparing the (real) interest rate of the economy to the growth rate.

The first fundamental law is just a definition:

$$\text{capital share of national income} = r \times (K/Y),$$

where r is the net real rate of return on capital (which can be viewed as a real interest rate), K is the capital stock, and Y is GDP (or equivalently, national income as the economy is taken to be closed).

The second fundamental law is slightly more substantial. It states that

$$K/Y = s/g,$$

where s is the saving rate and g is the growth rate of GDP. As we explain in the online Appendix (available with this paper at http://e-jep.org), a version of this law does indeed follow readily from the steady state of a Solow-type model of economic growth (but see Krusell and Smith 2014; Ray 2014). At an intuitive level, the growth rate of the capital stock K will be given by net investment, which in a closed economy will be equal to saving, sY. Thus, the ratio K/Y will reflect the ratio "change in K to change in Y" over time due to economic growth, which is s/g.

Let us follow Piketty here and combine these two fundamental laws to obtain

$$\text{capital share of national income} = r \times (s/g).$$

Piketty posits that, even as g changes, r and s can be taken to be approximate constants (or at least that they will not change as much as g). This then leads to

what can be thought of as his first general law, that when growth is lower, the capital share of national income will be higher.

This first law is not as compelling as one might at first think, however. After all, one must consider whether a change in the growth rate g might also alter the saving rate s or the rate of return r, because these are all endogenous variables that are linked in standard models of economic growth. Piketty argues that r should not change much in response to a decline in g because the elasticity of substitution between capital and labor is high, resulting in an increase in the capital share of national income.[2]

However, the vast majority of existing estimates indicate a short-run elasticity of substitution significantly less than one (for example, Hamermesh 1993; Mairesse, Hall, and Mulkay 1999; Chirinko, Fazzari, and Meyer 1999; Krusell, Ohanian, Rios-Rull, and Violante 2000; Chirinko 1993; Antràs 2004; Klump, McAdam, and Willman 2007; Oberfield and Raval 2014). This is also the plausible case on intuitive grounds: given technology, the ability to substitute capital for labor would be limited (for example, if you reduce labor to zero, for a given production process, one would expect output to fall to zero also). Though this elasticity could be higher in longer horizons, Chirinko (2008) and Chirinko and Mallick (2014) find it to be significantly less than one also in the long run. One reason why the long-run elasticity of substitution might be greater than one is the endogeneity of technology (for example, Acemoglu 2002, 2003). In this context, it is worth noting that the only recent paper estimating an elasticity of substitution greater than one, Karabarbounis and Neiman (2014), uses long-run cross-country variation related to changes in investment prices, making their estimates much more likely to correspond to endogenous-technology elasticities. Nevertheless, as Rognlie (2014) points out, even an elasticity of substitution significantly greater than one would not be sufficient to yield the conclusions that Piketty reaches.

Moreover, though it is true that there has been a rise in the capital share of national income, this does not seem to be related to the forces emphasized in *Capital in the Twenty-First Century*. In particular, Bonnet, Bono, Chapelle, and Wasmer (2014) demonstrate that this rise in the capital share is due to housing and the increased price of real estate, shedding doubt on the mechanism Piketty emphasizes.

The second general law of *Capital in the Twenty-First Century* is formulated as

$$r > g,$$

stating that the (real) interest rate exceeds the growth rate of the economy. Theoretically, in an economy with an exogenous saving rate, or with overlapping generations (for example, Samuelson 1958; Diamond 1965), or with incomplete markets

[2] However, the interest rate and the growth rate are linked from both the household side and the production side. For example, with a representative household, we have that $r = \theta g + \rho$, where θ is the inverse of the intertemporal elasticity of substitution and ρ is the discount rate. The fact that the representative household assumption may not be a good approximation to reality does not imply that r is independent of g. On the production side, g affects r through its impact on the capital stock, and it is the second channel that depends on the elasticity of substitution between capital and labor.

(for example, Bewley 1986; Aiyagari 1994), the interest rate need not exceed the growth rate. It will do so in an economy that is *dynamically efficient*, meaning in an economy in which it is impossible to increase the consumption at all dates (thus achieving a Pareto improvement). Whether an economy is dynamically efficient is an empirical matter—for example, Geerolf (2013) suggests that several OECD economies might be dynamically inefficient—and dynamic inefficiency becomes more likely when the capital-output ratio is very high as *Capital in the Twenty-first Century* predicts it to be in the future.

Finally, Piketty's third and most important general law is that whenever $r > g$, there will be a tendency for inequality to rise. This is because capital income will tend to increase at the rate of interest, r, while national income (and the income of noncapitalists) increases at the rate g. Because capital income is unequally distributed, this will translate into a capital-driven increase in inequality, taking us back to the age of Jane Austen and Honoré Balzac. In the words of Piketty (pp. 25–26): "This fundamental inequality [$r > g$] will play a crucial role in this book. In a sense, it sums up the overall logic of my conclusions. When the rate of return on capital significantly exceeds the growth rate of the economy, then it logically follows that inherited wealth grows faster than output and income."

He elaborates on this point later, writing: "The primary reason for the hyperconcentration of wealth in traditional agrarian societies and to a large extent in all societies prior to World War I is that these were low-growth societies in which [sic] the rate of return on capital was markedly and durably higher than the rate of growth" (p. 351). Based on this, he proposes an explanation for the rise in inequality over the next several decades: "The reason why wealth today is not as unequally distributed as in the past is simply that not enough time has passed since 1945" (p. 372).[3]

As with the first two general laws, there are things to quibble with in the pure economics of the third general law. First, as already mentioned, the emphasis on $r - g$ sits somewhat uneasily with the central role that labor income has played in the rise in inequality. Second, as we show in the online Appendix, $r > g$ is fully consistent with constant or even declining inequality. Third, $r - g$ cannot be taken as a primitive on which to make future forecasts, as both the interest rate and the growth rate will adjust to changes in policy, technology, and the capital stock. Finally, in the presence of a modest amount of social mobility, even very large values of $r - g$ do not lead to divergence at the top of the distribution (again, as we show in the online Appendix).

But our major argument is about what the emphasis on $r > g$ leaves out: institutions and politics. Piketty largely dismisses the importance of institutions against the

[3] It is unclear whether $r > g$ is a force towards divergence of incomes across the distribution of income, or towards convergence to a new and more unequal distribution of income. In many places, including those we have already quoted, Piketty talks of divergence. But elsewhere, the prediction is formulated differently, for example, when he writes: "With the aid of a fairly simple mathematical model, one can show that for a given structure of . . . [economic and demographic shocks]. . ., the distribution of wealth tends towards a long-run equilibrium and that the equilibrium level of inequality is an increasing function of the gap $r - g$ between the rate of return on capital and the growth rate" (p. 364). In the online Appendix, we discuss a variety of economic models linking $r - g$ to inequality.

crushing force of the fundamental inequality, writing that "the fundamental inequality $r > g$ can explain the very high level of capital inequality observed in the 19th century, and thus in a sense the failure of the French Revolution. The formal nature of the regime was of little moment compared with the inequality $r > g$" (p. 365). In passing, we should note that the available empirical evidence suggests that the French Revolution not only led to a decrease in inequality (Morrisson and Snyder 2000), but also profoundly changed the path of institutional equilibria and economic growth in Europe (Acemoglu, Cantoni, Johnson, and Robinson 2011).

If the history of grand pronouncements of the general laws of capitalism repeats itself—perhaps first as tragedy and then farce as Marx colorfully put it—then we may expect the same sort of frustration with Piketty's sweeping predictions as they fail to come true, in the same way that those of Ricardo and Marx similarly failed in the past. We next provide evidence suggesting that this is in fact quite likely as the existing evidence goes against these predictions.

Cross-Country Data on $r > g$ and Top-Level Inequality

The major contribution of Piketty, often together with Emmanuel Saez, has been to bring to the table a huge amount of new data on inequality (Piketty and Saez 2003). The reader may come away from these data presented at length in Piketty's book with the impression that the evidence supporting his proposed laws of capitalism is overwhelming. However, Piketty does not present even basic correlations between $r - g$ and changes in inequality, much less any explicit evidence of a causal effect. Therefore, as a first step we show that the data provide little support for the general laws of capitalism he advances.

We begin by using as a dependent variable the top 1 percent share (see Alvaredo, Atkinson, Piketty, and Saez's World Top Incomes Database at http://topincomes.parisschoolofeconomics.eu/). We combine this variable with GDP data from Madison's dataset. For the first part of our analysis, we do not use explicit data on interest rates, which gives us an unbalanced panel spanning 1870–2012. For the rest of our analysis, our panel covers the post–World War II period and uses GDP data from the Penn World Tables.[4]

[4] The number of countries varies depending on the measure of the interest rate used and specification. In columns 1–3 panel A, we have 27 countries: Argentina, Australia, Canada, China, Colombia, Denmark, Finland, France, Germany, India, Indonesia, Ireland, Italy, Japan, Malaysia, Mauritius, Netherlands, New Zealand, Norway, Portugal, Singapore, South Africa, Spain, Sweden, Switzerland, United Kingdom, and United States. In column 2 panel B, we lose China and Colombia, and additionally Portugal in column 3. In column 4 panel A, we lose the non-OECD countries, China, Colombia, India, Indonesia, Malaysia, Mauritius, and Singapore relative to columns 1–3, and additionally Germany in columns 5 and 6. In panel B, we additionally lose Portugal in columns 4 and 5, and Portugal and Germany in column 6. In column 7 panel B, we have Uruguay in addition to the 27 countries in column 1. In columns 8 and 9, we lose Germany and Uruguay. In panel B, we lose Uruguay in column 7 relative to panel A, and additionally China and Colombia in column 8, and Argentina, China, Colombia, Indonesia, and Portugal in column 9.

Table 1 reports regressions using three different measures of $r - g$. First, we assume that all capital markets are open and all of the countries in the sample have the same (possibly time-varying) interest rate. Under this assumption, cross-country variation in $r - g$ will arise only because of variation in the growth rate, g. The first three columns in panel A of this table then simply exploit variation in g using annual data (that is, we set $r - g = -g$ by normalizing $r = 0$). Throughout, the standard errors are corrected for arbitrary heteroskedasticity and serial correlation at the country level; and because the number of countries is small (varying between 18 and 28), they are computed using the pairs-cluster bootstrap procedure proposed by Cameron, Gelbach, and Miller (2008), which has better finite-sample properties than the commonly used clustered standard errors. (The same results with "traditional" standard errors that assume no heteroskedasticity and residual serial correlation are reported in Appendix Table A1 and show very similar patterns.) In column 1, we look at the relationship between annual top 1 percent share and annual growth in a specification that includes a full set of year dummies and country dummies—so that the pure time-series variation at the world level is purged by year dummies and none of the results rely on cross-country comparisons. Piketty's theory predicts a positive and significant coefficient on this measure of $r - g$: that is, in countries with higher g, the incomes of the bottom 99 percent will grow more, limiting the top 1 percent share.[5] Instead, we find a negative estimate that is statistically insignificant.

In column 2, we include five annual lags of top 1 percent share on the right-hand side to model the significant amount of persistence in measures of inequality. Though specifications that include the lagged dependent variable on the right-hand side are potentially subject to the Nickell (1981) bias, given the length of the panel here this is unlikely to be an issue (since this bias disappears as the time dimension becomes large). The test at the bottom of the table shows that lagged top 1 percent share is indeed highly significant. In this case, the impact of $r - g$ is negative and significant at 10 percent—the opposite of the prediction of *Capital in the Twenty-First Century*. Column 3 includes five annual lags of GDP as well as five lags of top 1 percent share simultaneously. There is once more no evidence of a positive impact of $r - g$ on top inequality. On the contrary, the relationship is again negative, as shown by the first lag and also by the long-run cumulative effect reported at the bottom.

What matters for inequality may not be annual or five-year variations exploited in panel A, but longer-term swings in $r - g$. Panel B investigates this possibility by looking at 10-year (columns 1, 2, 4, 5, 7, 8) and 20-year data (columns 3, 6, 9).[6]

[5] With returns to capital determined in the global economy, that is, $r_{it} = r_t$ (where i refers to country and t the time period), variation in r_t is fully absorbed by the time effects in these regression models, making the $r = 0$ normalization without any loss of generality. Note, however, that what determines the dynamics of inequality in a country according to Piketty's general law is that country's growth rate, supporting the methodology here, which exploits country-specific variation in growth rates (conditional on country and time fixed effects).

[6] To avoid the mechanical serial correlation that would arise from averaging the dependent variable, we take the top 1 percent share observations every 10 or 20 years. If an observation is missing at those dates and there exists an observation within plus or minus two years, we use these neighboring observations. The results are very similar with averaging.

Table 1
Regression Coefficients of Different Proxies of $r - g$
(dependent variable is the top 1 percent share of national income)

	No cross-country variation in r			*OECD data on interest rates*			$r = \text{MPK} - \delta$		
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*
Panel A: Estimates using annual panel									
Estimate of $r - g$ at t	−0.006	−0.018*	−0.018*	−0.066**	−0.038**	−0.040*	0.029	−0.004	−0.011
	(0.012)	(0.010)	(0.011)	(0.027)	(0.017)	(0.021)	(0.033)	(0.009)	(0.008)
Estimate of $r - g$ at $t - 1$			0.001			−0.003			0.005
			(0.009)			(0.015)			(0.014)
Estimate of $r - g$ at $t - 2$			0.005			0.010			−0.012
			(0.008)			(0.019)			(0.008)
Estimate of $r - g$ at $t - 3$			−0.002			−0.012			0.014*
			(0.008)			(0.024)			(0.008)
Estimate of $r - g$ at $t - 4$			−0.005			−0.005			0.006
			(0.007)			(0.013)			(0.010)
Joint significance of lags [*p*-value]			4.55			7.47			12.40
			[0.47]			[0.19]			[0.03]
Long-run effect		−0.16	−0.18		−0.39	−0.47		−0.04	0.03
[*p*-value estimate > 0]		[0.13]	[0.15]		[0.29]	[0.34]		[0.68]	[0.89]
Persistence of top 1 percent share		0.89	0.89		0.90	0.89		0.90	0.92
[*p*-value estimate < 1]		[0.00]	[0.00]		[0.31]	[0.30]		[0.11]	[0.18]
Observations	1,646	1,233	1,226	627	520	470	1,162	905	860
Countries	27	27	27	19	18	18	28	26	26

(continued)

These specifications do not provide any evidence of a positive relationship between this measure of $r - g$ and top 1 percent share either.

In columns 4–6 in panel A, we work with a different measure of $r - g$ based on the realized interest rate constructed from data on nominal yields of long-term government bonds and inflation rates from the OECD. The relationship is again negative and now statistically significant at 5 percent in columns 4 and 5, and at 10 percent in column 6. In panel B, when we use 10- and 20-year panels, the relationship continues to be negative but is now statistically insignificant.

One concern with the results in columns 4–6 is that the relevant interest rate for the very rich may not be the one for long-term government bonds. Motivated by this possibility, columns 7–9 utilize the procedure proposed by Caselli and Feyrer (2007) to estimate the economy-wide marginal product of capital minus the depreciation rate using data on aggregate factors of production, and construct $r - g$ using these estimates. Now the relationship is more unstable. In some specifications it becomes positive but is never statistically significant.

Appendix Tables A2 and A3 show that these results are robust to including, additionally, GDP per capita (as another control for the business cycle and its impact on the top 1 percent share), population growth, and country-specific trends, and

Table 1—Continued

	No cross-country variation in r			*OECD data on interest rates*			$r = \text{MPK} - \delta$		
	(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*
Panel B: Estimates using 10-year (columns 1, 2, 4, 5, 7, 8) and 20-year (columns 3, 6, 9) panels									
Average $r - g$	0.055	−0.036	−0.252	−0.114	−0.121	−0.110	0.069	0.148	0.238
	(0.110)	(0.118)	(0.269)	(0.138)	(0.132)	(0.320)	(0.118)	(0.100)	(0.164)
Long-run effect		−0.05			−0.25			0.29	
[p-value estimate > 0]		[0.76]			[0.44]			[0.22]	
Persistence of top 1 percent share		0.32			0.52			0.48	
[p-value estimate < 1]		[0.00]			[0.02]			[0.00]	
Observations	213	181	106	82	80	43	135	124	61
Countries	27	25	24	18	18	17	27	25	22

Notes: The table presents estimates of different proxies of $r - g$ on the top 1 percent share of national income. The dependent variable is available from 1871 onwards for the countries covered in the World Top Incomes Database. We use different proxies of $r - g$: Columns 1 to 3 use growth rates from Madisson, and assume no variation in real interest rates across countries. These data are available from 1870 onwards. Columns 4 to 6 use real interest rates computed by subtracting realized inflation from nominal yields on long-term government bonds, and growth rates from the Penn World Tables. These data are only available since 1955 for OECD countries. Columns 7 to 9 use $r = \text{MPK} - \delta$, constructed as explained in the text using data from the Penn World Tables, and growth rates from the Penn World Tables. These data are available for 1950 onwards. Panel A uses an unbalanced yearly panel. Columns 2, 5, and 8 add five lags of the dependent variable and report the estimated persistence of the top 1 percent share of national income and the estimated long run effect of $r - g$ on the dependent variable. Columns 3, 6, and 9 add four lags of $r - g$ on the right-hand side, and also report the long-run effect of a permanent increase of 1 percent in $r - g$ and a test for the joint significance of these lags (with its corresponding χ^2 statistic and p-value). Panel B uses an unbalanced panel with observations every 10 years or 20 years (columns 3, 6, 9). Columns 1, 2, 4, 5, 7, and 8 present estimates from a regression of the top 1 percent share of national income at the end of each decade in the sample (that is, 1880, 1890, . . ., 2010, depending on data availability) on the average $r - g$ during the decade. Columns 2, 5, and 8 add one lag of the dependent variable on the right-hand side. Finally, columns 3, 6, and 9 present estimates from a regression of the top 1 percent share of national income at the end of each 20-year period in the sample (that is, 1890, 1910, . . ., 2010, depending on data availability) on the average $r - g$ during the period. All specifications include a full set of country and year fixed effects. Standard errors allowing for arbitrary heteroskedasticity and serial correlation of residuals at the country level are computed using the pairs-cluster bootstrap procedure proposed by Cameron, Gelbach, and Miller (2008) and are reported in parentheses.
*, **, and *** indicate 10, 5, and 1 percent levels of significance, respectively.

to the use of the top 5 percent measure of inequality as the dependent variable. Appendix Table A4 verifies that the results are similar if we limit the analysis to a common sample consisting of OECD countries since 1950, and Appendix Table A5 shows that focusing on the capital share of national income, rather than the top 1 percent share, leads to a similar set of results, providing no consistent evidence of an impact from $r - g$ to inequality.[7]

[7] This table uses two alternative measures of the capital share of national income from the Penn World Tables and from the OECD. We do not present regressions using the marginal product of capital from Caselli and Feyrer (2007) as this measure is computed using the capital share of national income, making it mechanically correlated with the dependent variable in this table.

Although this evidence is tentative and obviously we are not pretending to estimate any sort of causal relationship between $r - g$ and the top 1 percent share, it is quite striking that such basic conditional correlations provide no support for the central emphasis of *Capital in the Twenty-first Century*.[8] This is not to say that a higher r is not a force towards greater inequality in society—it probably is. It is just that there are many other forces promoting inequality and our regressions suggest that, at least in a correlational sense, these are quantitatively more important than $r - g$.

A Tale of Two Inequalities: Sweden and South Africa

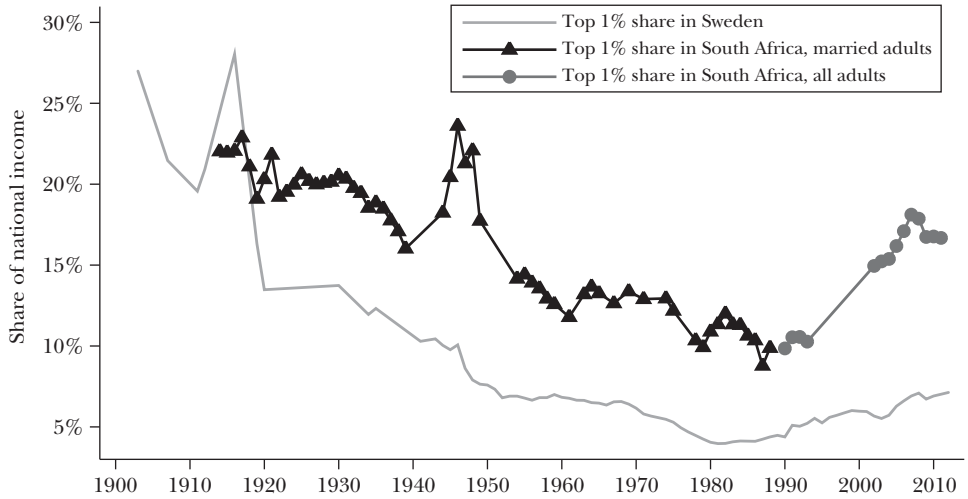
We now use the histories of inequality during the 20th century in Sweden and South Africa to illustrate how the dynamics of inequality appear linked to the institutional paths of these societies—rather than to the forces of $r > g$. In addition, these cases illustrate that the share of national income going to the top 0.1 percent or top 1 percent can give a distorted view of what is actually happening to inequality more broadly. Indeed, this focus on inequality at the top inevitably leads to a lesser and insufficient focus on what is taking place in the middle or the bottom of the income distribution.

Figure 1 shows the evolution of the share of the top 1 percent in national income in Sweden and South Africa since the early 20th century. There are of course some differences. Sweden started out with a higher top 1 percent share than South Africa, but its top 1 percent share fell faster, especially following World War I. The recent increase in the top 1 percent also starts earlier in Sweden and is less pronounced than what we see in South Africa in the 1990s and 2000s. But in broad terms, the top 1 percent share behaves similarly in the two countries, starting high, then falling almost monotonically until the 1980s, and then turning up. Such common dynamics for the top 1 percent share in two such different countries—a former colony with a history of coerced labor and land expropriation, ruled for much of the 20th century by a racist white minority, on the one hand, and the birthplace of European social democracy, on the other—would seem to bolster Piketty's case that the general laws of capitalism explain the big swings of inequality, with little reference to institutions and politics. Perhaps one could even claim, as in Piketty's example of the French Revolution, that the effects of apartheid and social democracy are trifling details against the fundamental force of $r > g$.

Except that the reality is rather different. In South Africa, for example, the institutionalization of white dominance after 1910 quickly led to the Native Land Act in 1913 which allocated 93 percent of the land to the "white economy" while

[8] One important caveat is that the ex post negative returns that may have resulted from stock market crashes and wars are not in our sample, because our estimates for r are from the post–World War II sample. Nevertheless, if $r - g$ is indeed a fundamental force towards greater inequality, we should see its impact during the last 60 years also.

Figure 1
Top 1 Percent Shares of National Income in Sweden and South Africa

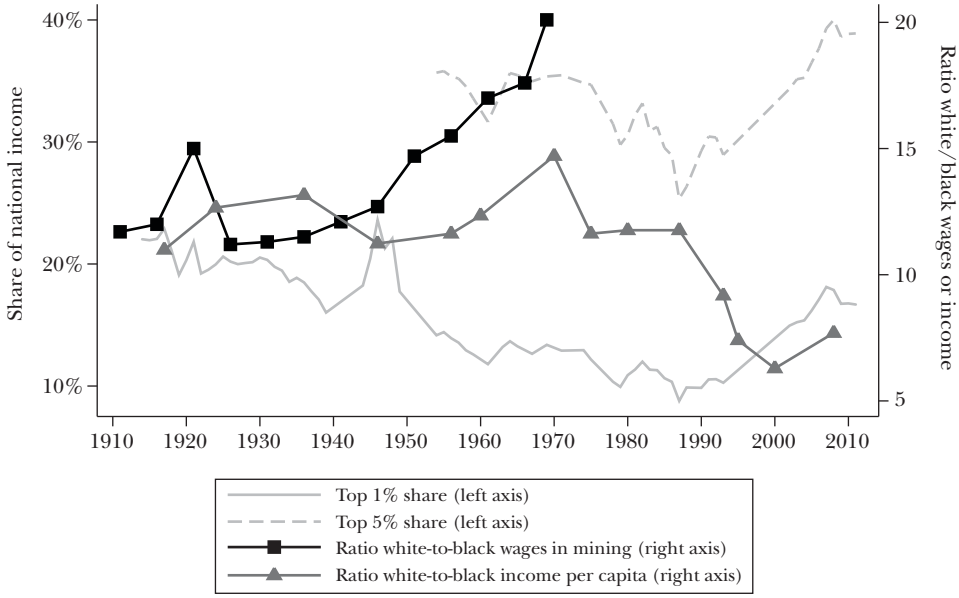


Sources: The data series for South Africa is from Alvaredo and Atkinson (2010). The data series for Sweden is from Roine and Waldenström (2009).
Note: The figure plots the top 1 percent share of national income for South Africa and Sweden.

the blacks (around 59 percent of the population) got 7 percent of the land. In the white economy, it became illegal for blacks to own property or a business, and many types of contractual relations for blacks were explicitly banned. By the 1920s, the "color bar" blocked blacks from practically all skilled and professional occupations (van der Horst 1942; Feinstein 2005, chap. 2–4). After 1948, the apartheid state became even stronger, implementing a wide array of measures to enforce social and educational segregation between whites and blacks. Finally, in 1994, the apartheid institutions collapsed as Nelson Mandela became South Africa's first black president. However, a naïve look at Figure 1 would seem to suggest that South Africa's apartheid regime, which was explicitly structured to keep black wages low and to benefit whites, was responsible for a great decrease in inequality, while the end of apartheid caused an explosion in inequality!

How can this be? The answer is that measuring inequality by the top 1 percent share can give a misleading picture of inequality dynamics in some settings. Figure 2 shows the top 1 percent share together with other measures of inequality in South Africa, which behave quite differently. Inequality between whites and blacks was massively widening during the 20th century as measured by the ratio of white-to-black wages in gold mining, a key engine of the South African economy at the time (from the wage series of Wilson 1972); this represents a continuation of 19th-century trends (discussed in de Zwart 2011). This pattern is confirmed by the white-to-black per capita income ratio from census data, which has some ups

Figure 2
Top Income Shares and Between-Group Inequality in South Africa



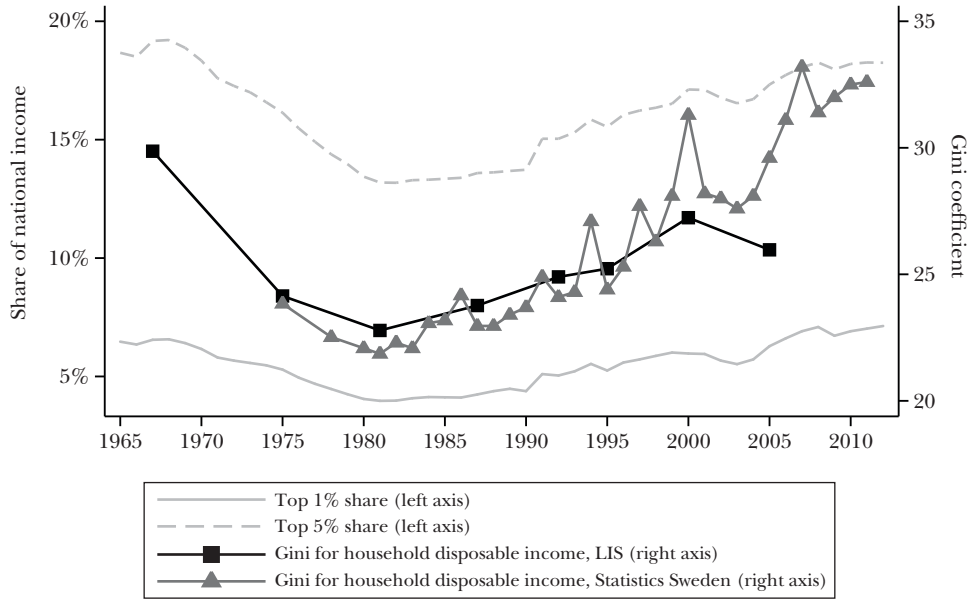
Sources and Notes: The left axis shows the top 1 and 5 percent shares of national income for South Africa on the left axis, obtained from Alvaredo and Atkinson (2010). The right axis shows the ratio between whites' and blacks' wages in mining (obtained from Wilson, 1972), and the ratio between whites' and blacks' income per capita (obtained from Leibbrandt, Woolard, Finn, and Argent 2010).

and downs but exhibits a fairly large increase from about 11-fold to 14-fold from 1911 until 1970. Thereafter, it shows a rapid decline. Even the top 5 percent share behaves somewhat differently than the top 1 percent share (though available data for this variable start only in the 1950s).

If one wanted to understand economic inequality in South Africa, changes in labor market institutions and political equilibria appear much more relevant than r and g. Indeed, the alternative measures of inequality in Figure 2 show that during the time the share of the top 1 percent was falling, South Africa became one of the most unequal countries in the world. As we will discuss, the turning points in inequality in South Africa in fact have institutional and political roots.

Figure 3 shows that in Sweden, the decline in the top 1 percent share from 1965 to 1980 is accompanied by a much more pervasive fall in inequality as measured by the Gini coefficient for household disposable income. And over the entire period, the two series for the Gini index have similar trends to the top 1 percent and the top 5 percent shares. However, in the Swedish case as well, the story of inequality seems related not to supposed general laws of capitalism and changes in r and g, but rather to institutional changes (Bengtsson 2014). The initial fall in the top 1 percent share coincided with

Figure 3
Top Income Shares and Overall Inequality in Sweden



Notes: The figure plots the top 1 and 5 percent shares of national income for Sweden on the left vertical axis, obtained from Roine and Waldenström (2009). The right axis plots the Gini coefficient for household disposable income, from the Luxembourg Income Study (Milanovic 2013), and from Statistics Sweden (SCB).

large changes in government policy: for example, a rapid increase in redistribution in the 1920s from practically nothing in the 1910s (Lindert 1994), and an increase in top marginal tax rates from around 10 percent in 1910 to 40 percent by 1930 and 60 percent by 1940 (Roine, Vlachos, and Waldenström 2009, p. 982). The expanding role of the government and of redistributive taxation plausibly had a negative impact on the top 1 percent share. The data in Figures 1 and 3 are for pre-tax inequality, but these are likely to be affected by taxes, which influence effort and investment (see the evidence in Roine, Vlachos, and Waldenström 2009), and also directly by the wage compression created by Sweden's labor market institutions. Indeed, union density rose rapidly from around 10 percent of the labor force during World War I to 35 percent by 1930 and to over 50 percent by 1940 (Donado and Wälde 2012).

Piketty emphasizes the role of the destruction of the capital stock and asset price falls in the aftermath of the two world wars as key factors explaining the decline of top inequality during much of the 20th century. But such factors can hardly account for the trends in Sweden or South Africa. Sweden was neutral in both wars, and though South Africa provided troops and resources for the Allied powers in both, neither economy experienced any direct destruction of their capital stock.

Towards an Institutional Framework

A satisfactory framework for the analysis of inequality should take into account both the effect of different types of institutions on the distribution of resources and the endogenous evolution of these institutions. We now flesh out such a framework and then apply it to the evolution of inequality—and institutions—in Sweden and South Africa. The framework we present is based on the one we proposed in Acemoglu, Johnson, and Robinson (2005). Adapting Figure 1 from that paper, our framework can be represented schematically as follows:

$$\left.\begin{array}{l}\text{political institutions}_t \Longrightarrow \\ \\ \text{inequality}_t \Longrightarrow\end{array}\right\}\begin{array}{l}\text{de jure political power}_t \\ \& \\ \text{de facto political power}_t\end{array}\begin{array}{l}\Longrightarrow \text{economic institutions}_t \Longrightarrow \left.\begin{array}{c}\text{technology}_t, \\ \text{skills}_t, \text{ \& } \\ \text{prices}_t\end{array}\right\} \Longrightarrow \left\{\begin{array}{c}\text{economic performance}_t \\ \text{\&} \\ \text{inequality}_{t+1}\end{array}\right. \\ \\ \Longrightarrow \text{political institutions}_{t+1}\end{array}$$

In this approach, the prevailing political institutions at a certain time determine the distribution of de jure political power (Acemoglu and Robinson 2000, 2008; Acemoglu 2008; Acemoglu, Egorov, and Sonin 2012, forthcoming): for example, which groups are disenfranchised, how political power is contested, how constrained the economic and political elites are, and so on. Political institutions also affect, together with inequality in society, the distribution of de facto political power. For instance, de facto power—which designates political power and constraints generated by access to the means of violence, collective action, informal institutions, and social norms—depends on the extent to which different social and economic groups are organized and how they resolve their collective action problems and how resources influence their ability to do so. De facto and de jure power together determine economic institutions and also the stability and change of political institutions.

In turn, economic institutions affect the supply of skills—a crucial determinant of inequality throughout history and even more so today. Economic institutions also, through regulation of both prices and market structure, by taxation, or by affecting the bargaining power of different factors of production and individuals, influence goods and factor prices. Finally, economic institutions affect technology, including whether and how efficiently existing technologies are utilized, as well as the evolution of technology through endogenous innovations and learning by doing. For example, Zeira (1998) and Acemoglu (2010) show how low wages, resulting from either supply or institutional factors, can sometimes reduce technology adoption or even technological progress, and Hornbeck and Naidu (2014) provide evidence consistent with this pattern. Through their joint impact on technology, the supply of skills, and relative prices, economic institutions affect not only r and g, but more importantly, inequality. In this approach, inequality should not be thought of as always summarized by a single statistic, such as the Gini index or the top 1 percent

share. Rather, the economic and political factors stressed here determine the distribution of resources more generally.

We do not mean to suggest that this framework determines the evolution of institutions, technology, and inequality deterministically. The arrows designate influences, which are mediated by various stochastic events and political economy interactions, and similar economic developments will result in very different institutional responses depending on the prevailing political equilibrium, as evidenced by the contrasting histories of Mexico and the United States in the 20th century (noted earlier). Nor do we imply that the framework captures all economic implications of import—or all of those that are relevant for inequality. Most centrally, technology will evolve over time not only because of institutional factors, but also due to scientific developments and because it responds to other economic changes, including factor prices, the abundance and scarcity of different types of skills and market structure (for example, Acemoglu 2002, 2003, 2010). It is possible as well that technological developments could in turn affect institutional dynamics (for example, Acemoglu, Aghion, and Violante 2001; Hassler, Rodriguez Mora, Storlesletten, and Zilibotti 2003). Nevertheless, this simple framework is useful for highlighting the potentially important role of institutional equilibria, and their changes, in shaping inequality.

Let us now apply it to South Africa. Before 1910, non-whites could vote in the Cape and Natal as long as they fulfilled certain wealth, income, or property restrictions (though this was more heavily restricted in Natal). After 1910, a specifically white franchise was established in the Transvaal and Orange Free State, and then gradually extended to the rest of the country with blacks finally being definitively disenfranchised in the Cape in 1936. The de jure institutions of the apartheid state cemented the political power of the white minority, and segregationist laws and other aspects of the regime created economic institutions, such as the skewed distribution of land and the "color bar," aimed at furthering the interests of the white minority. So then why did this and the flourishing of social apartheid after 1948 lead to a fall in the top 1 percent share?

The primary reason is that political dynamics in South Africa at this time cannot be fully captured as a conflict between monolithic groups of whites and blacks. Rather, apartheid should be viewed as a coalition between white workers, farmers, and mine-owners—at the expense of blacks but also white industrialists who had to pay very high wages for white workers (Lundahl 1982; Lipton 1985). Thus, one reason for a reduction in the top 1 percent share was that profits were squeezed by wages for white labor. Moreover, by depriving industrialists of a larger pool of skilled workers, and tilting the price of white labor higher (because the supply of labor was artificially restricted), these rules further stunted South African economic development.

In addition, there were forces within apartheid for redistribution from the very rich towards poorer whites. Indeed, South Africa's political discussions in the 1920s that led to the further spread of the "color bar" and subsequently to the victory of the National Party in 1948 were related to what was called the "poor white problem,"

highlighting the importance of the specific coalition underpinning apartheid. Alvaredo and Atkinson (2010) discuss other factors such as the gold price.

The compression of the huge wage gaps between South Africa's whites and blacks starting in the 1970s (see Figure 2) should be viewed within the context of the political weakening of the apartheid regime and its increasing economic problems (Wilson 1980; Mariotti 2012). The domestic turning point was the ability of black workers to organize protests and riots, and exercise their de facto power, particularly after the Soweto uprising of 1976, which led to the recognition of black trade unions. This process was aided by mounting international pressure, which induced British and US firms based in South Africa to push back against workplace discrimination. Ultimately, this de facto power forced the collapse of the apartheid regime, leading to a new set of political institutions and the enfranchisement of black South Africans. The new set of economic institutions, and their consequences for inequality, flowed from these political changes. Consistent with our framework, the institutions of apartheid may have also fed back into the evolution of technology, for example in impeding the mechanization of gold mining (Spandau 1980). As the power of apartheid started to erode in the 1970s, white businessmen responded rapidly by substituting capital for labor and moving technology in a labor-saving direction (Seekings and Nattrass 2005, p. 403).

As can be seen from Figure 1, the top 1 percent share in South Africa shows a steep rise after 1994, coinciding with the final overthrow of the formidable extractive institutions of apartheid. No clear consensus has yet emerged on the causes of the post-apartheid increase in inequality, but one reason relates to the fact that after the end of apartheid, the artificially compressed income distribution of blacks started widening as some portion of the population started to benefit from new business opportunities, education, and aggressive affirmative action programs (Leibbrandt, Woolard, Finn, and Argent 2010). Whatever the details of these explanations, it is hard to see the post-1994 rise in the top 1 percent share as representing the demise of a previously egalitarian South Africa.

The role of de facto and de jure political power in shaping political and economic institutions is no less central in Sweden, where the important turning point was created by the process of democratization. Adult male suffrage came in 1909, but true parliamentary democracy developed only after the Reform Act of 1918, with significant curbs on the power of the monarchy and more competitive elections. Both the 1909 reform and the emergence of parliamentary democracy in 1918 were responses to unrest, strikes, and the de facto power of disenfranchised workers, especially in the atmosphere of uncertainty and social unrest following World War I (Tilton 1974). Collier (1999, p. 83) explains: "[I]t was only after the economic crisis of 1918 and ensuing worker protests for democracy led by Social Democrats that the Reform Act was passed. Indeed, in November 1918, labor protests reached such a point as to be perceived as a revolutionary threat by Sweden's Conservative Party and upper classes."

Swedish democracy then laid the foundations for modern labor market institutions and the welfare state, and created powerful downward pressure on inequality,

including the top 1 percent share. However, democratic conflict in Sweden was not a simple contest between monolithic groups of workers and businesses either. As Moene and Wallerstein (1995, 2006) characterize it, social democracy was a coalition of the ends of the income distribution—businessmen and unskilled workers—against the middle class and skilled workers (for theories about the emergence of such political coalitions, see also Saint-Paul 2000; Gourevitch 1986; Luebbert 1991). In consequence, Swedish economic institutions strongly compressed skilled wages relative to unskilled wages, underpinning the rapid decline in broad-based measures of inequality. Some businesses benefitted from these arrangements, particularly those in sectors exposed to international competition, which used centralized wage bargaining as a tool to stop wage push from nontraded sectors, such as construction (Swenson 1991, 2002). Swedish labor market institutions also likely affected the path of technology. For instance, Moene and Wallerstein (1997) emphasize that wage compression acted as a tax on inefficient plants and stimulated new entry and rapid technological upgrading. In the face of high unskilled wages and the institutions of the welfare state, it is not a surprise that the top 1 percent share declined in Sweden as well, even if businessmen also did well with some aspects of Swedish labor market institutions.

What explains the fact that the top 1 percent share appears to increase not just in South Africa and Sweden, but in almost all OECD economies over the last 20 years or so? Factors left out of our framework—globalization, skill-biased technological changes, and the increase in the size of large corporations—are likely to be important. But these forces are themselves not autonomous but have likely responded to other changes in the world economy. For example, Acemoglu (2002) argues that skill-biased technological change cannot be understood without the increase in the supply of skilled workers in the United States and the world economy, making these types of technologies more profitable; and globalization and the increasing size of global corporations are themselves consequences of regulatory and technological changes of the last several decades. This simply underscores that the framework presented here cannot capture the dynamics of all dimensions of inequality—or the rich dynamics of political and economic institutions for that matter. Nevertheless, the basic forces that it stresses appear to be important not just in the context of Sweden and South Africa, but much more generally (as we argue in Acemoglu and Robinson 2006, 2012).

This framework also helps to clarify the reasons why we might care about inequality at the very top of the income and wealth distributions. Most relevant is that the factors undergirding a high share of income for the top 1 percent might also represent a lack of equality of opportunity or a lack of a level playing field. Extending the framework presented above, we argued in Acemoglu and Robinson (2012) that lack of a level playing field, including limited social mobility, is likely to hold back countries in their investments, innovation, and the efficiency of resource allocation. However, the top 1 percent share may not be the most relevant dimension of the distribution of income for evaluating equality of opportunity and barriers to the efficient allocation of talent and resources in society. For example, if a small

number at the top became wealthier—say, if Bill Gates and Warren Buffett became twice as wealthy—at the expense of other rich individuals, would that make US society notably less meritocratic? This seems unlikely. Indeed, Chetty, Hendren, Kline, and Saez (2014) and Chetty, Hendren, Kline, Saez, and Turner (2014) show that social mobility at the commuting zone level in the United States is unrelated to income inequality, especially inequality at the top. Their evidence that US social mobility has stayed the same even as the top 1 percent share has increased rapidly over the last several decades further corroborates this intuition. Other types of inequalities, such as the gap between whites and blacks as in South Africa or between the bottom and the middle class in the United States, may be more relevant for thinking about whether there have been changes in social mobility and the angle of the playing field.

But one dimension of political economy where the top 1 percent share may be central is the health of political institutions. It may be difficult to maintain political institutions that create a dispersed distribution of political power and political access for a wide cross-section of people in a society in which a small number of families and individuals have become disproportionately rich. A cautionary tale about the dangers created by this type of inequality is discussed in Puga and Trefler (2014) and Acemoglu and Robinson (2012): the story of late medieval Venice. Here, the economic power of the most prosperous and well-established families ultimately made it possible for them to block the access of others to political power, and once they thus monopolized political power, they could change economic institutions for their benefit by blocking the entry of other families into lucrative businesses and banning contracts that had previously made it possible for individuals with limited capital to enter into partnerships for long-distance trade. This change in political institutions, feeding into a deterioration of economic institutions, heralded the economic decline of Venice.

Yet if the primary threat from the top 1 percent share is political, then the main response should be related to monitoring and containing the political implications of the increase in top-level inequality—not necessarily catch-all policies such as the wealth taxes advocated by Piketty. Such policies should be explicitly related to the institutional fault lines of the specific society and should be conceived in the context of strengthening institutional checks against any potential power grab.

Conclusion

Thomas Piketty's (2014) ambitious work proffers a bold, sweeping theory of inequality applicable to all capitalist economies. Though we believe that the focus on inequality and the ensuing debates on policy are healthy and constructive, we have argued that Piketty goes wrong for exactly the same reasons that Karl Marx, and before him David Ricardo, went astray. These quests for general laws ignore both institutions and politics, and the flexible and multifaceted nature of technology, which make the responses to the same stimuli conditional on historical, political, institutional, and contingent aspects of the society and the epoch, vitiating

the foundations of theories seeking fundamental, general laws. We have argued, in contradiction to this perspective, that any plausible theory of the nature and evolution of inequality has to include political and economic institutions at the center stage, recognize the endogenous evolution of technology in response to both institutional and other economic and demographic factors, and also attempt to model how the response of an economy to shocks and opportunities will depend on its existing political and institutional equilibrium.

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Pareto and Piketty: The Macroeconomics of Top Income and Wealth Inequality†

Charles I. Jones

Since the early 2000s, research by Thomas Piketty and Emmanuel Saez (and their coauthors, including Anthony Atkinson and Gabriel Zucman) has revolutionized our understanding of income and wealth inequality. The crucial point of departure for this revolution is the extensive data they have used, based largely on administrative tax records. Piketty's (2014) *Capital in the Twenty-First Century* is the latest contribution in this line of work, especially with the new data it provides on capital and wealth. Piketty also proposes a framework for describing the underlying forces that affect inequality and wealth, and unlikely as it seems, a bit of algebra that plays an important role in Piketty's book has even been seen on T-shirts: $r > g$.

In this paper, I highlight some key empirical facts from this research and describe how they relate to macroeconomics and to economic theory more generally. One of the key links between data and theory is the Pareto distribution. The paper explains simple mechanisms that give rise to Pareto distributions for income and wealth and considers the economic forces that influence top inequality over time and across countries.

To organize what follows, recall that GDP can be written as the sum of "labor income" and "capital income." This split highlights several kinds of inequality that we can explore. In particular, there is "*within*-inequality" for each of these components: How much inequality is there within labor income? How much inequality within capital income—or more appropriately here, among the wealth itself for which capital income is just the annual flow? There is also "*between*-inequality" related to the

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split of GDP between capital and labor. This between-inequality takes on particular relevance given the within-inequality fact that most wealth is held by a small fraction of the population; anything that increases between-inequality therefore is very likely to increase overall inequality.[1] In the three main sections of this paper, I consider each of these concepts in turn. I first highlight some of the key facts related to each type of inequality. Then I use economic theory to shed light on these facts.

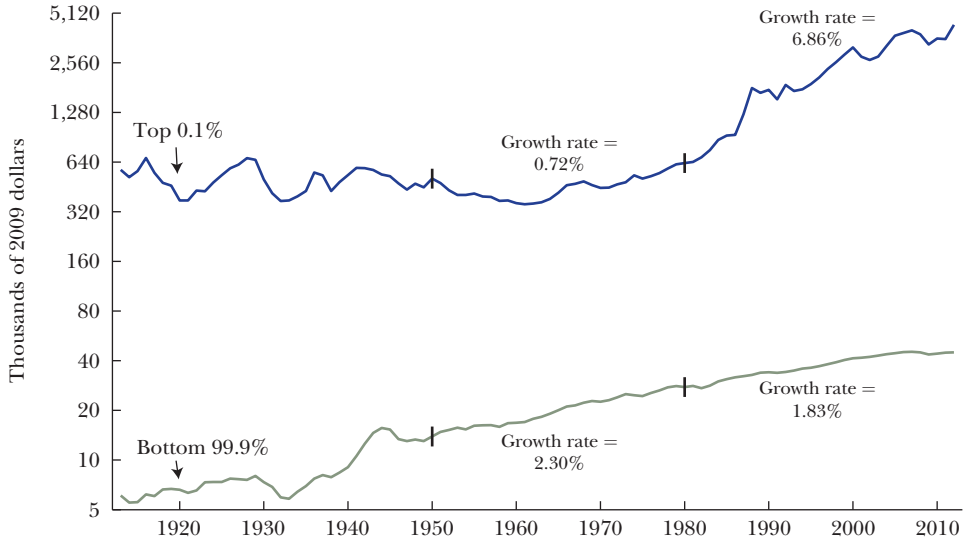
The central takeaway of the analysis is summarized by the first part of the title of the paper, "Pareto and Piketty." In particular, there is a tight link between the share of income going to the top 1 percent or top 0.1 percent and the key parameter of a Pareto distribution. Understanding why top inequality takes the form of a Pareto distribution and what economic forces can cause the key parameter to change is therefore central to understanding the facts. As just one example, the central role that Piketty assigns to $r - g$ has given rise to some confusion, in part because of its familiar presence in the neoclassical growth model, where it is not obviously related to inequality. The relationship between $r - g$ and inequality is much more easily appreciated in models that explicitly generate Pareto wealth inequality.

Capital in the Twenty-First Century, together with the broader research agenda of Piketty and his coauthors, opens many doors by assembling new data on top income and wealth inequality. The theory that Piketty develops to interpret these data and make predictions about the future is best viewed as a first attempt to make sense of the evidence. Much like Marx, Piketty plays the role of provocateur, forcing us to think about new ideas and new possibilities. As I explain below, the extent to which $r - g$ is the fundamental force driving top wealth inequality, both in the past and in the future, is unclear. But by encouraging us to entertain these questions and by providing a rich trove of data in which to study them, Piketty and his coauthors have made a tremendous contribution.

Before we begin, it is also worth stepping back to appreciate the macroeconomic consequences of the inequality that Piketty and his coauthors write about. For example, consider Figure 1. This figure is constructed by merging two famous data series: one is the Alvaredo–Atkinson–Piketty–Saez top income inequality data (about which we'll have more to say shortly) and the other is the long-run data on GDP per person for the United States that comes from Angus Maddison (pre-1929) and from the US Bureau of Economic Analysis. To set the stage, be aware that GDP per person since 1870 looks remarkably similar to a straight line when plotted on a log scale, exhibiting a relatively constant average growth rate of around 2 percent per year. Figure 1 applies the Piketty–Saez inequality shares to average GDP per person to produce an estimate of GDP per person for the top 0.1 percent and another for the bottom 99.9 percent. It is important to note that this estimate is surely imperfect. GDP likely does not follow precisely the same distribution as "adjusted gross income" in the income tax data: health insurance benefits are more equally distributed, for example. However, even with these caveats, the estimate still seems useful.

[1] One could also productively explore the correlation of the two *within* components: Are people at the top of the labor income distribution also at the top of the capital income and wealth distributions?

Figure 1
GDP per Person, Top 0.1 Percent and Bottom 99.9 Percent



Sources: Aggregate GDP per person data are taken from the Bureau of Economic Analysis (since 1929) and Angus Maddison (pre-1929). The top income share used to divide the GDP is from the October 2013 version of the World Top Incomes Database (Alvaredo, Atkinson, Piketty, and Saez n.d.).
Notes: This figure displays an estimate of average GDP per person for the top 0.1 percent and the bottom 99.9 percent. Average annual growth rates for the periods 1950–1980 and 1980–2007 are also reported.

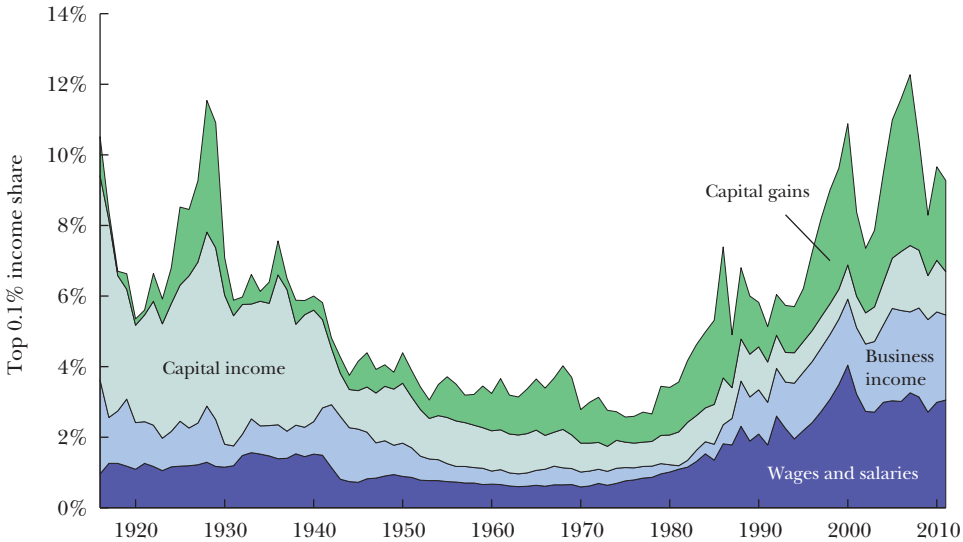
Two key results stand out. First, until recently, there is remarkably little growth in the average GDP per person at the top: the value in 1913 is actually *higher* than the value in 1977. Instead, all the growth until around 1960 occurs in the bottom 99.9 percent. Second, this pattern changed in recent decades. For example, average growth in GDP per person for the bottom 99.9 percent declined by around half a percentage point, from 2.3 percent between 1950 and 1980 to only 1.8 percent between 1980 and 2007. In contrast, after being virtually absent for 50 years, growth at the top accelerated sharply: GDP per person for the top 0.1 percent exhibited growth more akin to China's economy, averaging 6.86 percent since 1980. Changes like this clearly have the potential to matter for economic welfare and merit the attention they've received.

Labor Income Inequality

Basic Facts

One of the key papers documenting the rise in top income inequality is Piketty and Saez (2003), and it is appropriate to start with an updated graph from

Figure 2
The Top 0.1 Percent Income Share and Its Composition, 1916–2011



Source: These data are taken from the "data-Fig4B" tab of the September 2013 update of the spreadsheet appendix to Piketty and Saez (2003).

their paper. Figure 2 shows the share of income going to the top 0.1 percent of families in the United States, along with the composition of this income. Piketty and Saez emphasize three key facts seen in this figure. First, top income inequality follows a U-shaped pattern in the long term: high prior to the Great Depression, low and relatively steady between World War II and the mid-1970s, and rising since then, ultimately reaching levels today similar to the high levels of top income inequality experienced in the 1910s and 1920s. Second, much of the decline in top inequality in the first half of the 20th century was associated with capital income. Third, much of the rise in top inequality during the last several decades is associated with labor income, particularly if one includes "business income" in this category.

Theory

The next section of the paper will discuss wealth and capital income inequality. Here, motivated by the facts just discussed for the period since 1970, I'd like to focus on labor income inequality. In particular, what are the economic determinants of top labor income inequality, and why might they change over time and differ across countries?

At least since Pareto (1896) first discussed income heterogeneity in the context of his eponymous distribution, it has been appreciated that incomes at the top are

well characterized by a power law. That is, apart from a proportionality factor to normalize units,

$$\Pr[Income > y] = y^{-1/\eta},$$

which means the fraction of people with incomes greater than some cutoff is proportional to the cutoff raised to some power. This is the defining characteristic of a Pareto distribution.

We can easily connect this distribution to the Piketty and Saez (2003) "top share" numbers. In particular, for the Pareto distribution just given, the fraction of income going to the top p percentiles equals $(100/p)^{\eta-1}$. In other words, the top share varies directly with the key exponent of the Pareto distribution, η. With $\eta = 1/2$, the share of income going to the top 1 percent is $100^{-1/2} = .10$, or 10 percent, while if $\eta = 2/3$, this share is $100^{-1/3} \approx 0.22$, or 22 percent. An increase in η leads to a rise in top income shares. Hence this parameter is naturally called a measure of Pareto inequality. In the US economy today, η is approximately 0.6.

A theory of top income inequality, then, needs to explain two things: (i) why do top incomes obey a Pareto distribution, and (ii) what economic forces determine η? The economics literature in recent years includes a number of papers that ask related questions. For example, Gabaix (1999) studies the so-called Zipf's Law for city populations: why does the population of cities follow a Pareto distribution, and why is the inequality parameter very close to 1? Luttmer (2007) asks the analogous question for firms: why is the distribution of employment in US firms a Pareto distribution with an inequality parameter very close to 1? Here, the questions are slightly different: Why might the distribution of income be well represented by a Pareto distribution, and why does the inequality parameter change over time and differ across countries? Interestingly, it turns out that there is a lot more inequality among city populations or firm employment than there is among incomes (their η's are close to 1 instead of 0.6). Also, the size distribution of cities and firms is surprisingly stable when compared to the sharp rise in US top income inequality.

From this recent economics literature as well as from an earlier literature on which it builds, we learn that the basic mechanism for generating a Pareto distribution is surprisingly simple: *exponential growth that occurs for an exponentially distributed amount of time leads to a Pareto distribution.*[2]

To see how this works, we first require some heterogeneity. Suppose people are exponentially distributed across some variable x, which could denote age or experience or talent. For example, $\Pr[Age > x] = e^{-\delta x}$, where δ denotes the death rate in the population. Next, we need to explain how income varies with age in the population. A natural assumption is exponential growth: suppose income rises exponentially with age (or experience or talent) at rate μ, that is, $Income = e^{\mu x}$. In

[2] Excellent introductions to Pareto models can be found in Mitzenmacher (2003), Gabaix (2009), Benhabib (2014), and Moll (2012b). Benhabib traces the history of Pareto-generating mechanisms and attributes the earliest instance of a simple model like that outlined here to Cantelli (1921).

this case, the log of income is just proportional to age, so the log of income obeys an exponential distribution with parameter δ/μ.

Next, we use an interesting property: if the log of income is exponential, then the level of income obeys a Pareto distribution:[3]

$$\Pr[\mathit{Income} > y] = y^{-\delta/\mu}.$$

Recall from our earlier discussion that the Pareto inequality measure is just the inverse of the exponent in this equation, which gives

$$\eta_{\text{income}} = \mu/\delta.$$

The Pareto exponent is increasing with μ, the rate at which incomes grow with age, and decreasing in the death rate δ. Intuitively, the lower is the death rate, the longer some lucky people in the economy can benefit from exponential growth, which widens Pareto inequality. Similarly, faster exponential growth across ages (which might be interpreted as a higher return to experience) also widens inequality.

This simple framework can be embedded in a richer model to produce a theory of top income inequality. For example, in Jones and Kim (2014) we build a model along these lines in which both μ and δ are endogenous variables that respond to changes in economic policy or technology. In our setup, x corresponds to the human capital of entrepreneurs. Entrepreneurs who put forth more effort cause their incomes to grow more rapidly, corresponding to a higher μ. The death rate δ is an endogenous rate of creative destruction by which one entrepreneur is displaced by another. Technological changes that make a given amount of entrepreneurial effort more effective, such as information technology or the worldwide web, will increase top income inequality. Conversely, exposing formerly closed domestic markets to international competition may increase creative destruction and reduce top income inequality. Finally, the model also incorporates an important additional role for luck: the richest people are those who not only avoid the destruction shock for long periods, but also those who benefit from the best idiosyncratic shocks to their incomes. Both effort and luck play central roles at the top, and models along these lines combined with data on the stochastic income process of top earners can allow us to quantify their comparative importance.

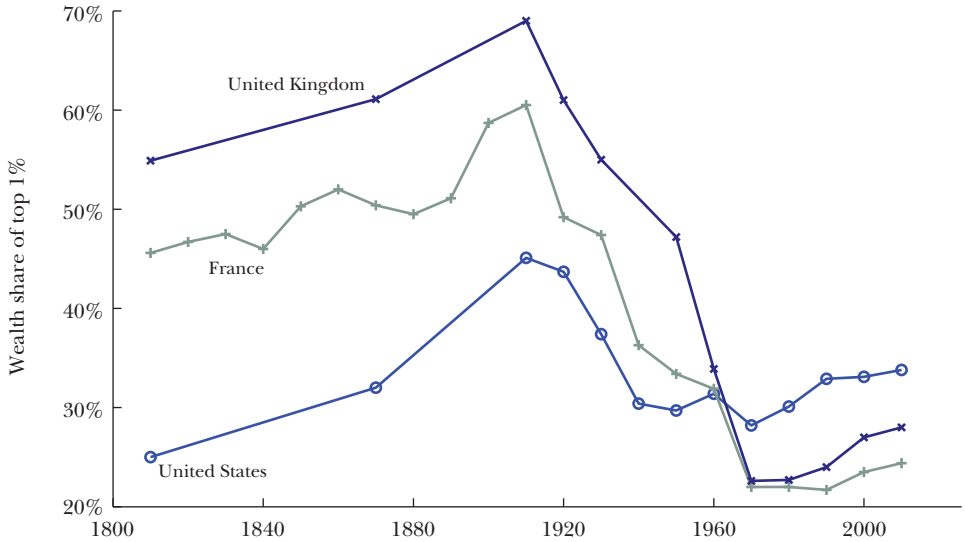
Wealth Inequality

Basic Facts

Up until this point, we've focused on inequality in labor income. Piketty's (2014) book, in contrast, is primarily about wealth, which turns out to be a more

[3] This derivation is explained in more detail in the online Appendix. Jones (2014) is available at http://www.stanford.edu/~chadj/SimpleParetoJEP.pdf and at the journal's website, http://e-jep.org.

Figure 3
Wealth Shares of the Top 1% in Three Countries, 1800 to 2010



Source: Supplementary Table S10.1 for chapter 10 of Piketty (2014), available at: http://piketty.pse.ens.fr/capital21c.
Note: The figure shows the share of aggregate wealth held by the richest 1 percent of the population.

difficult subject. Models of wealth are conceptually more complicated because wealth accumulates gradually over time. In addition, data on wealth are more difficult to obtain. Income data are "readily" (in comparison only!) available from tax authorities, while wealth data are gathered less reliably. For example, common sources include estate taxation, which affects an individual infrequently, or surveys, in which wealthy people may be reluctant to share the details of their holdings. With extensive effort, Piketty assembles the wealth inequality data shown in Figure 3, and several findings stand out immediately.

First, wealth inequality is much greater than income inequality. Figure 3 shows that the top 1 percent of families possesses around 35 percent of wealth in the United States in 2010—a newer source (Saez and Zucman 2014) says 40 percent—versus around 17 percent of income. Put another way, the income cutoff for the top 1 percent is about $330,000—in the ballpark of the top salaries for academics. In contrast, according to the latest data from Saez and Zucman (2014), the wealth cutoff for the top 1 percent is an astonishing $4 million! Note that both groups include about 1.5 million families.

Second, wealth inequality in France and the United Kingdom is dramatically lower today than it was at any time between 1810 and 1960. The share of wealth held by the top 1 percent is around 25 or 30 percent today, versus peaks in 1910 of 60 percent or more. Two world wars, the Great Depression, the rise of progressive

taxation—some combination of these and other events led to an astonishing drop in wealth inequality both there and in the United States between 1910 and 1965.

Third, Figure 3 shows that wealth inequality has increased during the last 50 years, although the increase seems small in comparison to the declines just discussed. An important caveat to this statement applies to the United States: the data shown are those used by Piketty in his book, but Saez and Zucman (2014) have recently assembled what they believe to be superior data in the United States, and these data show a rise to a 40 percent wealth share for the US top 1 percent by 2010 (as mentioned earlier), much closer to the earlier peak in the first part of the 20th century.

Theory

A substantial and growing body of economic theory seeks to understand the determinants of wealth inequality.[4] Pareto inequality in wealth readily emerges through the same mechanism we discussed in the context of income inequality: exponential growth that occurs over an exponentially distributed amount of time. In the case of wealth inequality, this exponential growth is fundamentally tied to the interest rate, r: in a standard asset accumulation equation, the return on wealth is a key determinant of the growth rate of an individual's wealth. On the other hand, this growth in an individual's wealth occurs against a backdrop of economic growth in the overall economy. To obtain a variable that will exhibit a stationary distribution, one must normalize an individual's wealth level by average wealth per person or income per person in the economy. If average wealth grows at rate g, which in standard models will equal the growth rate of income per person and capital per person, the normalized wealth of an individual then grows at rate $r - g$. This logic underlies the key $r - g$ term for wealth inequality that makes a frequent appearance in Piketty's book. Of course, r and g are potentially endogenous variables in general equilibrium so—as we will see—one must be careful in thinking about how they might vary independently.

To be more specific, imagine an economy of heterogeneous people. The details of the model we describe next are given in Jones (2014). But the logic is straightforward. To keep it simple, assume there is no labor income and that individuals consume a constant fraction α of their wealth. As discussed above, wealth earns a basic return r. However, wealth is also subject to a wealth tax: a fraction τ is paid to the government every period. With this setup, the individual's wealth grows exponentially at a constant rate $r - \tau - \alpha$. Next, assume that average wealth per person (or capital per person) grows exogenously at rate g, for example in the context of some macro growth model. The individual's normalized wealth then grows exponentially

[4] References include Wold and Whittle (1957), Stiglitz (1969), Huggett (1996), Quadrini (2000), Castaneda, Diaz-Gimenez, and Rios-Rull (2003), Benhabib and Bisin (2006), Cagetti and Di Nardi (2006), Nirei (2009), Benhabib, Bisin, and Zhu (2011), Moll (2012a), Piketty and Saez (2012), Aoki and Nirei (2013), Moll (2014), and Piketty and Zucman (2014).

at rate $r - g - \tau - \alpha > 0$. This is the basic "exponential growth" part of the requirement for a Pareto distribution.

Next, we obtain heterogeneity in the simplest possible fashion: assume that each person faces a constant probability of death, d, in each period. Because Piketty (2014) emphasizes the role played by changing rates of population growth, we'll also include population growth, assumed to occur at rate n. Each new person born in this economy inherits the same amount of wealth, and the aggregate inheritance is simply equal to the aggregate wealth of the people who die each period. It is straightforward to show that the steady-state distribution of this birth-death process is an exponential distribution, where the age distribution is $\Pr[Age > x] = e^{-(n+d)}x$. That is, the age distribution is governed by the birth rate, which equals $n + d$. The intuition behind this formulation is that a fraction $n + d$ of new people are added to the economy each instant.

We now have exponential growth occurring over an exponentially distributed amount of time. The model we presented in the context of the income distribution suggested that the Pareto inequality measure equals the ratio of the "growth rate" to the "exponential distribution parameter" and that logic also holds for this model of the wealth distribution. In particular, wealth has a steady-state distribution that is Pareto with

$$\eta_{\text{wealth}} = \frac{r - g - \tau - \alpha}{n + d}.$$

An equation like this is at the heart of many of Piketty's statements about wealth inequality, for example as measured by the share of wealth going to the top 1 percent. Other things equal, an increase in $r - g$ will increase wealth inequality: people who are lucky enough to live a long time—or are part of a long-lived dynasty—will accumulate greater stocks of wealth. Also, a higher wealth tax will lower wealth inequality. In richer frameworks that include stochastic returns to wealth, the super-rich are also those who benefit from a lucky run of good returns, and a higher variance of returns will increase wealth inequality.

Can this class of models explain why wealth inequality was so high historically in France and the United Kingdom relative to today? Or why wealth inequality was historically much higher in Europe than in the United States? Qualitatively, two of the key channels that Piketty emphasizes are at work in this framework: either a low growth rate of income per person, g, or a low rate of population growth, n—both of which applied in the 19th century—will lead to higher wealth inequality.

Piketty (2014, p. 232) summarizes the logic underlying models like this with characteristic clarity: "[I]n stagnant societies, wealth accumulated in the past takes on considerable importance." On the role of population growth, for example, Piketty notes that an increase means that inherited wealth gets divided up by more offspring, reducing inequality. Conversely, a decline in population growth will concentrate wealth. A related effect occurs when the economy's per capita growth rate rises. In this case, inherited wealth fades in value relative to new wealth generated

by economic growth. Silicon Valley in recent decades is perhaps an example worth considering. Reflections of these stories can be seen in the factors that determine η for the distribution of wealth in the equation above.

General Equilibrium

Whether changes in the parameters of models in this genre can explain the large changes in wealth inequality that we see in the data is an open question. However, one cautionary note deserves mention: the comparative statics just provided ignore the important point that arguably all the parameters considered so far are endogenous. For example, changes in the economy's growth rate g or the rate of the wealth tax τ can be mirrored by changes in the interest rate itself, potentially leaving wealth inequality unchanged.[5] To take another example, the fraction of wealth that is consumed, α, will naturally depend on the rate of time preference and the death rate in the economy. Because the parameters that determine Pareto wealth inequality are interrelated, it is unwise to assume that the direction of changing any single parameter will have an unambiguous effect on the distribution of wealth. General equilibrium forces matter and can significantly alter the fundamental determinants of Pareto inequality.

As one example, if tax revenues are used to pay for government services that enter utility in an additively separable fashion, the formula for wealth inequality in this model reduces to:

$$\eta_{\text{wealth}} = \frac{n}{n + d}.$$

See Jones (2014) for the details.[6] Remarkably, in this formulation the distribution of wealth is invariant to wealth taxes. In addition, the effect of population growth on wealth can actually go in the opposite direction from what we've seen so far. The intuition for this result is interesting: while in partial equilibrium, the growth rate of normalized wealth is $r - g - \tau - \alpha$, in general equilibrium, the only source of heterogeneity in the model is population growth. Newborns in this economy inherit the wealth of the people who die. Because of population growth, there are more newborns than people who die, so newborns inherit less than the average amount of wealth per capita. This dilution of the inheritance via population growth is the key source of heterogeneity in the model, and this force ties the distribution of wealth across ages at a point in time to population growth. Perhaps a simpler way of making the point is this: if there were no population growth in the model, newborns

[5] This relationship can be derived from a standard Euler equation for consumption with log utility, which delivers the result that $r - g - \tau = \rho$, where ρ is the rate of time preference. With log utility, the substitution and income effects from a change in growth or taxes offset and change the interest rate one for one.

[6] There are two key reasons for this result. The first is the Euler equation point made earlier, that $r - g - \alpha$ will be pinned down by exogenous parameters. The second is that the substitution and income effect from taxes cancel each other out with log utility, so the tax rate does not matter. For these two reasons, the numerator of the Pareto inequality measure for wealth, $r - g - \tau - \alpha$, simplifies to just n.

would each inherit the per capita amount of wealth in the economy. The accumulation of wealth by individuals over time would correspond precisely to the growth in the per capita wealth that newborns inherit, and there would be no inequality in the model despite the fact that $r > g$!

More generally, other possible effects on the distribution of wealth need to be considered in a richer framework. Examples include bequests, social mobility, progressive taxation, transition dynamics, and the role of both macroeconomic and microeconomic shocks. The references cited earlier make progress on these fronts.

To conclude this section, two points are worth appreciating. First, in a way that is easy to overlook because of our general lack of familiarity with Pareto inequality, Piketty is right to highlight the link between $r - g$ and top wealth inequality. That connection has a firm basis in economic theory. On the other hand, as I've tried to show, the role of $r - g$, population growth, and taxes is more fragile than this partial equilibrium reasoning suggests. For example, it is not necessarily true that a slowdown in either per capita growth or population growth in the future will increase inequality. There are economic forces working in that direction in partial equilibrium. But from a general equilibrium standpoint, these effects can easily be washed out depending on the precise details of the model. Moreover, these research ideas are relatively new, and the empirical evidence needed to sort out such details is not yet available.

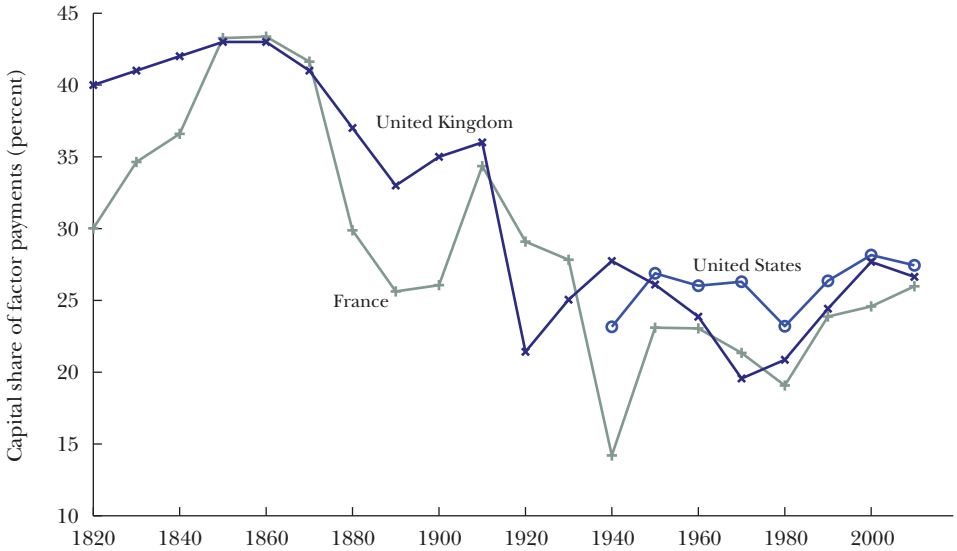
Between-Inequality: Capital versus Labor

We next turn to between-inequality: how is income to capital versus income to labor changing, and how is the wealth–income ratio changing? This type of inequality takes on particular importance given our previous fact about within-inequality: most wealth is held by a small fraction of the population, which means that changes in the share of national income going to capital (that is, rK/Y) or in the aggregate capital–output ratio also contribute significantly to inequality. Whereas Pareto inequality describes how inequality at the top of the distribution is changing, this between-inequality is more about inequality between the top 10 percent of the population—who hold around 3/4 of the wealth in the United States according to Saez and Zucman (2014)—and the bottom 90 percent.

Basic Facts

At least since Kaldor (1961), a key stylized fact of macroeconomics has been the relative stability of factor payments to capital as a share of GDP. Figure 4 shows the long historical time series for France, the United Kingdom, and the United States that Piketty (2014) has assembled. A surprising point emerges immediately: prior to World War II, the capital share exhibits a substantial negative trend, falling from around 40 percent in the mid-1800s to below 30 percent. By comparison, the data since 1940 show some stability, though with a notable rise between 1980 and 2010. In Piketty's data, the labor share is simply one minus the capital share, so the

Figure 4
Capital Shares for Three Countries, 1820 to 2010



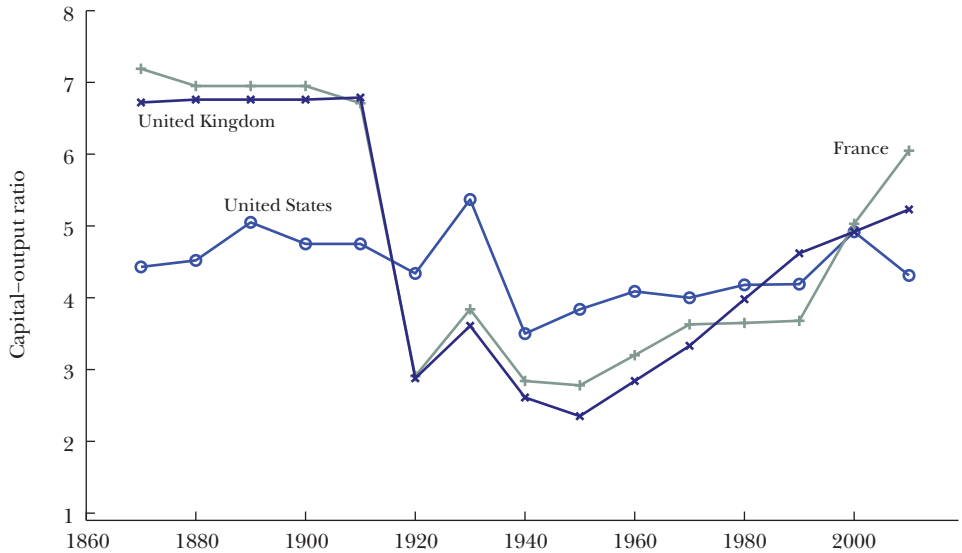
Source: For France and the United Kingdom, shares come from the supplementary tables for chapter 6 of Piketty (2014), available at http://piketty.pse.ens.fr/capital21c; for the United States, shares come from Piketty and Zucman (2014).
Note: Capital shares (including land rents) for each decade are averages over the preceding ten years.

corresponding changes in labor's share of factor payments can be read from this same graph.

Before delving too deeply into these numbers, it is worth appreciating another pattern documented by Piketty (2014). Figure 5 shows the capital–output ratio—the ratio of the economy's stock of machines, buildings, roads, land, and other forms of physical capital to the economy's gross domestic product—for this same group of countries, back to 1870. The movements are once again striking. France and the United Kingdom exhibit a very high capital–output ratio around 7 in the late 1800s. This ratio falls sharply and suddenly with World War I, to around 3, before rising steadily after World War II to around 6 today. The destruction associated with the two world wars and the subsequent transition dynamics as Europe recovers are an obvious interpretation of these facts. The capital–output ratio in the United States appears relatively stable in comparison, though still showing a decline during the Great Depression and a rise from 3.5 to 4.5 in the post–World War II period. These wonderful facts were not broadly known prior to Piketty's efforts.

Delving into the detailed data underlying these graphs, which Piketty (2014) generously and thoroughly provides, highlights an important feature of the data. By focusing on only two factors of production, capital and labor, Piketty includes land as a form of capital. Of course, the key difference between land and the rest of capital is that the quantity of land is fixed, while the quantity of other forms of

Figure 5
The Capital–Output Ratio



Source: Supplementary table S4.5 for chapter 4 of Piketty (2014), available at: http://piketty.pse.ens.fr/capital21c.

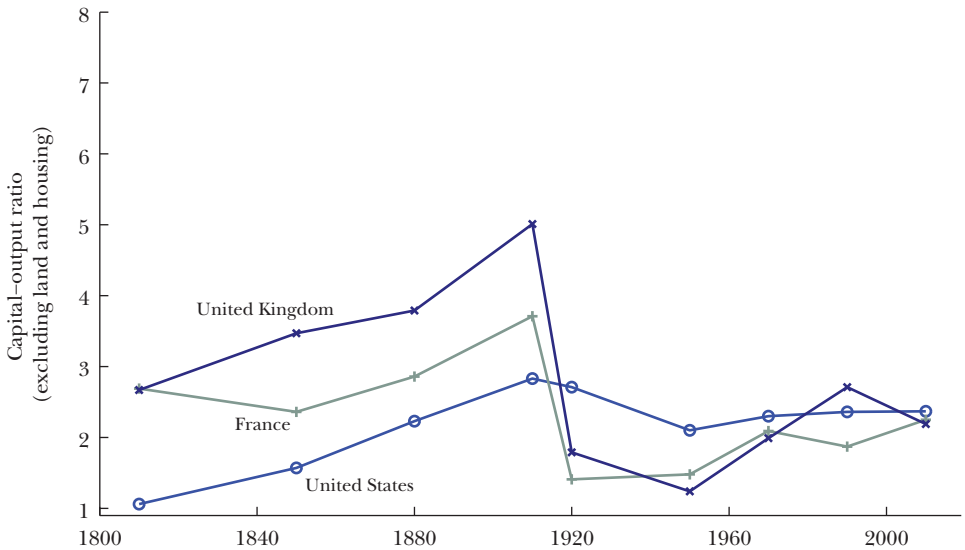
capital is not. For the purpose of understanding inequality between the top and the rest of the distribution, including land as a part of capital is eminently sensible. On the other hand, for connecting the data to macroeconomic theory, one must be careful.

For example, in the 18th and early 19th centuries, Piketty (2014) notes that rents paid to landlords averaged around 20 percent of national income. His capital income share for the United Kingdom before 1910 is taken from Allen (2007), with some adjustments, and shows a sharp decline in income from land rents (down to only 2 percent by 1910), which masks a rise in income from reproducible capital.

Similarly, much of the large swing in the European capital–output ratios shown in Figure 5 are due to land as well (in Piketty's book, Figures 3.1 and 3.2 make this clear). For example, in 1700 in France, the value of land equals almost 500 percent of national income versus only 12 percent by 2010. Moreover, the rise in the capital–output ratio since 1950 is to a great extent due to housing, which rises from 85 percent of national income in 1950 to 371 percent in 2010. Bonnet, Bono, Chapelle, and Wasmer (2014) document this point in great detail, going further to show that the rise in recent decades is primarily due to a rise in housing prices rather than to a rise in the quantity of housing.

As an alternative, consider what is called reproducible, nonresidential capital, that is the value of the capital stock excluding land and housing. This concept corresponds much more closely to what we think of when we model physical capital

Figure 6
The Capital–Output Ratio Excluding Land and Housing



Source: Supplementary tables S3.1, S3.2, and S4.2 for chapters 3 and 4 of Piketty (2014), available at: http://piketty.pse.ens.fr/capital21c.

in macro models. Data for this alternative are shown in Figure 6. In general, the movements in this measure of the capital–output ratio are more muted—especially during the second half of the 20th century. There is a recovery following the destruction of capital during World War II, but otherwise the ratio seems relatively stable in the latter period. In contrast, it is striking that the value in 2010 is actually lower than the value in several decades in the 19th century for both France and the United Kingdom. Similarly, the value in the United States is generally lower in 2010 than it was in the first three decades of the 20th century. I believe this is something of a new fact to macroeconomics—it strikes me as surprising and worthy of more careful consideration. I would have expected the capital-output ratio to be higher in the 20th century than in the 19th.

Stepping back from these discussions of the facts, an important point related to the "fundamental tendencies of capitalist economies," to use Piketty's language, needs to be appreciated. From the standpoint of overall wealth inequality, the declining role of land and the rising role of housing is not necessarily relevant. The inequality of wealth exists independent of the form in which the wealth is held. In the Pareto models of wealth inequality discussed in the preceding section, it turns out not to matter whether the asset that is accumulated is a claim on physical capital or a claim on a fixed aggregate quantity of land: the role of $r - g$ in determining the Pareto inequality measure η, for example, is the same in both setups. (The background models in Jones (2014) provide the details supporting this claim.) However,

if one wishes to fit Piketty's long-run data to macroeconomic growth models—to say something about the shape of production functions—then it becomes crucial to distinguish between land and physical capital.

Theory

The macroeconomics of the capital-output ratio is arguably the best-known theory within all of macroeconomics, with its essential roots in the analysis of Solow (1956) and Swan (1956). The familiar formula for the steady-state capital–output ratio is $s/(n+g+\delta)$, where s is the (gross) investment share of GDP, n denotes population growth, g is the steady-state growth rate of income per person, and δ is the rate at which capital depreciates. Notice that this expression pertains to the ratio of *reproducible* capital—machines, buildings, and highways—and therefore is not strictly comparable to the graphs that Piketty (2014) reports, which include land.

In this framework, a higher rate of investment s will raise the steady-state capital–output ratio, while increases in population growth n, a rise in the growth rate of income per person g, or a rise in the capital depreciation rate δ would tend to reduce that steady-state ratio. Partly for expositional purposes, Piketty simplifies this formula to another that is mathematically equivalent: $\tilde{s}/\tilde{g}$, where $\tilde{g} = n + g$ and $\tilde{s}$ now denotes the investment rate net of depreciation, $\tilde{s} = s - \delta K/Y$. This more elegant equation is helpful for a general audience and gets the qualitative comparative statics right: in particular, Piketty emphasizes that a slowdown in growth—whether in per capita terms or in population growth—will raise the capital–output ratio in the long run. Piketty occasionally uses the simple formula to make *quantitative* statements: for example, if the growth rate falls in half, then the capital–output ratio will double (see Piketty's discussion beginning on p. 170). This statement is not correct and takes the simplification too far.[7]

It is plausible that some of the decline in the capital–output ratio in France and the United Kingdom since the late 1800s is due to a rise in the rate of population growth and the growth of income per person—that is, to a rise in $n + g$—and it is possible that a slowing growth rate of aggregate GDP in recent decades and in the future could contribute to a rise in the capital–output ratio. However, the quantitative magnitude of these effects is significantly mitigated by taking depreciation into account. These points, as well as a number of interesting related issues, are discussed in detail in Krusell and Smith (2014).

To see an example, consider a depreciation rate of 7 percent, a population growth rate of 1 percent, and a growth rate of income per person of 2 percent. In this case, in the extreme event that all growth disappears, the $n + g + \delta$ denominator of the Solow expression falls from 10 percent to 7 percent, so that the capital–output ratio increases by a factor of 10/7, or around 40 percent. That would be a large change, but it is nothing like the changes we see for France or the United Kingdom in Figure 5.

[7] In particular, it ignores the fact that $\tilde{s}$ will change when the growth rate changes, via the $\delta K/Y$ term.

One may also worry that these comparative statics hold the saving rate s constant. Fortunately, the case with optimizing saving is straightforward to analyze and gives similar results.[8] The bottom line from these examples is that qualitatively it is plausible that slowdowns in growth can increase the capital–output ratio in the economy, but the magnitudes of these effects should not be exaggerated.

The effect on between-inequality—that is, on the share of GDP paid as a return to capital—is even less clear. In the Cobb–Douglas example, of course, this share is constant. How then do we account for the empirical rise in capital's share since the 1980s? The research on this question is just beginning, and there are not yet clear answers. Recent papers studying the rise in the capital share in the last two decades include Karabarbounis and Neiman (2013), Elsby, Hobijn, and ¸Sahin (2013), and Bridgman (2014).

Piketty himself offers one possibility, suggesting that the elasticity of substitution between capital and labor may be greater than one (as opposed to equaling one in the Cobb–Douglas case).[9] To understand this claim, look back at Figures 4 and 5. The fact that the capital share and the capital–output ratio move together, at least broadly over the long swing of history, is taken as suggestive evidence that the elasticity of substitution between capital and labor is greater than one. Given the importance of land in both of these time series, however, I would be hesitant to make too much of this correlation. The state-of-the-art in the literature on this elasticity is inconclusive, with some papers arguing for an elasticity greater than one but others arguing for less than one; for example, see Karabarbounis and Neiman (2013) and Oberfield and Raval (2014).

Conclusion

Through extensive data work, particularly with administrative tax records, Piketty and Saez and their coauthors have shifted our understanding of inequality in an important way. To a much greater extent than we've appreciated before, the dynamics of top income and wealth inequality are crucial. Future research combining this empirical evidence with models of top inequality is primed to shed light on this phenomenon.[10]

In *Capital in the Twenty-First Century*, Piketty suggests that the fundamental dynamics of capitalism will create a strong tendency toward greater inequality of wealth and even dynasties of wealth in the future unless this tendency is mitigated

[8] For example, with Cobb–Douglas production, $(r+\delta)K/Y=\alpha$, where α is the exponent on physical capital. With log utility, the Euler equation for consumption gives $r=\rho+g$. Therefore the steady state for the capital–output ratio is $\alpha/(\rho+g+\delta)$, which features similarly small movements in response to changes in per capita growth g.

[9] For example, see Piketty's (2014) discussion starting on p. 220.

[10] In this vein, it is worth noting that the Statistics of Income division of the Internal Revenue Service makes available random samples of detailed tax records in their public use microdata files, dating back to the 1960s (for more information on these data, see http://users.nber.org/~taxsim/gdb/).

by the enactment of policies like a wealth tax. This claim is inherently more speculative. Although the concentration of wealth has risen in recent decades, the causes are not entirely clear and include a decline in saving rates outside the top of the income distribution (as discussed by Saez and Zucman 2014), the rise in top labor income inequality, and a general rise in real estate prices. The theoretical analysis behind Piketty's prediction of rising wealth inequality often includes a key simplification in the relationships between variables: for example, assuming that changes in the growth rate g will not be mirrored by changes in the rate of return r, or that the saving rate net of depreciation won't change over time. If these theoretical simplifications do not hold—and there are reasons to be dubious—then the predictions of a rising concentration of wealth are mitigated. The future evolution of income and wealth, and whether they are more or less unequal, may turn on a broader array of factors.

I'm unsure about the extent to which $r - g$ will be viewed a decade or two from now as the key force driving top wealth inequality. However, I am certain that our understanding of inequality will have been enhanced enormously by the impetus—both in terms of data and in terms of theory—that Piketty and his coauthors have provided.

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What Do We Know about the Evolution of Top Wealth Shares in the United States?†

Wojciech Kopczuk

In Piketty's (2014) prominent book, *Capital in the Twenty-First Century*, he argues that the concentration of wealth may become increasingly extreme in the future. As Piketty reminds us, the group of rentiers—people living off accumulated capital—has been historically large and politically and socially influential. Because so much of large fortunes end up being inherited, the current concentration of wealth is bound to predict at least weakly, and perhaps strongly, how important rentiers will be. Regardless of whether one buys into depictions such as "the rentier, enemy of democracy" (p. 422), the extent to which the well-off are going to rely on work versus rely on the returns to their wealth in the future is clearly important for assessing the extent to which a society will view itself as in some way a meritocracy.

Given that the US economy has experienced rising inequality in its income and earning distributions (for example, Piketty and Saez 2003; or see the symposium on "The Top 1 Percent" in the Summer 2013 issue of this journal), one would expect that the distribution of wealth would follow a similar path. However, available evidence on this topic is much more scant and conflicting than that on income and earnings. In fact, when Piketty (2014) reports direct estimates of wealth concentration for France, the United Kingdom, Sweden, and the United States in chapter 10 of his book, he finds as yet little evidence of dramatic increase in wealth concentration in any of these countries.

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† To access the Data Appendix, visit
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In this paper, I discuss three different main methods for looking at the US wealth distribution: 1) the survey-based method using data from the Survey of Consumer Finances conducted by the Federal Reserve; 2) the estate multiplier method that uses data from estate tax returns to estimate wealth for the top of the wealth distribution; and 3) the capitalization method that uses information on capital income from individual income tax returns to estimate the underlying stock of wealth. At the time when Thomas Piketty wrote his book, only estimates based on the estate multiplier and the Survey of Consumer Finances were available; the capitalization method has been implemented by Saez and Zucman (2014) since the book was published. I also briefly comment on the usefulness of a fourth method: lists of high-wealth individuals, most notably the annual Forbes 400 list.

I will discuss the strengths and weaknesses of these approaches. I will focus in particular on a central difference in the estimates: the survey-based and estate tax methods suggest that the share of wealth held by the top 1 percent has not increased much in recent decades, while the capitalization method suggests that it has. I will offer some possible explanations for this divergence in findings: for example, questions over whether survey evidence on wealth captures those at the very top of the wealth distribution; varying estimates of the mortality rate of the very wealthy (which are necessary in projecting results from the estate tax to the broader population); sensitivity to rate-of-return assumptions; and changes in tax policy or business practices that would tend to alter the relationship between annual flows of income and accumulated stocks of wealth.

More broadly, as income inequality has grown in recent decades, the nature of wealth inequality has changed. Those in the top 1 percent of the US income and wealth distribution have less reliance on capital income and inherited wealth, and more reliance on income related to labor, than several decades ago. This transition can also help to explain why the methods of calculating wealth reach different results. These changes in the underlying sources and characteristics of high income and wealth must be the building blocks for understanding the connection between income and wealth inequality and whether, as predicted by Piketty (2014), the inequality of wealth and the importance of inherited wealth will dramatically rise in the future.

Basic Patterns in the Concentration of Wealth

There are four methods of measuring wealth at the very top of the distribution. First, one can carry out a survey that oversamples high-net-worth taxpayers. The Survey of Consumer Finances is the only source of that kind in the United States. Second, while the United States does not have an annual wealth tax (a few developed countries do—France and Norway in particular), it does have an estate tax. The estate tax records provide a snapshot of the distribution of wealth at the time of death. Third, while wealth itself is not reported to tax authorities, much of the capital income that wealth generates is taxable and observable, which provides

an opportunity to estimate the underlying wealth distribution based on the annual flows of capital income. Finally, lists of named top wealth-holders exist—Forbes has published the best-known such list since 1982.

The coverage of these data sources varies in specific ways. In principle, the survey-based and capitalization methods allow for characterizing all (or, at least, most) of the wealth distribution. The estate tax approach is limited to drawing inferences based on the population subject to the tax. For most of the 20th century, this method allowed for constructing estimates for the top 1 percent, although changes since 2001 and especially since 2010 significantly reduced the coverage of the tax.[1] The lists of the wealthy are limited to the very small group of top wealth-holders and have nonsystematic coverage.

In terms of the time frames over which the data are available, estate tax and capitalization methods allow for constructing estimates going back to the beginning of the 20th century: the US income tax was introduced in 1913, and the estate tax was introduced in 1916. The Survey of Consumer Finances is available every three years starting with 1989, with precursor surveys available in 1962 (Survey of Financial Characteristics of Consumers) and 1983 (though it was also called the Survey of Consumer Finances, it had methodological differences relative to later surveys).[2] Differences in coverage and sampling suggest that 1962 and 1983 survey estimates should be treated with more caution than those for later years, especially for the top 1 percent. The capitalization series presented here is based on recent work of Saez and Zucman (2014) and covers the period from 1913–2012.

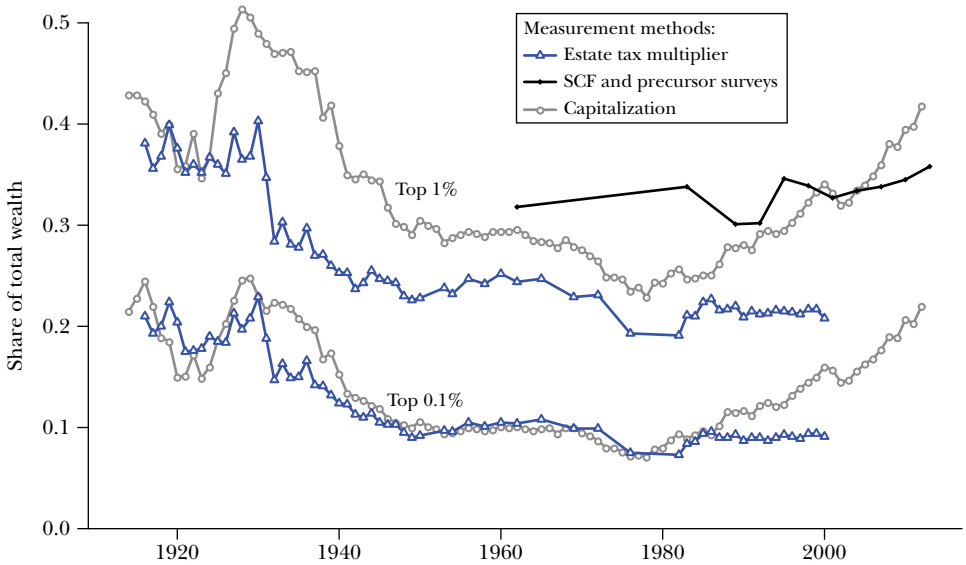
Each of the four methods has benefits and drawbacks that I will discuss in what follows. Before doing so, let us establish the basic facts. Figure 1 shows the evolution of the top 1 percent and top 0.1 percent of the wealth distribution using each of the methods that allow for constructing it. Figure 2 shows the evolution of the top 10 percent of the wealth distribution using the survey-based and capitalization methods and, separately, the wealth of the group from the 90th to 99th percentile—that is, the top 10 percent of the wealth distribution excluding the top 1 percent. Several observations are worth noting.

First, wealth is always highly concentrated. The share of wealth held by the top 10 percent has fluctuated between 65 and 85 percent of total wealth, the share of wealth held by the top 1 percent has ranged between 20 percent and as much as 45 percent of all wealth, and the share of wealth held by the top 0.1 percent ranged between less than 10 percent and as much as 25 percent.

[1] The estate tax series presented here is based on Kopczuk and Saez (2004a) and stops in 2000. Changes in the estate tax threshold reduced the coverage in subsequent years and will limit the applicability of this approach to groups significantly smaller than the top 1 percent.

[2] The series presented here were compiled by Roine and Waldenström (2015), and are in turn based on the work of Kennickell (2009b, 2011), Wolff (1996), and Lindert (2000). These estimates were extended to 2013 by Saez and Zucman (2014) following the Kennickell (2011) procedure. An unpublished paper by Scholz (2003) contains an alternative way of constructing wealth concentration estimates that generates very similar qualitative patterns. Related surveys are available for a few other years between 1962 and 1982, but they have not been used to estimate top wealth shares due to a small number of high-net-worth individuals.

Figure 1
Top 0.1% and Top 1% Wealth Shares

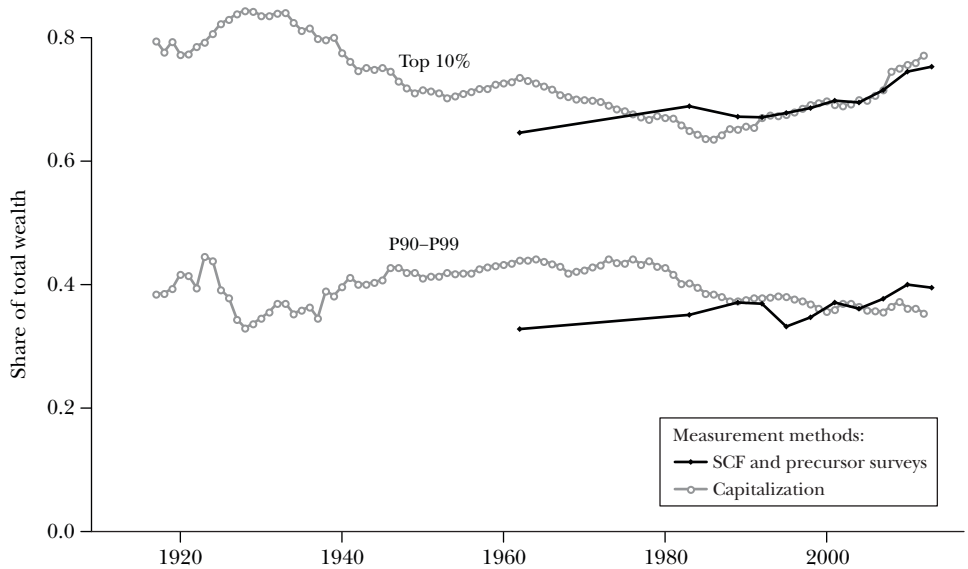


Source: Author using data described in the text.
Note: SCF is the Survey of Consumer Finances.

Second, the methods agree that the US wealth concentration peaked before the Great Depression and declined afterwards, staying relatively low at least until the 1980s. They do not necessarily agree on the timing though: the estate multiplier shows a rapid drop in the aftermath of the Great Depression, while the capitalization method shows more gradual adjustment, with rapid decline only in the late 1930s.

Third, the estate tax approach produces estimates that are lower than the other two approaches for the top 1 percent (estimates for the top 0.1 percent are much closer), but until the 1980s the two series available for that period move in a parallel fashion. There are conceptual differences that may generate different results from these approaches: for example, the estate tax multiplier method assigns wealth to individuals; the Survey of Consumer Finances (SCF) to households; and the capitalization method to "tax units." There are also differences in observability of assets. For example, tax evasion skews tax-based methods but not necessarily estimates from the SCF. Debt is observable on estate tax returns, but hard to capture by the capitalization method (debt is responsible for a reduction in the estate multiplier estimates of the top 1 percent share by more than 1 percentage point throughout and over 4 percentage points in the 1930s). Assets that do not generate taxable capital income have to be imputed in the capitalization approach.

Figure 2
Wealth Shares for Top 10% and 90th–99th Percentiles (P90–P99) in Terms of Wealth



Source: Author using data described in the text.
Note: SCF is the Survey of Consumer Finances.

Fourth, both the survey-based and the capitalization methods paint a very similar picture of the top 10 percent of the wealth distribution. Both indicate that the share of wealth held by the top 10 percent increased since the late 1980s.

Fifth, the different methods give diverging estimates since the 1980s, whether we look at the top 1 or top 0.1 percent of the wealth distribution. The methods that rely on direct measurement of wealth—that is, those based on the surveys and on the estate tax—show at best a small increase in the share of wealth held by the top 1 percent, while the capitalization methods shows a steep increase.

Sixth, given that the Survey of Consumer Finances and capitalization generate similar trends in recent years for the top 10 percent but different trends for the top 1 percent, it follows also that they do not coincide for the lower portion of the top 10 percent. The SCF shows a marked increase in the share of wealth going to P90–P99, while the capitalization method shows a decline.

These different approaches to estimating the distribution of wealth cover different periods of time and different parts of the distribution. They do not always paint the same picture, either. It is important then to understand the assumptions and the sources of data in order to understand weaknesses and strengths of different approaches. The next section discusses each of these four methods in more depth, and the following section then seeks to explain the discrepancies across the data series.

Four Methods of Measuring the Wealth Distribution

Survey of Consumer Finances

In a nutshell, the Survey of Consumer Finances is designed to measure household wealth. Bricker et al. (2014) and Kennickell (2009b, 2011) provide detailed overviews of its design. The definition of wealth in this survey includes all conventional categories of assets. Kennickell (2009b) concludes that the most important omissions are expected payments from defined benefit pension plans (naturally, Social Security wealth is also not accounted for), income streams from annuities or trusts, and human capital. In each case, these omissions are income-generating assets that are difficult or impossible to trade and that also escape the estate tax because they stop at death of the owner.

To cover the full wealth distribution in a way that accurately represents the concentration of wealth at the top end, the Survey of Consumer Finances supplements its random sample of the entire population with a stratified "list sample" derived from individual income tax returns. As a result, the survey significantly oversamples the very top of the wealth distribution. The sample, however, explicitly excludes individuals who belong to the Forbes 400 even if they are otherwise selected. Kennickell (2009a) notes that fewer than expected members of the Forbes 400 were selected and then disqualified, possibly because wealth in the Forbes sample may be held in trusts or by multiple family members, or because of errors in Forbes or issues with the Statistics of Income tax data that is relied on for stratification in the SCF.

A concern with the Survey of Consumer Finances is that the response rate among high-wealth individuals is only about 25 percent. Kennickell (2009a) discusses the response rate issue and the difficulties in reaching the very wealthy individuals, and concludes that the major difficulty in obtaining responses is the length of time that the interview takes. Given that this high-wealth sample is selected based on external income tax information, it is in principle possible to adjust for any potential nonresponse bias that varies systematically with observable characteristics: for example, if those, say, younger or with higher income were underrepresented because of a low response rate, those in these categories who did respond could be weighted more heavily. However, Kennickell (2009a) finds little evidence of nonresponse bias on observables.[3] In particular, he comments that refusal to fill out the survey (and various reasons for it) appears not related to the wealth index derived from income tax information that is relied on in sample design. Of course, one cannot eliminate the possibility that the sample is biased on some unobservable characteristics, but at least as the first pass, the sample does not appear biased in the dimensions that can be captured using income tax data.

[3] Verifying this point is the subject of ongoing work by the SCF staff, and I have confirmed that they still find that this conclusion holds in most recent surveys (personal communication).

Estate Tax Data

Since 1916—with the exception of 2010 when the estate tax requirement was eliminated for one year—estates of decedents with value exceeding a certain threshold are required to file an estate tax return. The threshold for the estate tax has varied significantly over time, but for most of the 20th century it corresponded to 1 percent or more of decedents being subject to the estate tax. In this way, the estate tax return provides a snapshot of wealth at the time of death for the population of sufficiently wealthy decedents.

A first practical difficulty in the estate tax approach is how to generalize from decedents to the full population. In Kopczuk and Saez (2004b), we provide extensive methodological discussion. The basic idea is to think of decedents as a sample from the living population. The individual-specific mortality rate m_i becomes the sampling rate. If m_i is known, the distribution for the living population can be simply estimated by reweighting the data for decedents by inverse sampling weights $1/m_i$, which are called "estate multipliers." Lampman (1962) was the first to provide such estimates for the US economy, although there are earlier estimates using UK data. In Kopczuk and Saez (2004a), we relied on confidential individual estate tax return data available at the IRS to construct such estimates for all years when they are available (1916–1945, a few years between 1946 and 1981, and 1982–2000) and supplemented it using data for a few other years between 1946 and 1981 for which detailed published tabulations exist.

The critical decision in applying the estate multiplier technique is the choice of mortality rates. While population mortality rates are relatively easy to observe by age and gender, mortality rates for the wealthy are known to be lower than those for the rest of the population, but are much harder to observe. In Kopczuk and Saez (2004a), we use estimated mortality differentials (by age and gender) between college-educated individuals (who are wealthier and longer living) and the full population at a single point in time (Brown, Liebman, and Pollet 2002) to adjust population mortality rates in all other years. The most worrisome feature of this approach is *not* that the mortality differentials for those with college education and for the wealthy are not the same: after all, as a first approximation such a difference would alter the level of the estimated wealth for the top groups, but would not necessarily affect the trend over time. A bigger concern is that the difference between mortality of college-educated and that of the wealthy may have changed over time. I will return to this issue when comparing capitalization and estate multiplier estimates.

Unlike the survey-based and capitalization methods, the estate tax method assigns wealth to individuals, rather than households. Depending on the composition of households (single vs. couple) across the distribution of wealth and on the division of assets within a household, this approach could in theory result in either higher or lower shares of top wealth percentiles relative to estimates based on a household distribution of wealth.

Another set of potential problems arises because the estate of a decedent may be different than wealth of an otherwise similar living person for various reasons.

As one example, an estate may have been diminished by a high level of end-of-life spending on health care. Estate tax data will reflect tax avoidance achieved by many high-wealth individuals through estate planning. The magnitude of the tax avoidance bias is difficult to assess, but some effect is clearly present; in Kopczuk (2013), I discuss available evidence. Certainly, there is a lot of estate tax planning and tax avoidance. At the same time, this phenomenon is not new, and there is no clear argument for why estate tax avoidance would have increased over time. Cooper (1979) dubbed the estate tax a "voluntary tax" in the 1970s, before any evidence would suggest that wealth inequality started growing. He showed that many aggressive estate tax planning techniques were possible at that time. Most of the loopholes he discussed can no longer be used, but new approaches have become available. The main constraint to aggressive tax planning, stressed by Schmalbeck (2001), is reluctance to relinquish control over wealth—effective estate tax planning inevitably corresponds to transfers with at least some irreversible aspects. Indeed, the available evidence suggests that there is too little tax planning in this context relative to what a fully tax-minimizing taxpayer would do (Kopczuk 2013).

Estate tax data that underlies the estate multiplier technique does not cover the full population. Hence, it cannot directly be used to provide an estimate of aggregate wealth, which in turn is necessary for constructing estimates of the share of wealth held by the top 0.1, top 1, or top 10 percent. In Kopczuk and Saez (2004a), we address this issue by constructing estimates of aggregate wealth using the Flow of Funds data. Saez and Zucman (2014) build on the same approach to construct aggregate wealth in their application of the capitalization method.

Capitalization Method

The idea behind the capitalization method of estimating wealth is straightforward. If we can observe capital income $k = rW$, where W is the underlying value of an asset and r is the known rate of return, then we can estimate wealth based on capital income and capitalization factor $1/r$ defined using the appropriate choice of rate of return. Many categories of capital income are subject to income taxation and hence income tax data may be used to implement this approach. Income tax data is "tax unit"–based; the unit may be a married couple or individual, with or without children, depending on tax-filing status selected by the taxpayer. Estimates obtained using this approach are likely closer to household (rather than individual) distribution of wealth. This method has a long history, although it has been rarely used in recent decades. Saez and Zucman (2014) implement and generalize this approach to construct what they refer to as "distributional Flow of Funds"—allocating aggregate wealth and its changes to different segments of the wealth distribution.

As one might expect, some practical difficulties arise in applying this approach. First, not all categories of assets generate capital income that appears on tax returns. For example, defined contribution pension plans do not generate taxable income as the funds accumulate. Owner-occupied housing does not generate annual taxable capital income, although it corresponds to property taxes that may be used to approximate its value in a rudimentary sense. The return on some types of

investments is primarily taxed as capital gains if sold (capital gains are very problematic to deal with adequately, as discussed below) and are often held until death of the taxpayer, in which case they benefit from an increase in basis ("step up") and the underlying gain is never taxed on the individual level. Saez and Zucman (2014) report that capital income on tax returns represents only about one-third of the overall return to capital. The rest has to be imputed based on other information. Regarding capital gains, they either have to be explicitly accounted for, or capitalization factors need to be adjusted for pricing effects that correspond to unrealized returns. Works of art, closely-held businesses, and farm assets are examples of problematic categories with no easy fix. As a way of illustration, these categories account for 4 percent, 10 percent, and 3.7 percent of assets reported on estate tax returns in 2012 for taxpayers with over $20 million of assets (roughly a threshold for the top 0.1 percent of the wealth distribution). Also one needs to impute wealth in an explicit manner for categories of assets, such as personal residence, life-insurance, or pension funds, that do not generate income that is observable on individual tax returns. Saez and Zucman argue that these types of assets are not very important at the top of the distribution.

Second, both realized and expected returns to capital vary by asset, but only a very rough division of capital income is available on income tax returns: specifically, income tax returns include dividends, interest, capital gains, rents and royalties, and business income. Piketty (2014) argues that the rate of return to large portfolios exceeds the rate of return to smaller ones (see his discussion on pages 431 and 449, for example). Saez and Zucman (2014) effectively attribute such differences in rates of return to differences in portfolio composition between major assets classes corresponding to the few income streams that can be separately observed on tax returns, without allowing for correlation of rates of return within an asset class with the position in the income distribution.

Third, the capitalization approach assumes that capital income on tax returns on average represents normal return to wealth. There are a number of reasons for concern about this assumption, although it is hard to assess their importance. For example, some markets may be structured in favor of well-positioned individuals. An extreme example would be insider trading. A less-extreme example would be unequal access to high-yield investments, like those created by hedge funds that have high initial investment requirements. A benign but important example would be the extraordinary returns accruing to skilled entrepreneurs or investors. In each of these cases, the capitalization method would overestimate the level of wealth: instead of dividing the observed income by the actual realized rate of return, it would adjust it by a smaller, normal, rate of return.

Fourth, some types of income treated as return to capital on tax returns do not correspond to a person's underlying stock of wealth in a clear way. For example, the "carried interest" rule allows managers of certain investment funds to treat part of their compensation for managing assets as capital gains that are taxed at preferential rates. This is one of many examples of taxpayers acting on the strong incentive for those who face high marginal income tax rates to find ways to characterize their

labor income as capital income. Other examples include payment through qualified stock options and certain choices about form of compensation in closely held firms. Such situations in which compensation is disguised as capital income are another reason why observed capital income might be higher than the normal rate would indicate, resulting in an overestimate of the underlying stock.

Fifth, wealthy individuals may in fact be those who received what, in retrospect, appears to be a very high rate of return. Obvious examples include successful technology companies—say Microsoft, Apple, or Google—that made their owners into billionaires. The capitalization method can capture the underlying stock of wealth after the valuation has already increased if assets pay, on average, normal dividends—although rapidly growing companies often do not pay dividends (Google still does not; Apple has only started in 2012; Microsoft initiated its dividend payouts in response to a dividend tax cut in 2003). But the capitalization method does not capture gain in the stock of equity wealth until individuals realize capital gains. Even if they do, such capital gains realized during explosive growth would correspond to extraordinary rates of return, but the capitalization method would interpret them as the outcome of a normal rate of return and hence would overestimate the underlying stock of wealth. It seems plausible that the prevalence of these types of issues is larger at the top of the distribution and that it has increased in recent decades with a rise in initial public offerings, weakening the attractiveness of the claim that such issues may somehow average out. Indeed, capital gains are an issue in general for the capitalization method, because income tax returns do not contain information about the holding period, which is necessary to capitalize them properly.

Sixth, the capitalization method is subject to biases due to tax avoidance. In fact, most tax avoidance/planning approaches that would skew estate tax data are going to leave a footprint in income tax data as well. As a trivial example, transfers of any income-generating assets would do so.

Despite these issues, the capitalization method produces estimates of wealth concentration that are parallel to the one obtained using the estate multiplier method until about 1986, as shown earlier in Figure 1. The key question, tackled in the next section, is to understand the source of differences in trends since then.

Saez and Zucman (2014) present a variety of validation checks for the capitalization method. For example, if one looks at the income reporting by foundations and applies this method, it does a good job of estimating the underlying wealth of the foundation. Of course, foundations are likely to be a poor counterfactual for the very wealthy individuals because foundations tend to be more diversified in their investments (in particular, for regulatory reasons) and they are nontaxable. Using matched income and estate data from the 1970s, Saez and Zucman also show that there is correspondence between wealth and capital incomes, which supports assumptions of the capitalization method. As another validation check, the Survey of Consumer Finances includes both income and wealth data, and the authors again show that the capitalization method allows the inference of wealth from the income data. Thus, there are surely reasons to be open to the possibility that the capitalization method may perform well in estimating wealth distribution.

Lists of the Wealthiest

Lists of the wealthiest Americans have the disadvantage of being based on valuations reported by journalists, which for a variety of reasons may contain errors or biases. However, one great advantage of such lists is that a researcher can identify specific people on the list and thus can identify whether their wealth comes from wages, other labor income, capital income, or inheritance. They also allow for looking at the age of top wealth-holders, their industry, and other factors.

The best-known of the lists of wealthy Americans is the Forbes 400. Using wealth as reported by Forbes, this group accounts for about a 2 percentage point increase in the total share of wealth at the top 1 percent (or the top 0.1 percent) between 1983 and 2013 (Saez and Zucman 2014). However, there are reasons to be concerned about the quality of this data. For example, Piketty (2014, pp. 441–443) is skeptical because he thinks that inherited wealth may be underrepresented. A direct comparison of estate tax returns and Forbes data by researchers from the IRS Statistics of Income Division (Johnson, Raub, and Newcomb 2013) finds that actual estates correspond to only about 50 percent of reported Forbes values. Part of this discrepancy may be due to tax avoidance and to a different way of allocating wealth (estate tax is individual, while Forbes often reports wealth for a "family"), but the gap is still very large. Possible reasons for overestimates in Forbes reports include difficulty in observing debt and differences in valuation approaches.

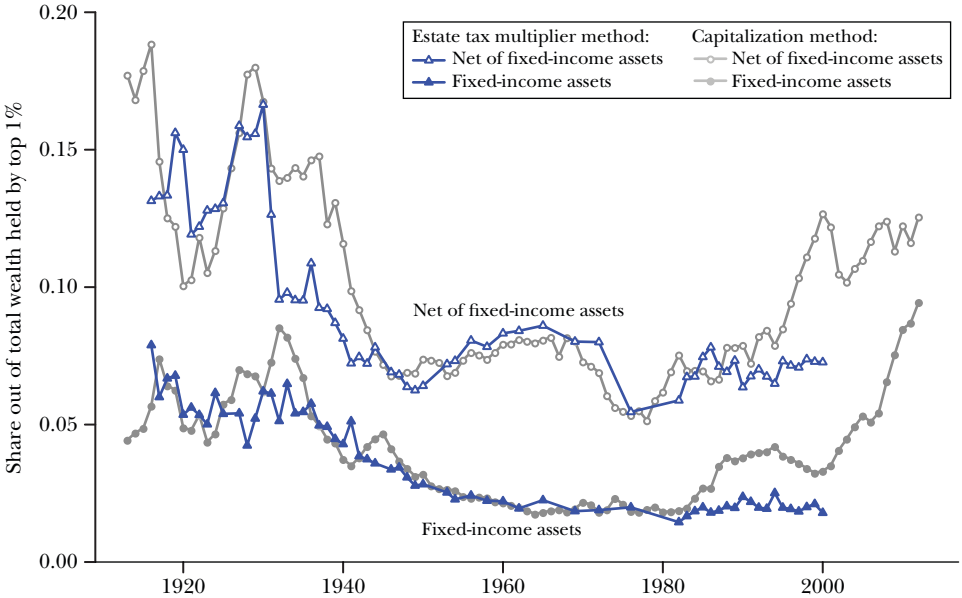
There are other historical lists going further back than Forbes. An impressive list of the 4,000 wealthiest Americans was published in 1892 by the *New York Tribune* newspaper. The website Classification of American Wealth (http://www.raken.com/american_wealth/) compiles many sources of information on top wealth-holders. Unfortunately, such sources are not systematic enough to allow for studying trends over time.

Understanding Discrepancies between Data Series

From about 1916 up until the 1960s, there are only two available approaches to estimating the evolving distribution of US wealth: the estate multiplier approach and the capitalization method. They agree that inequality in the distribution of wealth peaked in the 1920s, fell during the 1930s and into the 1940s, and then was mostly unchanged from the late 1940s up through the 1960s. As illustrated earlier in Figure 1, these data disagree on the level of wealth inequality during this time when looking at the top 1 percent, with the capitalization method usually providing higher estimates than the estate tax method. They are much closer for the smaller top 0.1 percent group. Possible straightforward explanations of the systematic difference in levels for the top 1 percent are differences in the unit of observation (individual versus "tax unit") and difficulty in observing debt on income tax returns.

There is one discrepancy during this time frame that is worth noting: the differing behaviors of the estate tax and capitalization series (as shown in Figure 1) around the time of the Great Depression. The estate tax approach shows an

Figure 3
Composition of the Top 0.1% Wealth Share



Source: Author using data described in the text.
Notes: The figure splits the estimated share of wealth accruing to the top 0.1 percent into two components: fixed income assets and everything else. The sum of the two components adds up to the share of the top 0.1 percent for the corresponding method. SCF is the Survey of Consumer Finances.

immediate decline in the share of wealth held by the top 1 percent during the Great Depression. Surprisingly, the capitalization method shows a smooth and fairly steady decline throughout the late 1920s through the 1940s, with the largest annual declines in the late 1930s and 1940s. This pattern resembles the Piketty and Saez (2003) finding that income inequality experienced the most rapid decline only in the 1940s.

Figure 3 shows what accounts for this difference. The figure splits the estimated share of wealth accruing to the top 0.1 percent into two components: fixed-income assets and everything else. Equities account for most of the latter category so that it primarily traces their dynamics; in particular, the share accounted for by real estate is fairly smooth and does not affect the qualitative pattern of the series. The sum of the two components adds up to the share of the top 0.1 percent for the corresponding method. Both methods show the decline in the non-fixed-income component (driven by equities) after 1929, although the decline in estate multiplier series is much steeper. Strikingly, the two series for the non-fixed-income component diverge throughout the 1930s. Furthermore, closer inspection of the underlying data available in online appendices to Saez and Zucman (2014) reveals that the capitalization factor for fixed income increases dramatically after 1929, reflecting lower yields, and

that this effect is behind the temporary increase in the fixed-income component visible on Figure 3 in the early 1930s. The overall result is a relatively gentle decline in the overall share of the top 0.1 percent visible on Figure 1. Still, the *increase* in the share accounted for by the value of fixed-income assets in the capitalization series on Figure 3 nevertheless corresponds to about a 10 percent *decline* in the real value of such assets between 1930 and 1932.

There is of course the question of which series does a better job in representing dynamics over this period. Given similar dynamics of the two series before and after this episode and given that the estate tax captures wealth directly while the capitalization series relies on hard-to-verify assumptions about the relationship between capital income and underlying stock, it seems reasonable to suspect that the latter approach has trouble picking up distributional dynamics in the aftermath of Great Depression. In particular, it is hard to see why the estate tax series would have exaggerated the extent of decline in non-fixed-income assets between 1930 and 1932.

From about 1960 up through the early 1980s, some survey-based evidence on the wealth distribution becomes available through predecessors of the modern Survey on Consumer Finances. Together with the estimates from the estate tax approach and the capitalization method, the general pattern is that the level of inequality of the wealth distribution remains relatively unchanged throughout this period—although there is again a difference in the levels produced by the alternative methods as far as the top 1 percent is concerned (though the top 0.1 percent coincides remarkably well for capitalization and estate multiplier approaches).

However, for the period since about 1986, the trend in the distribution of wealth differs across these approaches. Estimates of the distribution of wealth based on the Survey of Consumer Finances and the estate tax method show little or no rise in the share of total wealth held by the top 1 percent in the last 30 years, while the capitalization approach finds a substantial rise (as shown earlier in Figure 1). In addition, the Survey of Consumer Finances data shows that the share of wealth received by the 90th to 99th percentile is rising in recent years, while the capitalization method suggests that the share of wealth for this group is falling.

How can these differences be explained? Some of the possible explanations include lower mortality rates for the wealthy (which could lead to biases in the estate tax method), concerns over survey representativeness (which could lead to biases in the survey-based method), trends in the bias in the rate of return assumptions under the capitalization method, and changes in the relationship between wealth and individual capital income on tax forms driven, for example, by changes in tax law (which could lead to biases in the capitalization method) or tax avoidance (which would affect both capitalization and estate multiplier approaches).

Composition of Top Wealth and Tax Incentives

A potential problem with the two tax-based approaches arises due to changes in tax incentives over the years. First, both approaches may be skewed by tax avoidance and evasion. While this would lead to understating the level of concentration, it is less clear that this would make a big difference for the trends because tax avoidance

is hardly a new phenomenon and there is no clear presumption that it has secularly increased or declined over time. While international tax sheltering may be perhaps a bigger issue nowadays, corporate tax sheltering has likely been a much bigger issue in the past. The notion that tax avoidance has increased over time is also hard to reconcile with the evolution of tax rates. The top marginal income tax rate was above 60 percent from mid 1930s and 1981, and reached as high as 94 percent at its peak. It was then dramatically cut to 28 percent between 1981 and 1986 and remained below 40 percent ever since. Furthermore, tax avoidance is likely to affect both methods simultaneously. In particular, avoiding the estate tax usually entails transfer of assets and often income associated with them, so that it is likely to affect both estate multiplier and capitalization methods together.

Certain specific tax events appear important in understanding the discrepancy between the data series. The Tax Reform Act of 1986 in particular created an incentive to shift income from corporate to individual tax returns in a way that generated a massive behavioral response (Gordon and Slemrod 2000). The single largest short-term increase in top income shares according to Piketty and Saez (2003) takes place between 1986 and 1988 and reflects precisely this incentive. This is also the exact time when the capitalization measure of wealth begins to drift upward. There is no similar response at that point in time in estate multiplier estimates of wealth. This observation suggests the possibility that the capitalization method of estimating wealth, which is based on income-tax sources of information, may be responsive to tax-driven behavior in reporting or realization of capital income in ways that direct measures of wealth are not. More generally, changes in incentives and the repeal of the key provisions that had been behind some pre-1986s corporate tax shelters (such as the repeal of the "General Utilities doctrine") likely increased the extent to which wealth is revealed on individual-income (rather than corporate) tax data. These developments also potentially explain why the Survey of Consumer Finances—which, at least in principle, should not be biased by changes in tax treatment—yields larger wealth concentration in the top 1 percent in the 1960s and early 1980s than the capitalization method does, and why this difference disappears over time.

As in the aftermath of the Great Depression, the discrepancy between the two data series may also be traced to discrepancy in the composition of top wealth shares. As Figure 3 demonstrates, the sharp separation in the two series in 1986 is initially driven by the fixed-income component. Two incentives associated with the Tax Reform Act of 1986 may offer a potential explanation here. First, the reform significantly reduced deductibility of interest payments and may have increased net capital income reported on income tax returns, thereby driving up the estimate of its share under the capitalization method. Second, the shift from a corporate to an individual income tax base should have led to increases in all types of business-based income, including categories classified as fixed income.

Going forward, the estate tax series appears to completely miss the late 1990s stock market bubble and so does the Survey of Consumer Finances (although the infrequent timing of that survey may offer a partial explanation here), while

the bubble is clearly visible in the capitalization series. This is very puzzling. It is possible that the estate tax somehow misses owners of successful tech companies who are relatively young and not likely to die, although in principle it should not be an issue since the observations for the few young individuals who do die would just end up being heavily weighted. One would also think that portfolios of other individuals would be partially invested in tech stocks, so that the run-up should be visible. None of these appears to be the case. One potential explanation is that estates may elect so called "alternate valuation" under which assets are valued at a later date than death (though, generally within a year)—this could result in smoothing the peak of the bubble, but it would be unlikely to eliminate its presence altogether. Hence, this piece of evidence appears to support the capitalization method. However, it also simultaneously casts doubt on one of its assumptions: in order for the, clearly very rich, estate taxpayers to miss the run-up in stock prices due the tech bubble, their estates had to be insufficiently diversified relative to what the capitalization method assumes. Put differently, this piece of evidence supports the idea that very high capital incomes on individual tax returns reflect extraordinary rather than normal returns.

The most striking feature of the estimates for the 2000s is a huge run-up of fixed income-generating wealth in the capitalization series. In fact, this run-up accounts for virtually *all* of the increase in the share of the top 0.1 percent between 2000 and 2012 and most of the increase since 2003. The underlying change in taxable capital income (reported by Saez and Zucman 2014, in their figure 3) is nowhere as dramatic. The share of fixed-income in overall capital income actually falls, as would be expected when yields fall. Instead, the (almost) tripling of the fixed income component on Figure 3 (from 3.3 percent of total wealth in 2000 to 9.5 percent in 2012) is driven by an increase in the underlying capitalization factor from 24 to 96.6. This is precisely what the method is intended to do: as yields have declined, the capitalization method should weight the remaining income much more heavily. This increase—if real—would correspond to enormous rebalancing of the underlying portfolios of the wealthy throughout the 2000s. An alternative possibility is simply that the capitalization factors are difficult to estimate during periods of very low rates of return, resulting in a systematic bias.

Mortality Rates for the Wealthy

As noted earlier, projecting from estate taxes to the general population requires using a mortality rate: the approach treats those who have died as a representative sample from the population. However, the wealthy have a lower mortality risk than the general population. Indeed, Saez and Zucman (2014) cite evidence suggesting that socioeconomic mortality differentials for broad demographic groups may have increased in recent decades. Furthermore, to shed a light on mortality changes at the very top of the wealth distribution, they use confidential IRS data, and they report that the mortality of those who are college-educated is a good approximation of mortality for the top 10 percent of the wealth distribution but that this proxy overestimates mortality rates higher in the wealth distribution. For example, their

mortality rate evidence implies that mortality rates for 65 to 79 year-old males who are in the top 1 percent of the distribution are three quarters of the mortality rates of those in the top 10 percent. These are enormous differences in mortality rates: to put them in perspective, this estimated differential in mortality is bigger than that between the top 10 percent of the wealth distribution and the population average. Furthermore, they show that this discrepancy has increased since the 1970s and argue that the implied bias in estate multiplier might be able to explain the difference in trends between the estate tax method and the capitalization method.[4]

This explanation is conceptually plausible, but the estimated gap in mortality rates for the very wealthy is both very large and unexplored elsewhere in the literature, so the subject clearly requires further research. For example, an alternative possible explanation for their finding of such a large mortality advantage at the very top of the wealth distribution rests on the following observation: by construction, they report mortality rates for individuals with high capital income (which they interpret as high wealth); if high capital income represents active rather than passive returns (because it is a form of compensation for actively running or managing a business, for example), then individuals with high capital income are partially selected on health—it is being healthy that allows them to be active beyond retirement. On the flip side, individuals who are sickly may instead have an incentive to engage in tax planning and not realize capital income; in particular, there is a strong tax incentive not to realize capital gains until death in order to benefit from the step up of the basis of capital gains at death. As I will argue in what follows, it is likely that individuals at the top of the wealth distribution have become increasingly self-made, so that one might plausibly expect that this type of selection has become stronger over time. In addition, even such large increases in the mortality advantage of the very wealthy are still not large enough to explain the divergence between the capitalization and estate multiplier methods after the mid 1980s.[5]

Inclusion of Top Wealth-Holders?

As noted earlier, the Survey of Consumer Finances explicitly excludes those who appear on the Forbes 400. Saez and Zucman (2014) argue that one reason for the discrepancy between the SCF and the capitalization-based wealth estimates is that the SCF misses some of these top wealth-holders. However, remember that with more than 100 million households in the United States, the top 1 percent of the

[4] Their evidence indicates that mortality assumptions in the Kopczuk and Saez (2004a) study of the estate-tax-based measures of the wealth distribution are not far off for the 1970s, which is also the time when the capitalization method using merged estate and income tax data produces consistent results.

[5] Assuming a Pareto distribution with parameter a, a proportional increase in mortality differentials by a factor of $1 + x$ everywhere would result in an increase in the top share implied by the estate multiplier method by a factor of $(1 + x)^{1/a}$. Taking the value of $x = 0.3$ (an extremely large value, about the maximum adjustment suggested by Saez and Zucman, 2014, for any age group) and $a = 1.5$ (from Kopczuk and Saez, 2004a), it would yield an approximately 20 percent proportional adjustment in shares—in 2000, it amounts to about 4 percentage points correction for the top 1 percent share and about 2 percentage points for the top 0.1 percent, way short of the discrepancy between capitalization and estate multiplier methods that transpired between the 1980s and 2000s.

wealth distribution involves more than 1 million households. Even if the Forbes 400 list is capturing the very tip-top accurately—and as noted earlier, that assumption is dubious—the change in the top 400 can only account for about 2 percentage points of the 15 percent increase in the wealth share of the top 1 percent from 1983–2012 that the capitalization approach yields.

Going further down the distribution beyond the top 400 and into the rest of the top 1 percent of households in the wealth distribution, it is certainly possible that the Survey of Consumer Finances does miss individuals beyond the top 400 and does not correct for it by adjusting its weighting scheme, although Kennickell (2009a) finds no evidence of that. The sampling scheme in the SCF is based on income tax information, and hence it effectively identifies the top wealth-holders in a similar way as the capitalization method does. In neither case is wealth observed a priori, but wealthy individuals are sampled based on prediction of wealth from income. If this sampling approach fails to represent the wealthy population adequately in the Survey of Consumer Finances, the capitalization method will face similar problems. Similarly, just as the SCF does not include wealth from annuities or return to human capital, the capitalization method of estimating wealth is also likely to exclude this wealth; to the extent that income from these forms of wealth is taxable on individual tax returns, it would usually be taxable as labor income.

Hence, it is unclear why this type of bias would generate growing discrepancy between wealth estimates based on the Survey of Consumer Finances and the capitalization method. Furthermore, if the capitalization method produces accurate results and the SCF somehow misses the trend, one still would need to explain why the SCF provides an estimate of the wealth held by the top 1 percent which exceed the estimates of the capitalization approach in the 1980s but falls below the estimates of the capitalization approach in the 2000s (as visible in Figure 1).

Another issue with the capitalization method lies in its estimates of the share of wealth for the 90th to 99th percentile, shown in Figure 2. While one cannot completely rule out heavy trends in nonresponse bias in the Survey of Consumer Finances lower down in the wealth distribution, my prior is that this is not a likely explanation. Assuming that the SCF is representative of wealth in the 90th to 99th percentile group—which is much easier to measure accurately than the top 1 percent—then the capitalization method is actually getting steadily worse in measuring wealth in that group. One potential explanation here may have to do with an increasing importance of wealth held in the form of defined contribution pension plans, which are not observed in the income tax data and instead are imputed by the capitalization method. But of course, if imputations matter so much for the group from the 90th to 99th percentile, they may also matter elsewhere in the wealth distribution. One should also note that estimates of wealth not at the top of the distribution (such as the share of the bottom 90 or 99 percent) should be treated with caution: because many forms of wealth held lower in the distribution (pensions, housing) do not generate taxable income and require imputations, such estimates are effectively residuals obtained by subtracting estimates of the wealth at the top of the distribution from the overall wealth and hence contain little independent information.

Overall, the existing evidence on what happened to the concentration of wealth in the last few decades is not conclusive. My preference is to rely on the survey-based approach using the Survey of Consumer Finances and the estate-tax approach, primarily because of the strong assumptions and imputations needed to apply the capitalization methods in a way that gives consistent results over time. But this is a lively area of research, and the interpretation and implementation of all three of these approaches to estimating the concentration of wealth continues to evolve.

The Interplay of Income and Wealth Inequality

If, as the Survey of Consumer Finances and estate tax multiplier approaches say, the wealth share of the top 1 percent has *not* been rapidly trending upward, how can we reconcile this with the clear-cut evidence of growing *income* inequality? If, on the other hand, the capitalization method gets things right, is there an economic explanation for why the other two approaches seem to miss the growth in wealth concentration? I suspect that the difficulty here lies in the nature of changing inequality. Certainly, if the top 1 percent of incomes and the top 1 percent of wealth were the same people, growth in income shares would be expected to correspond to growth in top wealth shares.

However, the US distribution of income has not been stable in recent decades. There has been an increasing concentration of earnings over time, especially at the very top of the income distribution, as observed by Piketty and Saez (2003) and reiterated by many other authors. In addition, the nature of top incomes has changed since the 1920s—the last time when the share of income going to the top 1 percent was this high. In recent years, income at the top levels has been dominated by labor income; back in the 1920s, it was dominated by capital income (Piketty and Saez 2003). This change in the sources of income at the top suggests that the relationship between income inequality and wealth inequality has likely changed too.

The importance of inheritances as the source of wealth at top of the wealth distribution peaked in the 1970s and has declined since then, according to our analysis in Edlund and Kopczuk (2009). Our primary evidence is based on the gender composition of estate taxpayers and the observation that inherited wealth is much more equally distributed between sons and daughters than self-made wealth is. At the extreme tail of the wealth distribution, the trend has been toward observing more men, hence revealing the increased importance of self-made wealth. We also provide supportive evidence from a number of other sources, including the Forbes 400 list, that shows that the importance of inheritance among the richest Americans has declined since 1982 when the list was first published. Kaplan and Rauh (2013) provide a more comprehensive analysis of the Forbes 400 list and reach a similar conclusion. These observations suggest that the top of the wealth distribution is in flux. Individuals who are wealthy nowadays are less likely to come from wealth than in the past and more likely to have reached the top through earnings or entrepreneurial success.

Because wealth is an accumulated stock, not an annual flow, its distribution is bound to move more slowly than earnings distribution. The last 30 years have likely seen a transition in the upper parts of the wealth distribution, and this transition may still be taking place. Such a transition is consistent with a number of potential explanations I have given for why estimates of the trend in wealth concentration have been inconsistent in recent decades. For example, the increased importance of self-made, busy, active individuals among top wealth-holders is a plausible conjecture for why there could be a trend toward nonresponse bias among the wealthiest in the Survey of Consumer Finances and difficulties in observing them on estate tax returns. It is also a plausible reason for why large capital incomes may be increasingly reflecting work rather than underlying assets—which would then explain why there might be an observed trend in the mortality differential between people with high capital incomes (who are selected on being active) and everybody else. Without taking a stand on which of the preceding stories is most empirically important, these changes can plausibly reconcile the differences in methods of estimating the concentration of wealth, regardless of which one turns out to be closest to being right.

The central challenge for future work is to go beyond measuring income and wealth separately to try to understand how the joint distributions of income and wealth have been evolving over the last few decades—a period that certainly does not represent a steady state. Recognizing that the sources of income and wealth have been evolving for top income- and wealth-holders is a first step to improving our understanding of the trends and economic forces behind those patterns.

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Putting Distribution Back at the Center of Economics: Reflections on *Capital in the Twenty-First Century*

Thomas Piketty

When a lengthy book is widely discussed in academic circles and the popular media, it is probably inevitable that the arguments of the book will be simplified in the telling and retelling. In the case of my book *Capital in the Twenty-First Century* (2014), a common simplification of the main theme is that because the rate of return on capital r exceeds the growth rate of the economy g, the inequality of wealth is destined to increase indefinitely over time. In my view, the magnitude of the gap between r and g is indeed one of the important forces that can explain historical magnitudes and variations in wealth inequality: in particular, it can explain why wealth inequality was so extreme and persistent in pretty much every society up until World War I (for discussion, see Chapter 10 of my book). That said, the way in which I perceive the relationship between $r > g$ and wealth inequality is often not well-captured in the discussion that has surrounded my book—even in discussions by research economists.

In this essay, I will return to some of the themes of my book and seek to clarify and refocus the discussion concerning those themes. For example, I do not view $r > g$ as the only or even the primary tool for considering changes in income and wealth in the 20th century, or for forecasting the path of income and wealth inequality in the 21st century. Institutional changes and political shocks—which can be viewed as largely endogenous to the inequality and development process itself—played a major role in the past, and will probably continue to do so in the future. In addition, I certainly do not believe that $r > g$ is a useful tool for the discussion of rising inequality of labor income: other mechanisms

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and policies are much more relevant here, for example, the supply and demand of skills and education. One of my main conclusions is that there is substantial uncertainty about how far income and wealth inequality might rise in the 21st century and that we need more transparency and better information about income and wealth dynamics so that we can adapt our policies and institutions to a changing environment.

My book is primarily about the history of the distribution of income and wealth. Thanks to the cumulative efforts of several dozen scholars, we have been able to collect a relatively large historical database on the structure of national income and national wealth, and the evolution of income and wealth distributions, covering three centuries and over 20 countries. The first objective of my book was to present this body of historical evidence and to analyze the economic, social, and political processes that can account for the evolutions that we observe in the various countries since the Industrial Revolution. I stress from the beginning that we have too little historical data at our disposal to be able to draw definitive judgments. On the other hand, at least we have substantially more evidence than we used to have.

My book is probably best described as an analytical historical narrative based upon this new body of evidence. In this way, I hope I can contribute to placing the study of distribution and of the long-run back at the center of economic thinking. Many 19th century economists, including Thomas Malthus, David Ricardo, and Karl Marx, put the distribution question at the center of political economy. However, they had limited data at their disposal, and so their approach was mostly theoretical. In contrast, since the mid-20th century, a number of economists, most notably Simon Kuznets and Anthony Atkinson, have been developing the possibility of an approach that blends theory with more data-intensive and historical approaches. This historical data collection project on which my book is based follows directly in the tradition of the pioneering works by Kuznets (1953) and Atkinson and Harrison (1978).

In this essay, I will take up several themes from my book that have perhaps become attenuated or garbled in the ongoing discussions of the book, and will seek to re-explain and re-frame these themes. First, I stress the key role played in my book by the interaction between beliefs systems, institutions, and the dynamics of inequality. Second, I briefly describe my multidimensional approach to the history of capital and inequality. Third, I review the relationship and differing causes between wealth inequality and income inequality. Fourth, I turn to the specific role of $r > g$ in the dynamics of wealth inequality: specifically, a larger $r - g$ gap will amplify the steady-state inequality of a wealth distribution that arises out of a given mixture of shocks. Fifth, I consider some of the scenarios that affect how $r - g$ might evolve in the 21st century, including rising international tax competition, a growth slowdown, and differential access by the wealthy to higher returns on capital. Finally, I seek to clarify what is distinctive in my historical and political economy approach to institutions and inequality dynamics, and the complementarity with other approaches.

Beliefs Systems, Institutions, and the Dynamics of Inequality

In my book, I attempt to study not only the dynamics of income and wealth inequality, but also the evolution of collective representations of social inequality in public discussions and political debates, as well as in literature and movies. I believe that the analysis of representations and beliefs systems about income and wealth is an integral and indispensable part of the study of income and wealth dynamics.

Indeed, a main conclusion of my analytical historical narrative is stated in the introduction of the book (p. 20, 35), that "one should be wary of any economic determinism in regard to inequalities of wealth and income . . . The history of the distribution of wealth has always been deeply political, and it cannot be reduced to purely economic mechanisms. . . . It is shaped by the way economic, social, and political actors view what is just and what is not, as well as by the relative power of those actors and the collective choices that result. It is the joint product of all relevant actors combined. . . . How this history plays out depends on how societies view inequalities and what kinds of policies and institutions they adopt to measure and transform them." As I wrote in a follow-up essay with a co-author: "In a sense, both Marx and Kuznets were wrong. There are powerful forces pushing alternatively in the direction of rising or shrinking inequality. Which one dominates depends on the institutions and policies that societies choose to adopt" (Piketty and Saez 2014, p. 842–43).

The role of political shocks and changing representations of the economy is especially obvious when one studies inequality dynamics during the 20th century. In particular (p. 20), "the reduction of inequality that took place in most developed countries between 1910 and 1950 was above all a consequence of war and revolution and of policies adopted to cope with these shocks. Similarly, the resurgence of inequality after 1980 is due largely to the opposite political shifts of the past several decades, especially in regard to taxation and finance."

I also try to show that belief systems about the distribution of income and wealth matter a great deal if one wants to understand the structure of inequality in the 18th and 19th centuries, and indeed in any society. Each country has its own intimate history with inequality, and I attempt to show that national identities play an important role in the two-way interaction between inequality dynamics and the evolution of perceptions, institutions, and policies.

I continually refer to a large number of other institutions and public policies that play a substantial role in my historical account of inequality dynamics across three centuries and over 20 countries. I emphasize the importance of educational institutions (in particular the extent of equal access to high-quality schools and universities) and of fiscal institutions (especially the chaotic advent of progressive taxation of income, inheritance, and wealth). Other examples of important factors include: the development of the modern welfare state; monetary regimes, central banking, and inflation; labor market rules, minimum wages, and collective bargaining; forced labor (slavery); colonialism, wars, and revolutions; expropriations, physical destruction, and privatizations; corporate governance and

stakeholder rights; rent and other price controls (such as the prohibition or limitation of usury); financial deregulation and capital flows; trade policies; family transmission rules and legal property regimes; fertility policies; and many others.

A Multidimensional History of Capital and Inequality

A central reason that my book is relatively long is that I try to offer a relatively detailed, multidimensional history of capital and its metamorphosis. Capital ownership takes many different historical forms, and each of them involves different forms of institutions, rules, and power relations, which must be analyzed as such.

Theoretical models, abstract concepts, and equations (such as $r > g$, to which I return in greater detail below) also play a certain role in my analysis. However this role is relatively modest—as I believe the role of theory should generally be in the social sciences—and it should certainly not be exaggerated. Models can contribute to clarifying logical relationships between particular assumptions and conclusions but only by oversimplifying the real world to an extreme point. Models can play a useful role but only if one does not overestimate the meaning of this kind of abstract operation. All economic concepts, irrespective of how "scientific" they pretend to be, are intellectual constructions that are socially and historically determined, and which are often used to promote certain views, values, or interests. Models are a language that can be useful only if solicited together with other forms of expressions, while recognizing that we are all part of the same conflict-filled, deliberative process.

In particular, the notion of an aggregate capital stock K and of an aggregate production function $Y = F(K, L)$ are highly abstract concepts. From time to time, I refer to them. But I certainly do not believe that such grossly oversimplified concepts can provide an adequate description of the production structure and the state of property and social relations for any society. For example, I explain in Chapter 1, when I define capital and wealth (p. 47):

> Capital is not an immutable concept: it reflects the state of development and prevailing social relations of each society. . . . The boundary between what private individuals can and cannot own has evolved considerably over time and around the world, as the extreme case of slavery indicates. The same is true of property in the atmosphere, the sea, mountains, historical monuments, and knowledge. Certain private interests would like to own these things, and sometimes they justify this desire on grounds of efficiency rather than mere self-interest. But there is no guarantee that this desire coincides with the general interest.

More generally, I analyze the diversity of the forms taken by capital assets and the problems raised by property relations and market valorizations throughout

history. I study in some length the many transformations in the nature of capital assets, from agricultural land to modern real estate and business and financial capital. Each type of asset has its own particular economic and political history and gives rise to different bargaining processes, power struggles, economic innovations, and social compromises.

For example, the fact that capital ownership and property rights are historically determined is particularly clear when I study the role of slave capital in the Southern United States before 1865, which can be viewed as the most extreme form of ownership and domination of owners over others (Chapter 4). A similar theme also becomes evident when I examine the lower stock market capitalization of German companies relative to their Anglo-American counterparts, a phenomenon that is certainly related to the fact that German shareholders need to share power with other stakeholders (workers, governments, nongovernment organizations, and others) somewhat more than in other countries (Chapter 5). This power-sharing apparently is not detrimental to the productive efficiency and exporting performance of German firms, which illustrates the fact that the market and social values of capital can often differ.

Other examples involve real estate capital and natural resource wealth—like oil. Large upward or downward movements of real estate prices play an important role in the evolution of aggregate capital values during recent decades, as they did during the first half of the 20th centuries (in particular, Chapters 3–6). This can in turn be accounted for by a complex mixture of institutional and technological forces, including rent control policies and other rules regulating relations between owners and tenants, the transformation of economic geography, and the changing speed of technical progress in the transportation and construction industries relative to other sectors. The issue of oil capital and its world distribution is rooted in the power relations and military protections that go with it (in particular in the Middle East), which also have consequences for the financial investment strategies followed by the corresponding sovereign wealth funds (discussed in Chapter 12).

The institutional analysis of property relations and capital assets also has international and public-sector dimensions. The hypertrophy of gross financial asset positions between countries, which is one of the main characteristics of the financial globalization process of recent decades, is a recurring theme of the book (Chapters 1–5, 12, 15, and 16). I analyze the very large magnitude of the net foreign assets positions reached by Britain and France at the height of their colonial empires, and I compare them to today's net positions of China, Japan, or Germany. I repeatedly stress that international property relations—the fact that economic actors in some countries own significant claims on real and financial assets in other countries—can be particularly complicated to regulate in a peaceful manner. This was certainly true during the colonization and decolonization periods. Issues of international property relations could erupt again in the future. The difficulty in dealing with extreme internal and external inequality certainly contributes to explaining the high political instability that has long plagued the development process in Latin American and African countries.

Public capital—which depends on the changing patterns and complex political histories of public investment and deficit trajectories and nationalization and privatization policies—also plays a critical role in the book (especially Chapters 3 and 4). I emphasize the sharp dissimilarities in country experiences (contrasting in particular the cases of Britain and France in the 18th and 19th centuries), as well as the commonalities (such as the historically large level of public capital in the post–World War II period, and the large decline in recent decades in high-income countries as well as in Russia or China, with important consequences for the distribution of private wealth and the rise of new forms of oligarchs).

Given the specific and context-heavy discussion of these multidimensional factors, does it still make sense to speak of "capital" as a single category? The fact that it is technically possible to add up all the market values of the different existing assets (to the extent that such market values are well defined, which is not always entirely clear) in order to compute the aggregate value of the capital stock K does not change anything about the basic multidimensional reality of assets and corresponding property relations. I attempt to show that this abstract operation can be useful for some purposes. In particular, by computing the ratio $\beta = K/Y$ between the aggregate market value of capital K and national income Y, one can compare the overall importance of capital wealth, private property, and public property in societies that are otherwise impossible to compare. For instance, one finds that in spite of all metamorphosis in the nature of assets and institutional arrangements, aggregate capital values—expressed relative to total national income—are in a number of countries approaching the levels observed in the patrimonial societies that flourished in the 18th–19th centuries and until World War I. I believe that this finding is interesting in itself. But it certainly does not alter the fact that a proper comparison of these different societies requires a careful separate analysis of the various asset categories and corresponding social and economic relations.

Inequality of Labor Income and Inequality of Wealth

Another way in which my analysis of capital and inequality is multidimensional is that throughout the book, I continually distinguish between the inequality of labor income and the inequality of capital ownership. Of course these two dimensions of inequality do interact in important ways: for example, rising inequality in labor earnings during a certain period of time might tend to fuel rising wealth concentration in following decades or generations. But the forces that drive income inequality and wealth inequality are largely different.

For instance, I point out in my book (particularly Chapters 8–9) that the rise of top income shares in the United States over the 1980–2010 period is due for the most part to rising inequality of labor earnings, which can itself be explained by a mixture of two groups of factors: 1) rising inequality in access to skills and to higher education over this time period in the United States, an evolution which might

have been exacerbated by rising tuition fees and insufficient public investment; and 2) exploding top managerial compensation, itself probably stimulated by changing incentives and norms, and by large cuts in top tax rates (see also Chapter 14; Piketty, Saez, and Stantcheva 2014). More broadly, I argue (p. 243) that the mechanisms behind unequal incomes from labor "include the supply of and demand for different skills, the state of the educational system, and the various rules and institutions that affect the operation of the labor market and the determination of wages." This rise in labor earnings inequality in recent decades evidently has little to do with the gap $r - g$; indeed, it seems fairly difficult to find a logical way that $r - g$ could affect the inequality of labor income. Conversely, "[i]n the case of unequal incomes from capital, the most important processes involve savings and investment behavior, laws governing gift-giving and inheritance, the operation of real estate and financial markets, and so on" (p. 243).

In addition, the notions of top deciles or percentiles are not the same for the distributions of labor income and capital ownership. The use of deciles and percentages should be viewed as a language allowing for comparisons between societies that are otherwise impossible to compare, such as France in 1789 and China or the United States in 2014, in the same way as the aggregate capital-income ratio can be used to make comparisons. But in certain societies, the top shares of income and wealth might be highly correlated, while in other societies they may represent entirely different social hierarchies (as in traditional patrimonial societies). The extent to which these two dimensions of inequality differ gives rise to different representations and beliefs systems about social inequality, which in turn shape institutions and public policies affecting inequality dynamics.

The Dynamics of Wealth Inequality and the Role of $r > g$

Let me now try to clarify the role played by $r > g$ in my analysis of inequality dynamics. The rate of return on capital is given by r, while g measures the rate of economic growth. The gap between r and g is certainly not the only relevant mechanism for analyzing the dynamics of wealth inequality. As I explained in the previous sections, a wide array of institutional factors are central to understanding the evolution of wealth.

Moreover, the insight that the rate of return to capital r is permanently higher than the economy's growth rate g does not in itself imply anything about wealth inequality. Indeed the inequality $r > g$ holds true in the steady-state equilibrium of most standard economic models, including in representative-agent models where each individual owns an equal share of the capital stock.

For instance, consider the standard dynastic model where each individual behaves as an infinitely lived family and where the steady-state rate of return is well known to be given by the modified "golden rule" $r = \theta + \gamma g$ (where θ is the rate of time preference and γ is the curvature of the utility function). For example, if

$\theta = 3$ percent, $\gamma = 2$, and $g = 1$ percent, then $r = 5$ percent.[1] In this framework, the inequality $r > g$ always holds true, and this does not entail any implication about wealth inequality.

In a representative agent framework, what $r > g$ means is that in steady-state each family only needs to reinvest a fraction g/r of its capital income in order to ensure that its capital stock will grow at the same rate g as the size of the economy, and the family can then consume a fraction $1 - g/r$. For example, if $r = 5$ percent and $g = 1$ percent, then each family will reinvest 20 percent of its capital income and can consume 80 percent. Again, $r > g$, but this tells us nothing at all about inequality: this is simply saying that capital ownership allows the economy to reach higher consumption levels—which is really the very least one can ask from capital ownership.[2]

So what is the relationship between $r - g$ and wealth inequality? To answer this question, one needs to introduce extra ingredients into the basic model so that inequality arises in the first place.[3] In the real world, many shocks to the wealth trajectories of families can contribute to making the wealth distribution highly unequal (indeed, in every country and time period for which we have data, wealth distribution *within each age group* is substantially more unequal than income distribution, which is difficult to explain with standard life-cycle models of wealth accumulation; for a concise summary of the historical evidence on the extent of income and wealth inequality, see Piketty and Saez 2014). There are demographic shocks: some families have many children and have to split inheritances in many pieces, some have few; some parents die late, some die soon; and so on. There are also shocks to rates of return: some families make very good investments, others go bankrupt. There are shocks to labor market outcomes: some earn high wages, others do not. There are differences in taste parameters that affect the level of saving: some families consume

[1] Intuitively, in a model where everyone maximizes an infinite-horizon utility function $U = \int_{0 \leq t \leq +\infty} e^{-\theta t} u(c_t)$ (with $u(c) = c^{1-\gamma}/(1-\gamma)$), then $r = \theta + \gamma g$ is the unique rate of return to capital possible in the long-run for the following reason: it is the sole rate such that the agents are willing to raise their consumption at rate g, that is at the growth rate of the economy. If the return is higher, the agents prefer to postpone their consumption and accumulate more capital, which will decrease the rate of return; and if it is lower, they want to anticipate their consumption and borrow more, which will increase the rate of return.

[2] The inequality $r < g$ would correspond to a situation which economists often refer to as "dynamic inefficiency": in effect, one would need to invest more than the return to capital in order to ensure that one's capital stock keeps rising as fast as the size of the economy. In infinite horizon models with perfect capital markets, this cannot happen. In effect, $r < g$ would violate the transversality condition: the net present value of future resources would be infinite, so that rational agents would borrow infinite amounts in order to consume right away. However, in models with other saving motives, such as finite-horizon overlapping generation models, it is possible for $r < g$.

[3] In the dynastic model with no shock, there is no force generating inequality out of equality (or equality out of inequality), so that any initial level of wealth inequality (including full equality) can be self-sustaining, as long as the modified "golden rule" is satisfied. In effect, steady-state wealth inequality is exogenous and indeterminate, and does not depend on the gap $r - g$. Note however that the magnitude of the gap $r - g$ has an effect on the steady-state inequality of consumption and welfare in this basic model: for example, if $r - g$ is small, then high-wealth dynasties need to reinvest a large fraction of their capital income, so that they do not consume much more than low-wealth dynasties.

a lot more than a fraction $1 - g/r$ of their capital income and might even consume away the capital value and die with negligible wealth; others might reinvest a lot more than a fraction g/r and have a strong taste for leaving bequests and perpetuating large fortunes.

A central property of this large class of models is that for a given structure of shocks, the long-run magnitude of wealth inequality will tend to be magnified if the gap $r - g$ is higher. In other words, wealth inequality will converge towards a finite level in these models. The shocks will ensure that there is always some degree of downward and upward wealth mobility such that wealth inequality remains bounded in the long run. But this finite inequality level will be a steeply rising function of the gap $r - g$. Intuitively, a higher gap between r and g works as an amplifier mechanism for wealth inequality for a given variance of other shocks. To put it differently: a higher gap between r and g allows an economy to sustain a level of wealth inequality that is higher and more persistent over time (that is, a higher gap $r - g$ leads both to higher inequality and lower mobility).

More precisely, one can show that if shocks take a multiplicative form, then in the long run, the inequality of wealth will converge toward a distribution that has a Pareto shape for top wealth holders (which is approximately the form that we observe in real-world distributions and corresponds to relatively fat upper tails and a large concentration of wealth at the very top), and that the inverted Pareto coefficient (an indicator of top-end inequality) is a steeply rising function of the gap $r - g$.[4] This well-known theoretical result was established by a number of authors using various structures of demographic and economic shocks (see in particular Champernowne 1953; Stiglitz 1969). The logic behind this result and this "inequality amplification" impact of $r - g$ is presented in Chapter 10 of my book: for detailed references to this literature on wealth inequality, $r - g$, and Pareto coefficients see the online appendix to Chapter 10 of my book (available at http://piketty.pse.ens.fr/capital21c) and Piketty and Zucman (2015, section 5.4). These connections between $r - g$ and Pareto coefficients of steady-state wealth distributions are also explained very clearly in the review by Charles Jones in the present symposium.

In this class of models, relatively small changes in $r - g$ can generate very large changes in steady-state wealth inequality. For example, simple simulations of the model with binomial taste shocks show that going from $r - g = 2$ percent to $r - g = 3$ percent is sufficient to move the inverted Pareto coefficient from $b = 2.28$ to $b = 3.25$. This corresponds to a shift from an economy with moderate wealth inequality—say, with a top 1 percent wealth share around 20–30 percent, such as present-day Europe or the United States—to an economy with very high wealth

[4] A Pareto distribution means that above a certain wealth level z_0, the population fraction with wealth above z is given by $p(z) = p_0(z_0/z)^a$ (where a is a constant). A characteristic property of the Pareto distribution is that the ratio $b = \mathrm{E}(z|\, z > z')/z'$ between average wealth above some threshold z' and the level of the threshold z' is independent of z' and is equal to the inverted Pareto coefficient $b = a/(a-1)$.

inequality, with a top 1 percent wealth share around 50–60 percent, such as Europe in the 18th–19th centuries and up until World War I.[5]

To summarize: the effect of $r - g$ on inequality follows from its dynamic cumulative effects in wealth accumulation models with random shocks, and the quantitative magnitude of this impact seems to be sufficiently large to account for very important variations in wealth inequality.

To reiterate, this argument does not imply that the $r - g$ effect is the only important force that matters in accounting for historical variations in wealth inequality. The variance of other shocks (particularly to rates of returns, which vary enormously across assets and individuals), as well the income and wealth profiles of saving rates, obviously matter a great deal. Most importantly, it is really the *interaction* between the $r - g$ effect and the institutional and public policy responses—including progressive taxation of income, wealth, and inheritance; inflation; nationalizations, physical destruction, and expropriations; estate division rules; and so on—which in my view, determines the dynamics and the magnitude of wealth inequality. In particular, if one introduces taxation into the basic model, then it follows immediately that what determines long-run wealth inequality and the steady-state Pareto coefficient is the gap $(1 - t)r - g$ between the net-of-tax rate of return and the growth rate.

In their contribution to this symposium, Acemoglu and Robinson present cross-country regression results between income inequality and $r - g$ and argue that $r - g$ does not seem to have much impact on inequality. However, I do not find these regressions very convincing, for two main reasons. First, income inequality is primarily determined by the inequality of labor income (which typically represents between two-thirds and three-quarters of total income), which as I noted above has nothing to do with $r - g$. It would make more sense to run such a regression with wealth inequality, but long-run wealth inequality series are available for a much more limited number of countries than income inequality series. In Chapter 12 of my book, I present wealth inequality series for only four countries (France, Britain, Sweden, and the United States), and the data are far from perfect. We do plan in the future to extend the World Top Incomes Database (WTID) into a World Wealth and Income Database (W2ID) and to provide homogenous wealth inequality series for all countries covered in the WTID (over 30 countries). But at this stage, we have to do with what we have.

[5] In the special case with saving taste shocks, the transition equation for normalized wealth $z_{ti} = w_{ti}/w_t$ (where w_{ti} is the wealth level of dynasty i at period t, and w_t is average wealth at period t) is given by: $z_{t+1i} = (s_{ti}/s) \cdot [(1 - \omega) + \omega \cdot z_{ti}]$, with $\omega = s \cdot e^{(r-g)H}$ (where s is the average saving taste parameter, s_{ti} is the taste parameter of dynasty t at period t, r and g are the annual rate of return and growth rate, and H is generation length). With binomial shocks with probability p, one can show that the inverted Pareto coefficient is given by $b = \log(1/p)/\log(1/\omega)$. See Piketty and Zucman (2015, section 5.4) for calibrations of this formula. In Atkinson, Piketty, and Saez (2011, figures 12–15, p. 50–55), we provide evidence on the long-run evolution of inverted Pareto coefficients for income distributions. See also the discussion in the online appendix to Chapter 10 of my book (available at http://piketty.pse.ens.fr/capital21c).

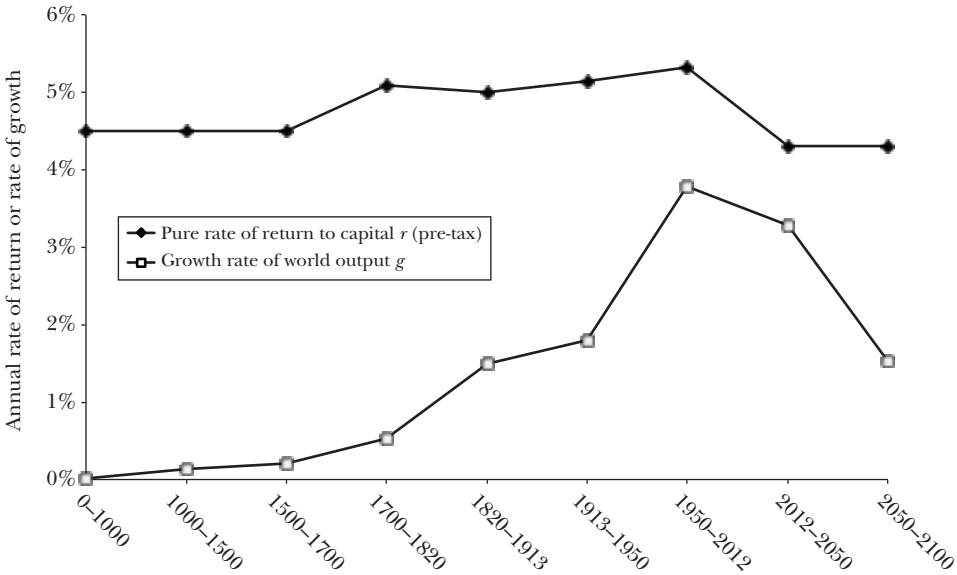
Second, the process of intergenerational accumulation and distribution of wealth is very long-run process, so looking at cross-sectional regressions between inequality and $r - g$ may not be very meaningful. One would need to introduce time lags, possibly over very long time periods: for example, one might use the average $r - g$ observed over 30 or 50 years. As I argue below, the broad correlations between $r - g$ and wealth inequality certainly seem to run in the right direction, both from a long-run (18th–19th versus 20th centuries) and international (Europe versus US) perspective. However, given the data limitations and the time-lag specification problems, I am not sure there is a lot to learn from running explicit cross-country regressions.

In my view, a more promising approach—on this issue as well as on many other issues—is a mixture of careful case studies and structural calibrations of theoretical models. Although we do not have many historical series on wealth inequality, they show a consistent pattern. Namely, we observe extremely high concentration of wealth in pretty much every European society in the 18th and 19th centuries up until World War I. In particular, in France, Britain, and Sweden, the top 10 percent wealth share was about 90 percent of total wealth (including a top 1 percent wealth share of around 60–70 percent) in the 19th century and at the very beginning of the 20th century. If anything, wealth inequality seems to have been rising somewhat during the 19th century and up until World War I—or maybe to have stabilized at very high levels around 1890–1910. Thus, in spite of the large changes in the nature of wealth during the 19th century—agricultural land as a form of wealth is largely replaced by real estate, business assets, and foreign investment—wealth inequality was as extreme in the modern industrial society of 1914 as it had been under France's *ancien regime* in 1789.

The most convincing explanation for the very high wealth concentration in these pre–World War I European societies seems to be the very large $r - g$ gap—that is, the gap between rates of return and growth rates during the 18th and 19th centuries. There was very little taxation or inflation up until 1914, so the gap $(1 - t)r - g$ was particularly high in pre–World War I societies, which in dynamic models of wealth accumulation with random shocks leads to very large wealth concentration. In contrast, following the large capital shocks of the 1914–1945 period—a time of physical destruction, periods of high inflation and taxation, and nationalizations—the after-tax, after-capital-losses rate of return precipitously fell below the growth rate after World War I. Figure 1 compares the pre-tax pure rate of return with growth rate g, while Figure 2 shows a post-tax, post-losses rate of return, including projections into the future.

This interpretation of the evidence is further confirmed by the detailed individual-level data collected in French inheritance archives since the time of the French Revolution (Piketty, Postel-Vinay, and Rosenthal 2006, 2014). We find that the more and more steeply increasing age-wealth profiles at high wealth levels in the 19th century and early 20th century can be well accounted for by a capitalization effect and a high gap between $(1 - t)r$ and g. This age–wealth pattern suddenly breaks down following the 1914–1945 capital shocks. The fact that US

Figure 1
Rate of Return versus Growth Rate at the World Level, from Antiquity until 2100



Source: Author (figure 10.9 from Piketty 2014). For more on sources and series, see http://piketty.pse.ens.fr/capital21c.
Note: The rate of return to capital (pre-tax) has always been higher than the world growth rate, but the gap was reduced during the 20th century, and might widen again in the 21st century.

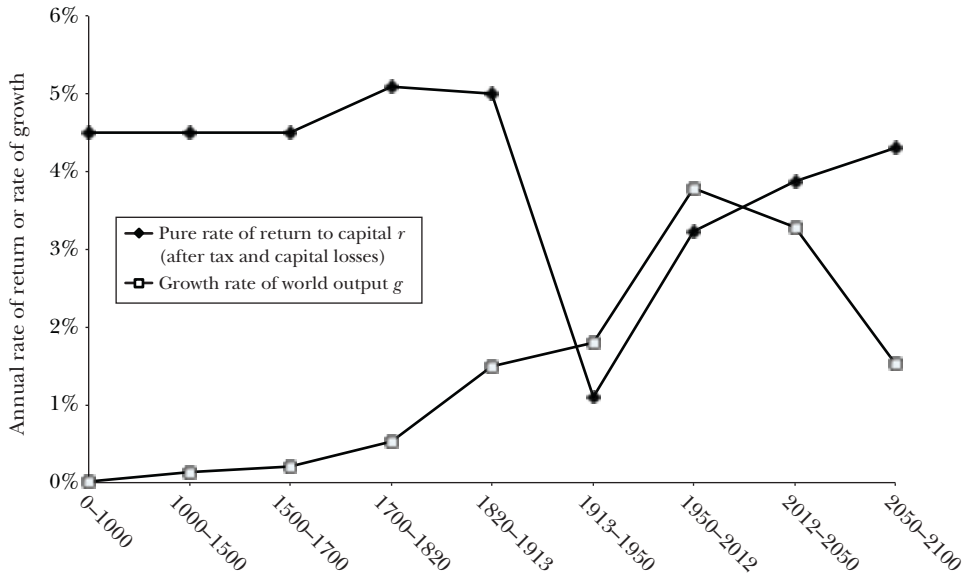
wealth concentration was significantly less than in Europe during the 19th century and up until World War I is also consistent with this model: growth rates were higher in the US economy, in particular due to higher population growth, thereby limiting the dynamic cumulative effects of the inequality amplification channel. Also, there had been less time for dynastic wealth concentration to arise in the US economy by the 19th century. This evidence is further reviewed in Chapters 10–11 of my book.

Data collection in French archives and in other countries will continue, and new data will certainly allow for better empirical tests of wealth accumulation models in the future. But at this stage, the best evidence we have suggests that $r > g$ is an important part of the explanation for the very high and persistent level of wealth concentration that we observe in most societies in the 18th–19th centuries and up until World War I.

What Will Be the Evolution of $r - g$ in the 21st Century?

A number of forces might lead to greater inequality of wealth in the 21st century, including a rise in the variance of shocks to demographic factors, rates of return,

Figure 2
After-Tax Rate of Return versus Growth Rate at the World Level, from Antiquity until 2100



Source: Author (figure 10.10 from Piketty 2014). For more on sources and series, see http://piketty.pse.ens.fr/capital21c.
Note: The rate of return to capital (after tax and capital losses) fell below the growth rate during the 20th century, and may again surpass it in the 21st century.

labor earnings, tastes for saving and bequests, and so on. Conversely, a reduction of the variance of these shocks could lead to a decline in wealth inequality. The gap between $(1 - t)r$ and g is certainly not the only determinant of steady-state wealth inequality. It is one important determinant, however, and there are reasons which might push toward a persistently high gap between the net-of-tax rate of return $(1 - t)r$ and the growth rate g in the 21st century—which might in turn lead to higher steady-state wealth inequality (other things equal). In my book, I particularly emphasize the following three potential forces: global tax competition to attract capital; growth slowdown and technical change; and unequal access to high financial returns (Chapters 10–12). Here, I restate and sharpen some of the main arguments.

As international competition intensifies to attract investment, it is plausible that capital taxes will fall, as they have already been doing in many countries in the last few decades. By capital taxes, I include both corporate profit taxation and wealth and inheritance taxes. But of course, the ultimate effect of tax competition will depend on the institutional response. If a sufficiently large number of countries manage to better coordinate to establish a common corporate tax on large corporations and a reliable system of automatic transmission of information of

cross-border financial assets, then the effective capital tax rate might rise, in which case $(1 - t)r$ will decline, and so will steady-state wealth inequality. Ultimately, the outcome depends on the institutional response. Indeed, recent research indicates that better international fiscal coordination is difficult but by no means impossible (Zucman 2014).

Note also that a decline in capital tax rates and a rise in the after-tax rate of return $(1 - t)r$ might in principle induce an increase in saving rates and capital accumulation, thereby leading to a decline in the marginal product of capital which could partly undo the rise in the after-tax rate of return. Indeed, in the example mentioned earlier of the benchmark infinite-horizon dynastic model with no shock and a representative agent, in the long run, the after-tax rate of return to capital has to follow the rule $(1 - t)r = \theta + \gamma g$. In this case, the tax cut leads to a savings response that ultimately moves the rate of return completely back to its earlier level. However, this outcome only arises due to an extreme and unrealistic assumption: namely, the long-run elasticity of saving and capital accumulation with respect to after-tax rate of return is infinite in such a model. In more realistic dynamic models of capital accumulation where this elasticity is positive but not infinite, a decline in capital tax will lead to a net increase in the after-tax rate of return in the long run.[6]

The effect of a growth slowdown on $r - g$ and on the long-run dynamics of wealth inequality is more complicated to analyze. In the historical data, the pre-tax rate of return r seems to display little historical variation, so that $r - g$ definitely appears to be smaller than when the growth rate is higher, as illustrated earlier in Figure 1. This would tend to support the view that lower growth rates in the 21st century (in particular due to the projected decline of population growth) are likely to contribute to a rise of $r - g$.[7]

From a theoretical perspective, however, the effect of a decline in the growth rate g on the gap $r - g$ is ambiguous: it could go either way, depending on how a change in g affects the long-run rate of return r. This depends on a mixture of forces, including saving behavior, multisector technological substitution, bargaining power, and institutions. Let me summarize the main arguments (see Chapters 5–6 of my book for a more thorough analysis; see also the discussion of this point by Jones in this symposium). Generally speaking, a lower g, due either to a slowdown of population and/or productivity growth, tends to lead to a higher steady-state capital–output ratio $\beta = K/Y$, and therefore to lower rates of return to

[6] For a class of dynamic capital accumulation models with finite long-run elasticities of saving with respect to after-tax rates of returns, and for a study of corresponding socially optimal tax rates on capital, see Piketty and Saez (2013). One of the important findings is that the optimal tax rate is an increasing function of $r - g$ (due in particular to the inequality effect of $r - g$).

[7] This conclusion largely depends on the way the corrected rates of return reported on Figure 1 were constructed: specifically, the rates of return implied by conventionally measured capital shares are generally very large in high-growth, reconstruction periods. Chapter 6 of my book offers a discussion as to why such high returns might include substantial entrepreneurial labor input and should therefore be corrected downwards; such corrections are highly uncertain, however.

capital r (for given technology). The key question is whether the fall in r is smaller or larger than the fall in g. There are, in my view, good reasons to believe that r might fall less than the fall in g, but this issue is a complex one.

In the benchmark dynastic model, the steady-state β rises as g declines, and the rate of return $r = \theta + \gamma\, g$ drops. Whether $r - g$ rises or declines as g declines depends entirely on whether the curvature of the utility function γ is smaller or larger than one. However this model does not seem to be particularly realistic empirically, so this may not be the best way to look at the problem. Note that the dynastic model can be viewed as a special case of the general Harrod–Domar–Solow steady-state formula $\beta = s/g$. In effect, in the steady-state of the dynastic model, the (net-of-depreciation) saving rate $s = s(g)$ rises moderately with g, so that $\beta = s(g)/g$ is a declining function of g.[8]

If one instead assumes a fixed, exogenous saving rate s, then the steady-state capital output ratio $\beta = s/g$ will rise even more strongly as g declines. With perfect competition and a constant-elasticity-of-scale production function, whether the resulting decline in r will more than compensate for a decline in g depends (among other things) on the value of the elasticity of substitution. With high substitutability between capital and labor (which might happen because of the rise of new capital-intensive technologies such as robots of various sorts), the rate of return will decline relatively little as β rises, so that $r - g$ will be higher with lower g.[9] In recent decades, the rise in the capital–income ratio β came together with a rise in the net-of-depreciation capital share α, which in a one-good model with perfect competition implies an elasticity of substitution higher than one. However, the one-good, perfect competition model is not a very satisfactory model, to say the least. In practice, the right model to think about rising capital–income ratios and capital shares is a multisector model (with a large role played by capital-intensive sectors such as real estate and energy, and substantial movements in *relative* prices) with important variations in bargaining power over time (see Chapters 5–6; see also Karababounis and Neiman 2014 about the role played by the declining relative price of equipment). In particular, intersectoral elasticities of substitution combining supply and demand forces can arguably be much higher than within-sector capital–labor elasticities.

Note also there is, of course, no reason why the net-of-depreciation saving rates should be viewed as a constant. What I have in mind is an intermediate model (intermediate between the dynastic model and the exogenous saving model), with a relatively low elasticity of saving behavior with respect to r over a large range of middle returns (say, from 3 to 6 percent) and a much higher elasticity if rates of return take very low or very high values. In particular, if g becomes increasingly

[8] With a Cobb–Douglas production function $Y = \mathrm{F}(K, L) = K^{\alpha}L^{1-\alpha}$, the long-run capital–output ratio is given by $\beta = \alpha/r = \alpha/(\theta + \gamma g) = s(g)/g$, with $s(g) = \alpha g/r = \alpha g/(\theta + \gamma g)$. See Piketty and Zucman (2014).

[9] With $Y = \mathrm{F}(K, L) = [aK^{(\sigma-1)/\sigma} + (1 - a)L^{(\sigma-1)/\sigma}]^{\sigma/(\sigma-1)}$, the marginal productivity of capital is given by: $r = \mathrm{F}_K = a(Y/K)^{1/\sigma} = a\beta^{-1/\sigma}$.

close to zero, then it is clear that $\beta = s/g$ will not go to infinity: otherwise the rate of return would go to zero, and most agents would probably stop saving. In historical periods with very low growth rates (such as in pre-industrial societies), we observe large capital–income ratios, but not infinite β. As pointed out by Jones (in this symposium) and others, another obvious reason why β will not go to infinity is that depreciation would then become enormous. This intermediate model might explain why the rate of return seems to display limited systematic variations in the long run: it is roughly stable within a given range, which one might interpret as an interval of psychologically plausible time preference parameters.

Yet another way to explain why the rate of return appears to be relatively stable in the long run is the following. Pure economic reasoning tends to imply that higher growth leads to higher returns. But high growth periods arguably require more entrepreneurial labor in order to reallocate capital continually and thus to benefit from higher returns (in other words, measured rates of return must be corrected downwards in order to take into account mismeasured labor input in high-growth societies). Conversely, measured rates of returns might be closer to pure returns in low-growth societies (where it is relatively easier to be a rentier, since capital reallocation requires less attention). This is the interpretation that I favor in the book; indeed, the historical estimates of rates of return in the book (those given above and in Chapter 6 of the book) are largely built upon this assumption.

If we combine all these different effects, it is clear however that there is no general, universal reason why $r - g$ should increase as g declines: it could potentially go either way. Historical evidence and new technological developments suggest that it should increase (and I tend to favor this conclusion), but I fully agree that this remains relatively uncertain.

Finally, the last reason (and arguably the most important one) why $r - g$ might be high in the 21st century is due to unequal access to high financial returns. That is, even though the gap between the average rate of return r and the growth rate g is not particularly high, it could be that large potential financial portfolios have access to substantially higher returns than smaller ones. In the book, I present evidence suggesting that financial deregulation might have contributed to such an evolution (Chapter 12). For example, according to *Forbes* rankings, the wealth of top global billionaires seem to be rising much faster than average wealth, as shown in Table 1. This evolution cannot continue for too long, unless one is ready to accept an enormous increase in the share of world wealth belonging to billionaires (and a corresponding decline in the share going to the middle class). Also, larger university endowments tend to obtain substantially higher returns, as shown in Table 2 (and the data presented by Saez and Zucman 2014 on nonprofit foundations indicates a similar pattern). This data is clearly imperfect and too incomplete to prove the general theme of unequal access to high returns. But given that even small changes in $r - \mathrm{g}$ can have large amplifying effects on changes in wealth inequality, this effect is potentially important.

Overall, there remains substantial uncertainty about how far wealth inequality might rise in the 21st century, and we need more transparency and better

Table 1

The Growth Rate of Top Global Wealth, 1987–2013

	Average real growth rate per year (after deduction of inflation) 1987–2013
For top 1/(100 million) highest wealth-holders (about 30 adults out of 3 billion in 1980s, and 45 adults out of 4.5 billion in 2010s)	6.8%
For top 1/(20 million) highest wealth-holders (about 150 adults out of 3 billion in 1980s, and 225 adults out of 4.5 billion in 2010s)	6.4%
For average world wealth per adult	2.1%
For average world income per adult	1.4%
For world adult population	1.9%
For world GDP	3.3%

Source: Table 12.1 from Piketty (2014). For more information, see http://piketty.pse.ens.fr/capital21c.
Notes: Between 1987 and 2013, the highest global wealth fractiles have grown at 6–7 percent per year, versus 2.1 percent for average world wealth and 1.4 percent for average world income. All growth rates are net of inflation (2.3 percent per year between 1987 and 2013).

Table 2

The Return on the Capital Endowments of US Universities, 1980–2010

	Average real annual rate of return (after deduction of inflation and all administrative costs and financial fees) 1980–2010
For all universities (850)	8.2%
Harvard-Yale-Princeton	10.2%
Endowments higher than 1 billion $ (60)	8.8%
Endowments between 500 million and 1 billion $ (66)	7.8%
Endowments between 100 and 500 million $ (226)	7.1%
Endowments less than 100 million $ (498)	6.2%

Source: Table 12.2 from Piketty (2014). For more information, see http://piketty.pse.ens.fr/capital21c.
Notes: Between 1980 and 2010, US universities earned an average real return of 8.2 percent on their capital endowments, and even more for higher endowments. All returns reported here are net of inflation (2.4 percent per year between 1980 and 2010) and of all administrative costs and financial fees.

information about wealth dynamics. In my view, one main benefit of a progressive wealth tax is that it would produce better information regarding the size and evolution of different wealth groups such that the wealth tax could be adapted in the future on the basis of this better information. I agree with the argument by Kopczuk in this symposium that the data sources about the distribution of wealth that we have at our disposal are insufficient. At this stage, however, it seems to me that the method that infers wealth from the resulting income flows, the income capitalization method developed by Saez and Zucman (2014), produces probably the most reliable estimates we have, and these estimates show substantial recent rise in US wealth inequality—indeed, a higher rise than what I report in my book. In particular, Saez and Zucman find increasing concentration of capital income for all asset income categories (including dividend and interest, which cannot easily be contaminated by labor income considerations). Finally, the Saez and Zucman findings are consistent with the finding from the *Forbes* rankings that the wealth of top wealth-holders is rising much faster than average wealth. However, it is clear that these evolutions remain relatively uncertain. In my view, this makes the lack of transparency about wealth dynamics—largely due to the absence of a comprehensive wealth tax and the limitations of international coordination—particularly problematic.

Toward a New Historical and Political Economy Approach to Institutions

In my book *Capital in the Twenty-First Century*, I attempt to develop a new historical and political economy approach to the study of institutions and inequality dynamics. Economic forces such as the supply and demand for skills, wage bargaining models, or the effect of $r - g$ on wealth dynamics, also play a role. But ultimately, what really matters is the interaction between economic forces and institutional responses, particularly in the area of educational, labor, and fiscal institutions. Given my strong emphasis on how institutions and public policies shape the dynamics of income and wealth inequality, it is somewhat surprising that Acemoglu and Robinson argue in their contribution to this symposium that I neglect the role of institutions. It seems to me that we disagree less intensively than what they appear to believe, and that the well-known academic tendency to maximize product differentiation might be at work here.

It is also possible that some of the confusion comes from the fact that we do not have exactly the same approach to the study of "institutions." However I believe that our approaches are broadly consistent and complementary to one another: they differ in terms of specific institutional content, as well as in time and geographical scope, more than in substance. In some of their earlier work, Acemoglu and Robinson mostly focused upon a relatively specific institution, namely the protection of property rights. In their fascinating book *Why Nations Fail*, they develop a broader view of institutions and stress the distinction between "inclusive" and "extractive"

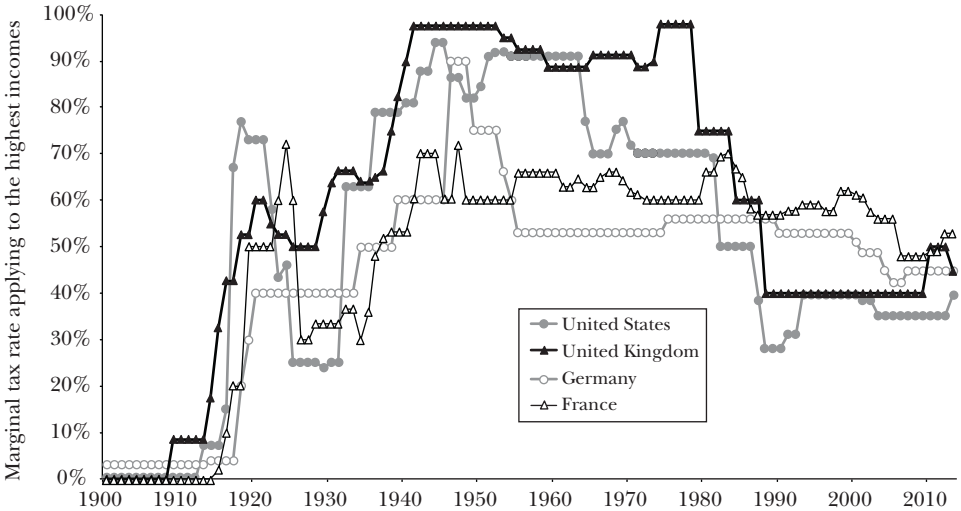
institutions. This broad concept might certainly include the type of institutions and policies on which I focus upon, including progressive taxation of income, wealth, and inheritance, or the modern welfare state. I must confess, however, that seeking to categorize institutions with broad terms like these strikes me as maybe a little too abstract, imprecise, and ahistorical.

I believe that institutions like the welfare state, free education, or progressive taxation, or the effects of World War I, the Bolshevik revolution, or World War II on inequality dynamics and institutional change, each need to be analyzed in a precise and concrete manner within the historical, social, and political context in which they develop. While Acemoglu and Robinson (2012) in their earlier book take a very long-run perspective on the history of the planet (from prehistoric times to the "great discoveries" and the formation of the modern world), I tend to focus on the historical periods and countries on which I was able to collect systematic data, that is, on the 18th, 19th, and especially the 20th centuries (an important period indeed for the formation of the modern social and fiscal state).

My approach to institutions emphasizes the role of political conflict in relation to inequality. In particular, wars and revolutions play a large role in my account of inequality dynamics and institutional change in the 20th century. Of course, steady democratic forces caused by the extension of suffrage also played an important role in the rise of more inclusive social, educational, and fiscal institutions during the 19th and 20th centuries. But many of the most important changes did not come simply from the steady forces of peaceful electoral democracy: rather, specific historical events and political shocks often played an important role. For example, there is little evidence of a natural movement toward more progressive taxation until the violent military, political, and ideological shocks induced by World War I (see Figure 3). Belief systems and collective representations about social inequality and the role of government were deeply affected by World War I and the rise of communism, as they were by the Great Depression, World War II, and then, at the end of the 20th century, by the stagflation of the 1970s and the fall of the Soviet Union.

It is particularly interesting to note that until 1914, the French elite often justified its strong opposition to the creation of a progressive income tax by referring to the principles of the French Revolution. In the view of these elites, France had become equal after 1789 thanks to the end of aristocratic privileges and the development of well-protected property rights for the entire population. Because everybody had been made equal in their ability to hold property, there was no need for progressive taxation (which would be suitable for aristocratic Britain, the story went, but not for republican France). What I find particularly striking in this pre-1914 debate is the combination of strong beliefs in property-rights-centered institutions and an equally strong denial of high inequality. In my book, I try to understand what we can learn from the fact that wealth inequality was as large in France in 1914 as in 1789, and also from the fact that much of the elite was trying to deny this. I believe there are important implications for the current rise in wealth and income inequality and the current attempts to minimize or deny that they are occurring. Then as now, when various shocks are tending to push wealth (and income) inequality higher at

Figure 3
Top Income Tax Rates, 1900–2013



Source: Author (figure 14.1 from Piketty 2014). For more on sources and series, see http://piketty.pse.ens.fr/capital21c.
Note: The top marginal tax rate of the income tax (applying to the highest incomes) in the United States dropped from 70 percent in 1980 to 28 percent in 1988.

a time when $r - g$ is at sustained high levels, the result can be a concentration of wealth that is high in historical terms.

Of course, I am not arguing that it will always take wars, revolutions, and other disruptive or violent political shocks to make institutional changes happen. In the case of early 20th century Europe, one can certainly argue that extreme inequality contributed to the high social tensions of the time and the rise of nationalism. But beliefs systems and resulting perceptions and policies can also be affected by peaceful public discussion. However we should not take this for granted. It is important to recognize the role of political conflict in the history of inequality and institutional change. It often took major fights to deliver change in the past, and it is not impossible that it will be the same in the future.

More generally, one of the lessons that I draw from this work is that the study of inequality dynamics and institutional change are intimately related. The development of stable institutions and the construction of a legitimate and centralized government are closely linked to the way different societies are able to address the issue of social inequality in a peaceful and orderly manner. In order to put institutions back at the center of economics, I believe that it is also necessary to put the study of distribution back at the center of economics. Institutions do not arise out of harmonious societies populated by representative agents; they arise out of unequal societies and out of conflict. This is again an issue on which the approaches developed by Acemoglu and Robinson and myself are broadly consistent and complementary.

Finally, let me conclude by making clear that my historical and political approach to inequality and institutions should be viewed as highly exploratory and incomplete. In particular, I suspect that new social movements and political mobilizations will give rise to institutional change in the future, but I do not pursue this analysis much further. As I look back at my discussion of future policy proposals in the book, I may have devoted too much attention to progressive capital taxation and too little attention to a number of institutional evolutions that could prove equally important, such as the development of alternative forms of property arrangements and participatory governance. One central reason why progressive capital taxation is important is that it can also bring increased transparency about company assets and accounts. In turn, increased financial transparency can help to develop new forms of governance; for instance, it can facilitate more worker involvement in company boards. But these other institutions also need to be analyzed on their own terms.

The last chapter of my book concludes: "Without real accounting and financial transparency and sharing of information, there can be no economic democracy. Conversely, without a real right to intervene in corporate decision-making (including seats for workers on the company's board of directors), transparency is of little use. Information must support democratic institutions; it is not an end in itself. If democracy is someday to regain control of capitalism, it must start by recognizing that the concrete institutions in which democracy and capitalism are embodied need to be reinvented again and again" (p. 570). I do not push this line of investigation much further, which is certainly one of the major shortcomings of my work. Together with the fact that we still have too little data on historical and current patterns of income and wealth, these are key reasons why my book is at best an introduction to the study of capital in the 21st century.

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