

# Piketty's Theory of Inequality and its Critics: A White Paper

Marshall Steinbaum September 2, 2014

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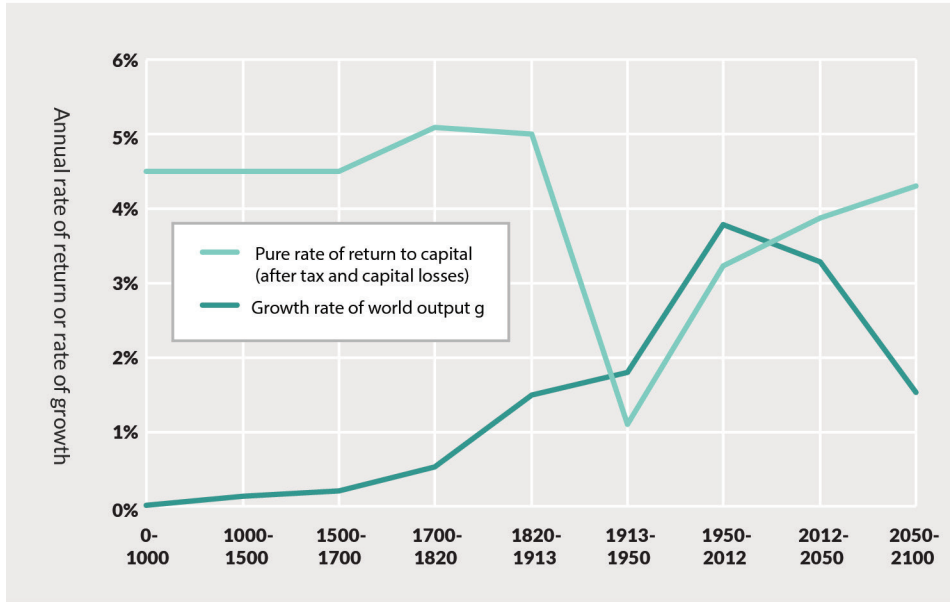
## Overview

In “Capital in the 21<sup>st</sup> Century,” Thomas Piketty of the Paris School of Economics proposes an economic theory of rising inequality over time thanks to the growing prevalence of capital over labor. That theory’s analysis of recent trends and its prediction about future inequality—and the capital-centered channel that he specifies for it to play out—have been subjected to criticism from economists, most pointedly from some who conduct research in macroeconomic theory. There are substantial differences between the theory Piketty uses and some of the economics profession’s received wisdom. This short paper examines how his theory relates to key ideas in macroeconomics, and, where they are not consistent with Piketty’s empirically-based analysis and conclusions, why Piketty’s assumptions, reasoning, and predictions are more likely to be correct than those of his critics.

Piketty argues that there are two mechanisms by which capital is and will continue to be the reason for rising wealth and income inequality. Both mechanisms are premised on the long-run empirical relation  $r > g$ , meaning that the rate of return to owning capital is higher than the economy-wide growth rate (which determines the growth rate of wages). Both mechanisms are also based on the empirical fact that the distribution of capital is highly skewed: the top 10 percent of the wealth distribution has always owned more than 50 percent of total wealth, and has historically owned 90 percent or more of total wealth.<sup>1</sup> (See Figures 1 and 2 on next page.)

FIGURE 1

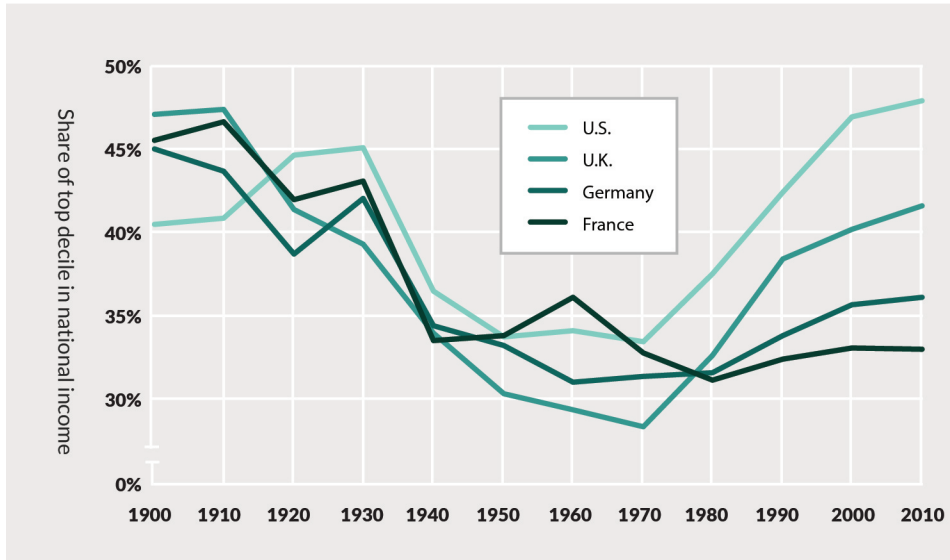
After Tax Rate of Return Vs. Growth Rate at the World Level, from Antiquity until 2100



Source: Thomas Piketty, *Capital in the Twenty-First Century*  
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FIGURE 2

Top Decile Share in National Income in Europe and the USA, 1900-2010 (decennial averages)



Source: Thomas Piketty, *Capital in the Twenty-First Century*  
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The two mechanisms that determine rising wealth and income inequality are:

- The wealthy are likely to accumulate more and more wealth (as a percentage of the economy's annual output) because the return they get from existing wealth net of consumption and of wealth taxes is higher than the growth rate of output. As they do, the share of annual output that accrues to the owners of capital will increase.<sup>2</sup> That growing capital share increases the incomes of the already-wealthy owners of capital relative to the much larger portion of the population who earn income mostly or solely from their labor.
- Even stipulating that capital's share of income remains constant, the wealth and income distributions can still become more and more skewed thanks to capital accumulation if the rate of return earned by the wealthy is an increasing function of initial wealth, or if the saving rate is an increasing function of initial wealth, or both.<sup>3</sup>

Each of the three challenges considered below casts doubt on one or both elements of Piketty's capital channel.

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### Three theoretical challenges

This short paper confronts three main objections to Piketty's theory of rising inequality via the capital channel leveled by macroeconomic theorists:<sup>4</sup>

- As capital is accumulated, the rate of return to capital will fall enough to reverse the relation  $r > g$ . Hence, capital's share of income will not grow at the expense of labor.
- In a low-growth environment, households will save a smaller fraction of their income than they have when growth was higher. Hence capital accumulation will not continue at the rate Piketty predicts.
- The infinite potential for workers to acquire human capital implies they can adjust to the capital-intensive "robot economy" by learning new skills, thus preserving labor's share of income, increasing the growth rate of output above what Piketty forecasts, or both.

Before addressing each of these objections in detail, it's helpful to consider several of their underlying assumptions, which are common to macroeconomic theory but which are ill-suited to interpreting or predicting patterns of inequality.

- **Microfoundations:** Modern theoretical macroeconomics is based on modeling the economic decisions made by individual households and firms. It assumes that aggregate outcomes can plausibly be explained by this "bottom-up" approach, in which the same economic problems are solved at the individual and aggregate level. A key foible

of this approach is that aggregate behavior that is supposedly implausible for individuals is ruled out *a priori*, that is, before looking at the empirical evidence.<sup>5</sup>

- **Representative agents:** Relatedly, those models take as their premise that the decisions facing a single, average worker and firm is “representative” of workers and firms in general, and hence of the macroeconomy. Obviously, assuming aggregate outcomes reflect the reality for a diverse population rules out the possibility that heterogeneity in general and income inequality in particular have macroeconomic significance—precisely the point under discussion. Furthermore, representative agent modeling places mathematical restrictions on the degree of heterogeneity in the population of agents whose behavior is being modeled, and those restrictions become more likely to be violated as inequality increases.
- **Marginalism:** Most macroeconomic models further assume that market prices are set in a competitive equilibrium, and in particular one governed by parameters that guarantee a Balanced Growth Path with a stable income split between capital and labor.<sup>6</sup> More specifically, the models contain first order conditions that set factor prices according to the representative firm’s marginal productivity, or vice versa.<sup>7</sup>

These modeling assumptions can be clarifying in some contexts, but are particularly ill-suited to a proper understanding of Piketty’s book and economic inequality in general. Below I explain where each of them inhibits evaluation of Piketty’s predictions.

As capital is accumulated, the rate of return to capital will fall enough to reverse the relation  $r > g$ . Hence, capital’s share of income will not grow at the expense of labor.

Piketty’s entire argument for the capital channel as the engine of rising inequality is grounded in the empirical fact that, in the long run, the rate of return on capital has exceeded the growth rate of the economy as a whole and wages in particular, as discussed above. In the mainstream macroeconomic theory common to both Piketty and his critics, what determines the rate of return to capital is the marginal productivity of capital, which, in turn, depends on how useful capital is in the production of output. Where Piketty and his critics disagree is whether, as more capital is accumulated, it will remain as useful in the future as it has in the past. If it does not,  $r$  will decline more than one-for-one in response to capital accumulation. If  $r$  declines by that much, then capital’s share of income will not increase and might even decrease. That would rule out the first of the two elements of the capital channel outlined above.

Whether  $r$  will decline by more or by less than the capital stock increases is ultimately an empirical question. As capital increases, does the rate of return fall? To examine this question, economists model and estimate a parameter known as the Elasticity of Substitution between capital and labor. If that parameter is greater than one, as Piketty

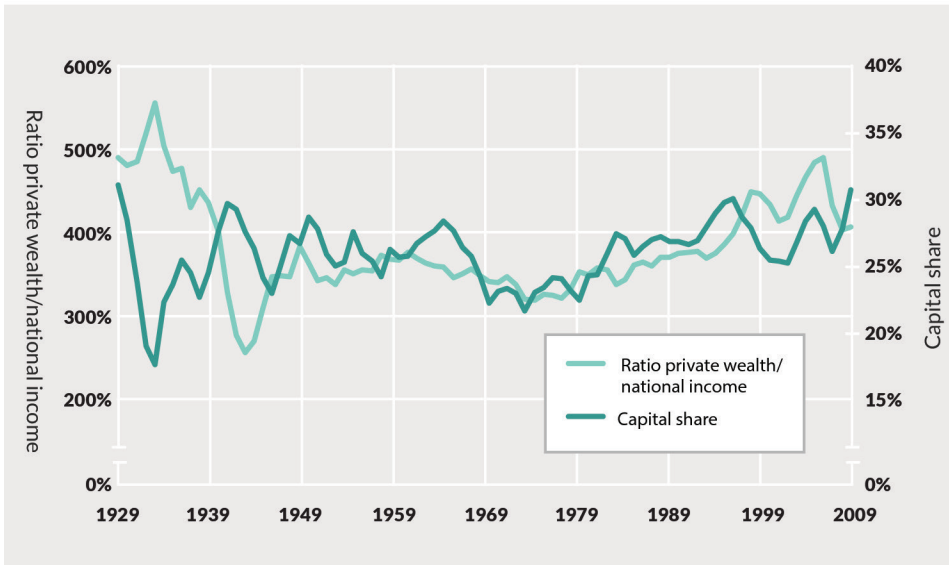
asserts, then capital remains relatively useful because it can replace labor in production. By contrast, if it is less than or equal to one, as the critics believe, additional capital is less useful because it cannot replace labor, and hence the return it is able to command will diminish accordingly. (If it is exactly equal to one, then the two forces of accumulation and diminishing marginal productivity cancel out exactly and capital's share of income will remain constant.)

There are three main reasons to agree with Piketty on this question:

- The historical data favors his contention that the Elasticity of Substitution is greater than one, while the empirical case put forward by the critics rests on a much weaker foundation.
- The critics' inference about the future behavior of  $r$  lacks plausibility since it commits them to the odd conclusion that the long-run Elasticity of Substitution is lower than the short-run.
- This entire argument interprets the rate of return to capital in an excessively narrow, literal way, such that it ignores the essential element of power in determining how high a return the owners of capital can expect.

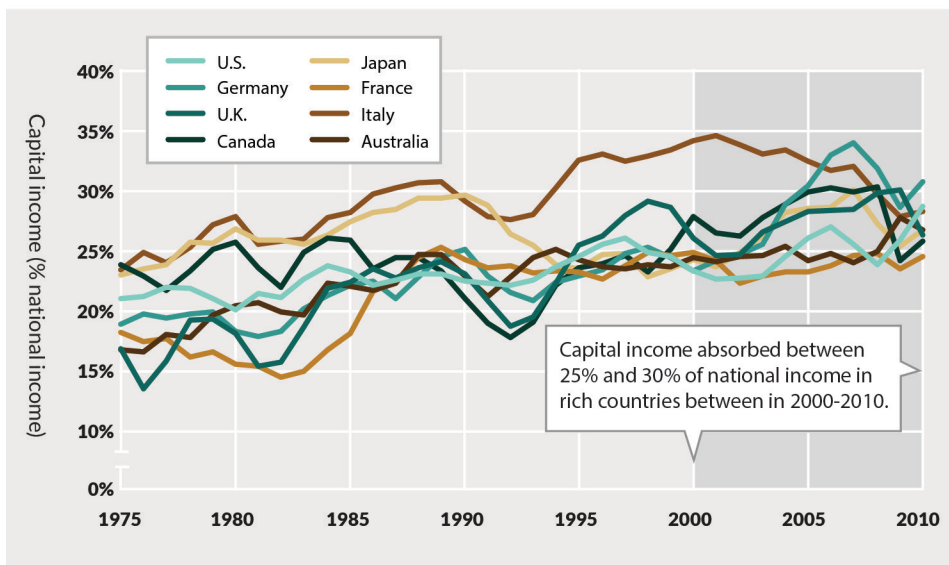
Piketty's empirical case for his contention that capital's share of income will continue to increase as capital is accumulated rests on the observation that in the very long-run data, both the capital-to-income ratio and capital's share of income take on similar U- shapes. When the capital-to-income ratio was historically high, so was capital's share of income, and when the capital-to-income ratio was low, during the mid-20<sup>th</sup> century, so was the capital share. If the Elasticity of Substitution were less than one, then the capital share would be an inverse U shape over time since capital's share would move inversely with the stock of capital, and if it were equal to one, as most neo-classical models assume, the capital share would be a horizontal line. (See Figures 3 and 4 on next page.)

**FIGURE 3**  
**Capital to Income Ratio V. Capital Share in the U.S.**



Source: Thomas Piketty, *Capital in the Twenty-First Century*  
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**FIGURE 4**  
**The Capital Share in Rich Countries, 1975-2010**



Source: Thomas Piketty, *Capital in the Twenty-First Century*  
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The trend in the capital share is less pronounced than the trend in the capital-to-income ratio, which implies that there is some dampening effect from  $r$  when capital is accumulated. When there's a lot of capital, additional capital is paid somewhat less, which is consistent with the marginalist approach. In other words, we don't live in a pure capital-dominated "robot economy" in which the Elasticity of Substitution between capital and labor is infinity because capital can do everything that workers can.

By contrast, Matt Rognlie, a graduate student at the Massachusetts Institute of

Technology —and, in passing, Professor Lawrence Summers of Harvard University— argue that almost all econometric studies of the Elasticity of Substitution between capital and labor find that it is less than one.<sup>8</sup> While true, those studies look at substitution within plants, firms, or industries in the relatively short run, in which there’s every reason to believe that elasticities are lower: individual firms have fewer alternative technologies or factor supplies to draw on, or they face fixed adjustments costs (including over their choice of where to locate production).<sup>9</sup> In this sense, the focus on micro-foundations leads the critics astray because data from those micro studies are not valid analogs for aggregate production across centuries.<sup>10</sup>

Second of all, beyond the problem of inference from variation in the cross-section of industries or firms, the argument that the Elasticity of Substitution is low lacks plausibility because the trend over the past 40 years is so clearly the opposite. Figure 4 depicts the almost universal rise in capital’s share of income across advanced economies, which can clearly be understood as an international trend that, at least at first glance, seems likely to admit a unified explanation.<sup>11</sup> In order to reconcile this data with the theoretical prediction of a constant or *falling* capital share as capital is accumulated, the critics must argue that the long-run Elasticity of Substitution will be lower than the short-run rate: in the recent past, firms have substituted capital for labor, but in the near future, they will hire back those displaced workers. They argue that the long-run elasticity of substitution will be lower even though the data on which they base their argument is from the short-run, and even though long-run elasticities of substitution are, as a rule, higher, since adjustment costs are less relevant.

What those critics want us to believe is that the returns to production will shift back toward labor, after having shifted away. The critics should ask themselves what currently detectable empirical basis there is for that prediction, given that some critics, among them Professor Tyler Cowen of George Mason University, otherwise espouse the view that firms will increasingly substitute capital for labor and therefore the “robot economy” poses a long-run threat to labor.<sup>12</sup> The prediction that the rise in the capital share seen to date will reverse seems to be premised not on empirical reality, but rather on the theoretical assumption that the capital share should never have increased in the first place.

Third, and finally, there is good reason for economists to question economic theory further—in fact, one might say that’s our job. The idea that the return to capital will decline as the stock of capital expands assumes that the return to capital depends solely on its marginal productivity (or vice versa), which is, of course, a simplification.<sup>13</sup> The question is whether the simplification helps illuminate what is actually going on or obscures it. In this case, the theory of factor returns determined solely by scarcity ignores the reality that factor returns are also partly determined by power.<sup>14</sup>

A key reason for the decline in the labor share over the past 30-to-40 years in advanced western economies is that wages have not kept up with worker productivity growth,<sup>15</sup> or alternatively, that the owners of capital (and, when the parties are distinct, firm execu-

tives) have been able to extract an increasing proportion of their enterprise's earnings for themselves. One obvious mechanism for that process is globalization, here taken to mean the increasing mobility of capital relative to labor. In that case, workers can be forced to settle for wages below their marginal productivity through the threat that firms will relocate overseas or outsource jobs abroad.

Another is the privatization of the corporate sector, which effectively unites corporate management and ownership, thus institutionally increasing the scope for capital to win out over labor. Lawrence Summers and Andrei Schleifer wrote about that dynamic in a prescient analysis of corporate hostile takeovers in the 1980s, and their ideas are entirely applicable to leveraged buyouts by private equity firms in the 1990s and into the 21<sup>st</sup> century. Their basic argument is that privatization is profitable for owners because existing implicit contracts that partly benefit workers (and also management, where the setting is a hostile takeover) can be abrogated when those contracts have no legal standing, or when workers' claims are ignored in litigation or bankruptcy proceedings.<sup>16</sup>

A further point to note on the applicability of marginalism, beyond the issue of power, is that Piketty expressly interprets capital as more than a factor of production in order to capture the notion of any kind of wealth that produces a return for its owner without any effort. For Piketty's inclusive definition of capitalism, the marginalist assumption that price is determined by marginal productivity is less relevant, since marginal productivity has nothing to do with how useful wealth is as a store of value. The value of one unit in a horde of gold, for example, doesn't decline as that horde gets larger because there's no sense in which additional units are less useful in production. The horde isn't being used in production.

In conclusion, much of the debate over Piketty's prediction of rising inequality via the capital channel has focused on asserting that the Elasticity of Substitution between capital and labor is lower than the high level Piketty needs to generate an increasing capital share of income. But the arguments brought forward to support that counter-argument themselves lack plausibility or empirical basis.

In a low-growth environment, households will save a smaller fraction of their income than they did when growth was higher. Hence capital accumulation will not continue at the rate Piketty predicts.

In Piketty's model, the savings rate net of depreciation is assumed to be a constant fraction of annual income—essentially baking in capital accumulation, irrespective of the total stock of capital already accrued. When the capital-to-income ratio is high, annual depreciation as a percent of income is also high. As the growth rate of the economy approaches zero, the gross saving rate of the representative household needs to approach 100 percent of its income in order to pay for all the depreciation associated with an exploding capital stock.



Professors Per Krusell at the Institute for International Economic Studies and Tony Smith at Yale University argue this is not behavior any actual household would ever engage in since its members would need to consume.<sup>17</sup> Their critique is aimed at Piketty’s prediction that the capital-to-income ratio will continue to increase in the future as it has over the past 40 years. Where they go wrong is assuming that the “representative household” is a meaningful concept when inequality explodes. In the limit of Piketty’s model, only the decisions of the wealthiest households matter because the rest of the economy becomes tiny. And the wealthiest households can live resplendently on a small fraction of a percentage point of their wealth.

Krusell and Smith’s argument is driven by a theoretical commitment to microfoundations and representative agent modeling, specifically to the Permanent Income Hypothesis of the late Milton Friedman, which predicts that actual households consume a constant fraction of their “lifetime income” and would never choose to save so much and add to the capital stock indefinitely. Krusell and Smith write:

*“The simplest theory of saving in the case without growth is the permanent-income theory (due to Friedman (1957)): with a constant wage rate and a constant return to saving, a consumer maintains his asset holdings at a constant level and consumes his wage plus the interest income on the assets every year. Maintaining a constant asset level precisely means having a net saving rate of zero. Thus, a zero net saving rate when there is no growth is very natural: it is what one would expect. Under optimal saving behavior, the result is, moreover, very robust.”*

What they mean by ‘optimal saving behavior’ is an environment in which a representative agent allocates his income between consuming and saving over time, what economists call an “inter-temporal consumption/savings tradeoff.” Again, this is in contrast to Piketty’s model, which assumes that the net saving rate is positive and predicts that the gross saving rate approaches 100 percent if the growth rate goes to zero.

Piketty rejects the Permanent Income Hypothesis and the importance of the precautionary savings motive—that is, the idea that the representative household accumulates and draws down assets to smooth consumption—on empirical grounds. His extensive data show that, other than during the aberrational period in the 20th century when  $r < g$ , the stock of wealth has grown over time.<sup>18</sup> At the individual level, wealthy individuals die with a great deal of wealth, rather than spend it down. In order to explain that, he invokes a pure accumulation motive, which isn’t part of the traditional micro-founded model but is nonetheless required to explain the very long run data that shows the persistence of large fortunes, at least before the 20<sup>th</sup> century.

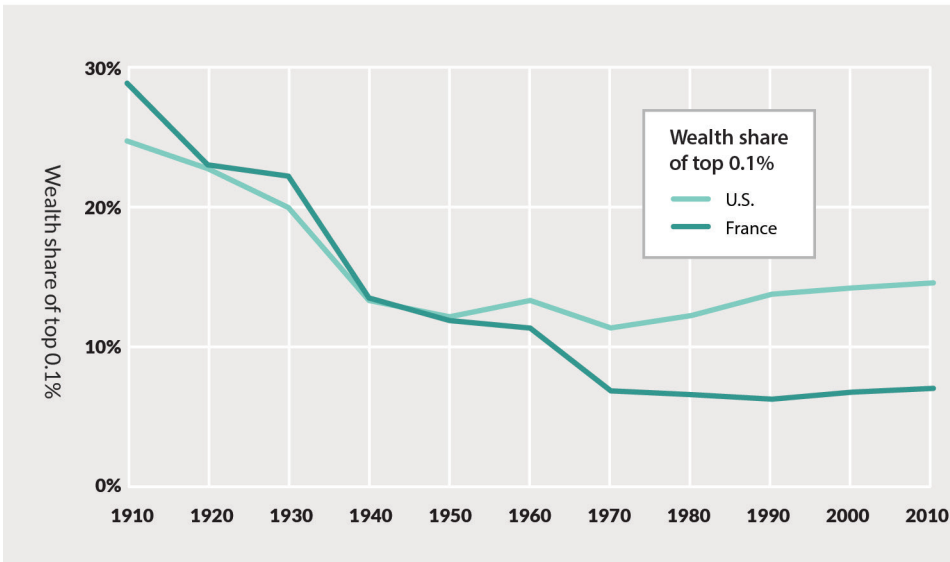
More importantly, in an economy with extremely high wealth inequality, a high capital-to-income ratio, and a high capital share of income, almost all income accrues to the wealthiest households, which only need to consume a tiny fraction of it to survive.

Thus, any argument based on the idea that a representative household needs to eat fails because the whole construct of a representative household becomes irrelevant in the environment Piketty analyzes.

Krusell and Smith bring forward evidence from 1950-2012 that—they argue—demonstrates the aggregate savings rate—both gross and net—is increasing in the growth rate, which ostensibly implies that the savings rate will decline as growth gets even lower in future, not increase, and hence capital accumulation will level off. They fail to consider that the saving rate is also increasing in household income, which means that there's a strong possibility that increasing the concentration of income at the top of the distribution will increase the aggregate saving rate in the long run, counteracting the effect of low growth.

Of course, that does not mean that the drawdown of precautionary savings never plays any kind of a role in the economy. What has happened in the past several decades is the accumulation of household debt below the top of the wealth distribution, shoring up aggregate consumption even as inequality has increased. That is what Barry Cynamon and Professor Steven Fazzari of Washington University in St. Louis found in their recent working paper investigating the effect that rising inequality had on the Great Recession and its aftermath: households below the top 5 percent accumulated debt starting around 1980 in order to smooth consumption, and now they've run up against borrowing constraints and their consumption-to-income ratio is pro-cyclical. The Permanent Income Hypothesis predicts that it's counter-cyclical.<sup>19</sup>

**FIGURE 5**  
**Evolution of Wealth Inequality in the U.S. and France**



Source: Thomas Piketty, *Capital in the Twenty-First Century*  
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Piketty’s prediction is essentially that the phenomenon of declining net saving by the bottom 95 percent of the wealth distribution as economic growth declines will soon run its course—that what he calls the “patrimonial middle class” will wither, and the aggregate saving rate will, if anything, increase as more and more income accrues to the wealthiest. The patrimonial middle class is the reason why wealth concentration—depicted in Figure 5—has not attained the heights of the early 20<sup>th</sup> century. But in the future, most of the income distribution will be living exclusively off a lower total labor market income while the owners of capital build their wealth.

The infinite potential for workers to acquire human capital implies they can adjust to the capital-intensive “robot economy” by learning new skills, thus preserving labor’s share of income, increasing the growth rate of output above what Piketty forecasts, or both.

The final critique of Piketty’s forecast of the immiseration of labor at the hands of capital is that even if some sectors of the economy shrink and some workers are displaced, labor as a whole is not threatened in the long run thanks to the next generation’s ability to acquire human capital better suited to working with the same physical capital that put their parents out of a job. In a canonical example, Ford assembly lines that put workers with expertise making buggy whips out of a job nonetheless provided even better-paid work to their children, who were able to gain the necessary expertise to thrive in an economy based on heavy manufacturing.

This idea could be interpreted as a partial answer to the fact of a declining labor share discussed above, but there is no reason why human capital should automatically increase to counteract the immiseration of labor. Piketty associates the “human capital” view with the late University of Chicago economist Gary Becker, whose research tends to take as given that the world has irrevocably become a meritocracy thanks to the spread of capitalism and the decline of capital. Piketty’s whole point is that the latter trend was merely a rapidly fading transitory phenomenon. The past happy experience with adjusting to sectoral displacement, Piketty argues, occurred in a context of general prosperity for labor—its share seemed to be preserved. Yet the human capital solution to rising inequality is probably contingent on education and labor market policies, on responses to globalization, and generally on the strength of democracy to make the economy serve the interests of the broader electorate, meaning mostly wage earners.

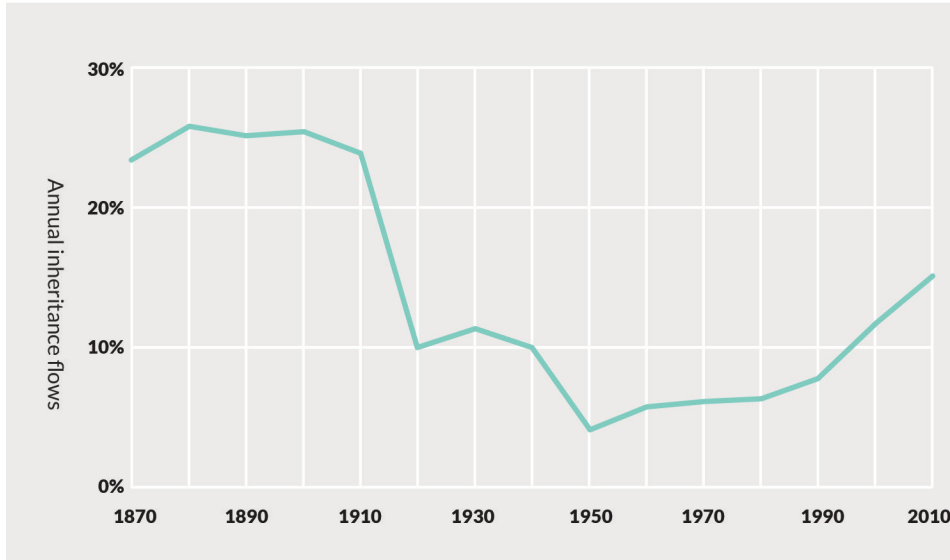
A reason to be pessimistic, however, is the society Piketty evokes with his 19<sup>th</sup> century literary references to previous episodes of very high capital accumulation, in which the returns to a fortuitous marriage and to generally serving the interests of the wealthy dwarfed the economic possibilities attached to even the greatest professional success. In that environment, why pursue the studying that’s required for professional success? Birth matters far more. Those literary references are not mere stylistic quirks of an erudite man of letters—they are intended as data about the economic choices confront-

ing actual people in a world dominated by patrimonial capital, a past world from which the surviving data on individual outcomes is extremely sketchy but to which we are very likely to return.<sup>20</sup>

Human capital didn't offer a way out of that world, but capital destruction and expropriation amid the great upheavals of the past century did. The remedy Piketty proposes—a global wealth tax and concerted international action to reverse  $r > g$ —is a good deal less violent.

FIGURE 6

### Annual Inheritance as a Percentage of National Income in France.



Source: Thomas Piketty, *Capital in the Twenty-First Century*  
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## Conclusion

Ultimately, “Capital in the 21<sup>st</sup> Century” makes data-driven predictions about future aggregate trends. If the model Piketty bases those predictions on is false then those predictions will also (very likely) be false, and there’s no way to adjudicate the matter definitively *ex ante*. But as this paper demonstrates, there is substantial reason to believe rising inequality via the capital channel is an enduring economic trend, despite what some theorists have argued, and that it will not wane naturally. That has profound implications for the distribution of wellbeing over the next century, and also for the standard models that economic theorists use to interpret the past and forecast the future. The challenge that Piketty’s book poses to macroeconomics can’t be waved away simply by showing that aspects of his theory are inconsistent with standard assumptions—and so far, his critics don’t have much else.

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## Endnotes

- 1 Some of the critics, notably Debraj Ray in his aptly-titled note Nit-Piketty, have stressed that  $r > g$  does not necessarily imply growing inequality because there's no a priori reason for the benefits of  $r$  to be more unequally distributed than the benefits of  $g$ . That is true, of course, but profoundly ahistorical. See Debraj Ray, *Nit-Piketty: A Comment on Thomas Piketty's Capital in the Twenty First Century*, May 23, 2014.
- 2 Controversially but crucially, Piketty takes an expansive view of capital that includes any form of wealth that produces an annual return for its owner. As discussed below, that return is in part, but not necessarily entirely, determined by the aggregate marginal productivity of capital.
- 3 This analysis is very close to that implied by Branko Milanovic, *The Return of "Patrimonial Capitalism": Review of Thomas Piketty's Capital in the 21st Century* (Washington, DC, October 9, 2013), [http://mpira.ub.uni-muenchen.de/52384/1/MPRA\\_paper\\_52384.pdf](http://mpira.ub.uni-muenchen.de/52384/1/MPRA_paper_52384.pdf). Ryan Avent of the Economist schematizes Piketty's argument differently. He enumerates four capital-based channels for growing wealth inequality:
  1. The accumulation of capital.
  2. The fact that capital is increasingly substitutable with labor.
  3. The fact that the rate of return on capital is higher than wage growth and is increasing in initial wealth.
  4. The increasing scarcity of land.The first channel outlined in this piece corresponds roughly to (1) and (2) of Avent's scheme, and the second corresponds to (3). His (4) is best understood as a component of the continuing high return on capital. The contention that the capital-to-income ratio has increased substantially and will increase further is less disputed than the view that capital's share of income will increase, though the paper by Krusell and Smith discussed in part II casts doubt on whether the trend will continue. Some critics have argued that the importance of housing appreciation in the "Capital is Back" narrative undermine its implications. On that point, see my column: Marshall Steinbaum, *Is Piketty's Treatment of Housing an Excuse to Ignore Him?*, Online Column (Washington Center for Equitable Growth, 2014), <http://equitablegrowth.org/research/pikettys-treatment-housing-excuse-ignore/>. What makes Piketty's argument about capital's share of income contentious is that he says the capital share will rise because the return to capital won't fall (very much) as capital is accumulated. Ryan Avent, *Housing in the Twenty-First Century* (The Economist, 2014), <http://www.economist.com/blogs/freexchange/2014/06/thomas-pikettys-capital>.

Piketty puts forward three "fundamental laws of capitalism," the third of which is the aforementioned empirical relation  $r > g$ . The first two are that the capital share is the product of the return to capital and the capital-to-income ratio, and the second is that the capital-to-income ratio is equal to the ratio of the net saving rate to the growth rate. Combining the two laws produces an equation stating that capital's share of income is equal to the product of the saving rate and the return to capital,  $r^s$ , divided by the growth rate. The first channel noted above says simply that the right hand side of that resulting equation is higher now and will be in the future than it was in the 20th century, so capital's share of income will also be higher. The second channel says that even if the capital share is restricted to be constant, inequality could increase because if the terms are disaggregated in the cross section of households,  $r^s$  is increasing in household wealth.
- 4 The main critiques this paper is concerned with were articulated by Lawrence Summers in his review of the book for Democracy, Per Krusell and Tony Smith in a working paper titled "Is Piketty's Second Law of Capitalism Fundamental?" published on their website(s), and Matt Rognlie, similarly circulated as a working paper called "A Note on Piketty and Diminishing Returns to Capital." See Lawrence Summers, "The Inequality Puzzle," *Democracy*, no. 33 (2014), no. 33 (2014) Per Krusell and Tony Smith, "Is Piketty's 'Second Law of Capitalism' Fundamental?", Working Paper (New Haven, CT, May 28, 2014), <http://www.econ.yale.edu/smith/piketty1.pdf>. Matthew Rognlie, *A Note on Piketty and Diminishing Returns to Capital*, Working Paper, (2014).
- 5 It's worth noting that theoretical physics seemingly suffers from the same problem: that the behavior rules that explain sub-atomic interactions are very, very different from those that explain macro phenomena on the level of stars, galaxies, or the universe. But in macroeconomic theory, the epistemological bias is such that one must choose a single class of models (the micro ones) and erroneously apply them to macro outcomes, instead of taking each set of outcomes as given and constituting models that explain each accurately.
- 6 In a Balanced Growth Path, the economy as a whole, as well as the capital stock and the wage, grow at a constant annual rate, while the amount of labor and the rate of return on capital are fixed over time. (Or, if there's population growth, the labor force grows accordingly.) Critically, a Balanced Growth Path requires a stable split of national income between capital and labor, which makes the data Piketty brings to the table especially challenging to the assumption that the economy follows a Balanced Growth Path.
- 7 Of course, Piketty himself assumes that the first order condition for capital holds in aggregate, as discussed below.
- 8 Lawrence Summers refers vaguely to such studies in his review of *Capital in the 21st Century*, and Matt Rognlie discusses them in detail in his widely-circulated critique (Rognlie, *A Note on Piketty and Diminishing Returns to Capital*, primarily citing Robert Chirinko, "Sigma: The Long and Short of It," *Journal of Macroeconomics* 30, no. 2 (2008): 671–86.), but neither address the issue of inference from relatively short-run micro studies of substitution in production to the very long run aggregate phenomena Piketty focuses on. Rognlie does argue that Piketty's very long run data is irrelevant because the capital stock was largely comprised of agricultural land in the distant past and was thus not "reproducible." Piketty's whole point is that while there is a great deal of variation in the composition of the capital stock over time, the overall significance and economic role of capital is (perhaps surprisingly) unchanged. Rognlie also devotes considerable attention to the fact that if the price of capital varies systematically differently than the price of output (or of labor), that undermines inference from the aggregate time series of the capital share and the capital-to-income ratio. While it is true of the theoretical model that unobserved price changes make that inference problematic, Rognlie ignores the fact that we do actually observe the price of capital inputs. Karabarbounis and Neiman show that the cross-country panel of capital prices and capital's share of income provides support to the high elasticity of substitution Piketty posits. See Loukas Karabarbounis and Brent Neiman, *The Global Decline of the Labor Share*, Working Paper (National Bureau of Economic Research, June 2013), <http://www.nber.org/papers/w19136>.
- 9 Chirinko does report on some studies that he considers long run, but most are still based on microdata. The largest estimates he reports, well above 1, are for long-run studies of aggregate Mexican and Canadian data.
- 10 Chirinko explicitly acknowledges this essential problem of inference.
- 11 Daron Acemoglu and James Robinson take the opposite view in their working paper critiquing Piketty. They contend that inequality within countries is driven by institutional evolution within countries, not by the "Laws of Capitalism" Piketty proposes. Branko Milanovic took issue with their approach in a blog post, concluding that insofar as Acemoglu and Robinson have an empirical argument that is at odds with Piketty, their argument is unconvincing. See Daron Acemoglu and James Robinson, *The Rise and Fall of General Laws of Capitalism*, August 2014.

- 12 Cowen agreed with Rognlie's argument that the Elasticity of Substitution is low based on the microeconomic evidence, despite the bleak future for workers he articulates in *Average is Over* thanks to increasingly productive capital. It's worth noting that Piketty's prediction of labor immiseration is quite different from the one Cowen articulates, however. Cowen adheres to the "superstar" model as the explanation for rising inequality—and by implication, that rising inequality is both inevitable and benevolent because it represents greater efficiency and innovation, or, to put the emphasis elsewhere, policy should not aim to reverse inequality because to do so would risk sacrificing technological gains from would-be superstars. Piketty, by contrast, holds an inherently contingent view: that current trends will bring about higher inequality (due to capital accumulation, not superstar effects), but that those trends are both harmful and policy-contingent. Nonetheless, there's no way to render Cowen's argument consistent with Rognlie's prediction of a rising labor share. See Tyler Cowen, *Average Is Over: Powering America Beyond the Age of the Great Stagnation* (Dutton Adult, 2013). Sherwin Rosen, "The Economics of Superstars," *American Economic Review* 71, no. 5 (1981): 845–58.
- 13 As discussed above, that simplification is at least partly consistent with the data, since the capital share has not tracked capital accumulation one-for-one.
- 14 Ryan Avent applies this insight to the case of housing and land values, which have increased due in part to political manipulation by incumbent owners to restrict the supply of housing in high-demand urban areas. Avent, *Housing in the Twenty-First Century*.
- 15 Lawrence Mishel and Kar-Fai Gee, "Why Aren't Workers Benefiting from Labour Productivity Growth in the United States?," *International Productivity Monitor*, 2012.
- 16 See Andrei Schleifer and Lawrence Summers, "Breach of Trust in Hostile Takeovers," in *Corporate Takeovers: Causes and Consequences* (University of Chicago Press, 1988), 33–56.
- 17 Krusell and Smith, *Is Piketty's "Second Law of Capitalism" Fundamental?*.
- 18 Again, some of the critics dispute Piketty's assertion that "Capital is Back" on the grounds that in some countries, housing appreciation accounts for the rise in the capital-to-income ratio. See Steinbaum, *Is Piketty's Treatment of Housing an Excuse to Ignore Him?*.
- 19 See Barry Z. Cynamon and Steven M. Fazzari, *Inequality, the Great Recession, and Slow Recovery*, SSRN Scholarly Paper (Rochester, NY: Social Science Research Network, November 12, 2013), <http://papers.ssrn.com/abstract=2205524>; plainCitation": "Barry Z. Cynamon and Steven M. Fazzari, Inequality, the Great Recession, and Slow Recovery, SSRN Scholarly Paper (Rochester, NY: Social Science Research Network, November 12, 2013).
- 20 Those data are, of course, incomplete, and one fortuitous result of *Capital in the 21<sup>st</sup> Century* would be further work on micro-level outcomes during periods of high inequality, by economic historians and others versed in archival research.

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Accelerate cutting-edge analysis into whether and how structural changes in the U.S. economy, particularly related to economic inequality, affect economic growth.

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