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A synthetic review of Thomas Piketty's *Capital*

Introduction

Thomas Piketty's book *Capital in the 21st Century* is exceptional in multiple dimensions. It is heroically empirical, a years-long data-collection effort joining the ranks of such monumental contributions as Carmen Reinhart and Kenneth Rogoff's *This Time is Different: Eight Centuries of Financial Folly* and Milton Friedman and Anna Schwartz's *A Monetary History of the United States, 1867-1960*. It addresses distribution, a topic given little priority by economists since the late 1800s when marginalist arguments convinced many of the essential fairness or efficiency of market-generated inequalities (Thoma, 2014). In selecting distribution as his area of research, Piketty was motivated by a desire to face "the world's economic problems" rather than "churn out purely theoretical results", a failing he believes is common among American economists (Piketty, 2014a, p. 16; see also Erlanger, 2014). This concern for ambitious and significant questions is complemented by Piketty's desire to contribute to a broader conversation. Significant issues are not the property of one discipline or of academia more generally, and Piketty does not write as though they are. His book is an effort to converse accessibly with other disciplines and with the general public, to break down rather than reinforce the "insularity of the economics department" (Erlanger, 2014). His success in this effort is admirable though mixed: *Capital in the 21st Century* spent weeks on several best-seller lists, but also apparently discouraged many readers to the point of quitting after a chapter or so (Cohn, 2014; Ellenberg, 2014; NYT, 2014).

This paper summarizes Piketty's arguments, weighing them against criticisms voiced by other economists and offering my assessment of which positions are more accurate. Criticisms of Piketty can be sorted into four broad categories. First, there is the question of how Piketty's proposed mechanism relates to other forces driving inequality. Does it conflict with or complement them? Does it have a larger or smaller impact, and in what timescale does it operate? A second area of concern is with the empirical underpinnings of his theory, whether his data are adequate to support his conclusions and, perhaps more seriously, whether they are scrupulously constructed and presented. The final two areas of disagreement are with Piketty's definitions and with the assumptions he makes in constructing his models and describing their dynamics.

How does Piketty's argument relate to other explanations of inequality?

Before even defining Piketty's $r > g$ argument, I want to discuss the intended and perceived scope of it. A poll by the University of Chicago's Initiative on Global Markets asked thirty-four prominent economists to indicate the extent of their agreement with this question, supposedly a stand-in for Piketty's work: "The most powerful force pushing towards greater wealth inequality in the US since the 1970s is the gap between the after-tax return on capital [r] and the economic growth rate [g]" (IGM, 2014). Their confidence-weighted responses tilted heavily towards disagreement and strong disagreement; a handful were uncertain, fewer agreed, and none strongly agreed. The consensus among these peer opinions seems damning. But then, as O'Brien (2014) noted, the question misrepresents Piketty's argument, and the fact that the respondents didn't object to it suggests they many not have read Piketty themselves. Wolfers (2014) followed up with the original poll respondents, only ten of whom reported finishing the book with the rest reporting some lower degree of engagement. Wolfers himself was pleasantly surprised by these figures. In my own estimation, they are not impressive. Whether or not the poll authors and respondents have read Piketty, it appears they have not read him well. Let Piketty speak for himself here: "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" (Piketty, 2015, p. 67).

Deirdre McCloskey (2014) reads Piketty much more carefully but nonetheless summarizes the thrust of Piketty's argument as this: in capitalism, there is a dominant tendency pushing towards greater inequality. In fact, Piketty speaks in terms of multiple tendencies, all of them "powerful mechanisms pushing alternately toward convergence and divergence" (Piketty, 2014a, p. 21). His $r > g$ mechanism is only one force among many that he takes care to identify. I think it is important to list these mechanisms and repeat, on Piketty's behalf, what he considers the relative significance of each. It makes no sense to consider Piketty's mechanism outside the context of these other processes, or to assign it more significance than he does himself.

Piketty names several forces of convergence, tending to reduce inequality. At present, these are most relevant and evident on a global scale, a point Piketty makes more clearly in an interview than in his book (Burcharth, 2014, pp. 104-105). But as discussed at least briefly in the book, international diffusion of technology and skills has a "large effect" in reducing the gap between rich countries and poor countries (2014a, p. 21). The international effect of increasing human capital is somewhat different from the role of human capital within rich countries: in Piketty's estimation, human capital accumulation within rich countries has merely a "small or absent effect", one that partly depends on automation and is perhaps as likely to increase (meritocratic) inequality as to decrease it (2014a, p. 21; more on this later, in the section of the paper addressing criticisms of Piketty's definitions). Piketty also mentions "small", "ambiguous", or "absent" convergent effects from the mobility of capital, the mobility of labor, and the market forces of supply and demand (2014a, p. 21). Downplaying the impact of market forces is a point of difference between him and McCloskey; she accuses Piketty of not simply *disagreeing* with supply effects but of fundamentally failing to understand them, a failure that manifests in his description of a hypothetical market adjustment (McCloskey, 2014, pp. 85-94; she takes care to rule out the possibility of translation error). I will discuss her point more fully below, as it relates to the dynamics of Piketty's model. Piketty greatly facilitates her criticisms by failing to provide references supporting his dismissal of market forces. I would have been very interested to see them.

All told, Piketty does not mean to say that there are no economic forces capable of reducing inequality, nor to deny the current reality of economic convergence on a global level. His message should be read in context, as an intervention in a field that has been willing to presume otherwise: "there is no natural, spontaneous process to prevent destabilizing, inegalitarian forces from prevailing permanently" (Piketty, 2014a, p. 21). Contrary to McCloskey's read, this is not a statement of faith that inegalitarian forces *will* prevail permanently. Its aim is to reintroduce divergence as one possible outcome, to be considered rather than prematurely and overconfidently ruled out.

Piketty is also careful in placing his mechanism for divergence among others that have been proposed. He dismisses rising intergenerational inequality since it is a minor contributor to overall inequality, relative to other sources. Contrary to the wording of the IGM poll, he spends several chapters making the case that recently increasing inequality has been driven by the rising labor incomes of "supermanagers" (a phenomenon explained by executives' ability to influence their own pay rates, he argues, not by a genuine increase in marginal productivity such as would warrant more compensation; 2014a, p. 29). He nods to a host of institutional and social forces that can alter the distributions of income and wealth, such as "war and of policies adopted to cope with the shocks of war … [policies of] taxation and finance … [all] 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" (p. 20). Behind all these convergent and divergent forces, and often overshadowed by them in the short-run, is where Piketty places his $r > g$ mechanism. He calls it "fundamental" in the sense that it is "simpler and more transparent and no doubt exerts greater influence on the long-run evolution of the wealth distribution" (2014a, p. 25). This is a process most visible and relevant at the timescale of thirty-year generational periods (2014a, p. 75).

How sound are the empirical foundations of Piketty's argument?

Piketty's economic data comes from income and estate tax records, data on inheritance, national wealth and income statistics (2014a, pp. 16-20). His narrative presentation of the data in the book seems modest, emphasizing the limitations of the data and often dealing in relative orders of magnitude rather than pretending that the precise values of the data are meaningful. He also provides his data online for others to investigate. The rhetoric and transparency combine to make Piketty seem very credible.

Magness and Murphy (2014), though, fault Piketty for inconsistent and unnecessary interpolation practices. Some kind of interpolation is needed, of course, to produce long graphs based on scattered data points gathered at different intervals for different countries. It is not the sparseness of the data and interpolation per se that troubles Magness and Murphy, but what they identify as Piketty's inconsistency and arbitrariness in implementing it. Looking at formulas in his provided spreadsheets and comparing his data with overlapping data from Wojciech Kopczuk and Emmanuel Saez, they find differences that are not explained. In some cases, they claim Piketty makes unnecessary interpolations because the data actually exists elsewhere but has not been incorporated into the dataset. Finally, they point out errors of historical fact and argue that these errors are not random, but function to create a selective narrative that exaggerates the unpleasantness of highly unequal eras. With this second set of objections, their concern is more clearly political, and I am inclined to take them less seriously than their data-related ones. Even if Piketty's historical narrative goes astray in certain parts, it does not seem egregious enough to have the rhetorical effect they assign to it; it seems more like stray errors that can be simply ignored.

Evaluating Magness and Murphy's criticisms would require an effort outside the scope of this paper; in what follows, I will necessarily take Piketty's data as given. Their angle of critique seems worth taking seriously, though, even if the specific concerns they raise are unjustified. Ultimately, Piketty's argument rests on its data. It is possible that corrections or additions to his dataset could change the qualitative patterns he observed.

How does Piketty define the basic elements of his model?

Piketty's $r > g$ mechanism emerges from his analysis of his long-run model, which rests on modeling assumptions and, ultimately, his definitions of the elements of his model. In brief, the elements are national income, Y; growth rate, g; average annual rate of return on capital, r; and capital (or wealth), W. The first three definitions are comparatively but not completely uncontroversial; the fourth is hotly disputed and has major implications for the significance and validity of Piketty's work.

National income is defined as annual GDP growth, minus depreciation and plus (or minus) income from abroad. Piketty uses pre-tax figures and has been criticized for this, but Steinbaum (2014a) finds that factoring in taxation is not enough to alter the distribution of income; even 'progressive taxation' schemes do not accomplish enough redistribution to have a significant impact on the analysis. Growth is decomposed into population growth and per capita growth, the latter measured in terms of GDP. By defining *g* and *Y* in this way (as a function of GDP), Piketty somewhat skirts the factual debate that informs many people's normative conclusions about modern inequality. This is the question of absolute living standards and how they have changed over time. (GDP, of course, does not measure living standards but only formal economic activity.) Many people, for instance McCloskey (2014, pp. 81-82), are not concerned about relative inequality so long as the circumstance of the poorest have improved. This is partly a criticism of Piketty's definitions but more accurately a criticism of his thesis, for his concern with distribution separate from living standards.

Annual average return on capital is defined in real, pre-tax terms. This number *r* consistently ranges between 3-6%, meaning it is normally higher than the growth rate. Piketty considers this a "historical fact, not a logical necessity" (2014a, p. 353), which is to say he has no theoretical explanation for why *r* should be higher (in particular, he is not interested in deriving it from some "rate of time preference" as is commonly done in economics). One point of criticism is that there are many types of capital facing different average values of *r*; for example, DeLong (2014) defines four distinct *r'*s and wishes that Piketty had taken care to disaggregate his measure in a similar fashion. It is hard to guess whether this sort of disaggregation is possible using historical data, and how it might change Piketty's analysis were it available. DeLong does not offer any hints.

Piketty uses market value to measure national capital stocks, and does not distinguish between capital and wealth, meaning he does not try to differentiate between financial assets and ones put to direct productive use (2014a, p. 47). These decisions, he explains, allow him to draw intertemporal and international comparisons that would otherwise be impossible (Piketty, 2015, p. 72). More importantly, he chooses to exclude human capital from his definition of capital, offering several justifications. Human capital is not capital because, in non-slaveholding societies, it cannot be permanently exchanged on the market, only rented (2014a, p. 46). Ruccio (2014) quotes Branco Milanovic's helpful rephrasing of this point, which is that *working* is how one obtains a return on human capital, whereas returns to capital come from simple *ownership*; owning is not working, it is a different activity. Ruccio adds that human capital is a phrase coined recently, not for analytic purposes but for the political purposes of downplaying class conflicts by "[depicting] all economic agents, including labourers, as capitalists (who 'invest' in and 'manage a portfolio' of skills and abilities)" (2014).

Alongside this rationale rooted in Marxist conceptual distinctions, Piketty adds that *all* forms of capital accumulation have increased recently along with any accumulation of human capital, so that human capital remains comparatively unimportant (2014, pp. 223-224). On this point, McCloskey (among others) sharply disagrees:

> human capital, owned by the workers … has grown in rich countries to be the main source of income, when it is combined with the immense accumulation since 1800 of capital in knowledge and social habits, owned by everyone with access to them … The result of excluding human capital from capital is to artificially force the conclusion Piketty wants to achieve, that inequality has increased, or will, or might, or is to be feared … The neglect of human capital on the Problems side of the book is doubly

strange because on the Solutions side Piketty recommends education and other investments in human capital" (2014, pp. 88-89).

It *is* strange. Perhaps it is simply a matter of different priorities in the face of reasonable constraints. In more than a few places Piketty indicates that he does not consider human capital *unimportant*; he only considers it to operate on a different timescale than the process of primary concern to him in this particular book. "Human capital is 'key' to understanding inequality, Piketty wrote in an e-mailed response to questions [about why he chose to exclude it]. 'Next time I will write an even longer book!'" (Stilwell, 2014). This does not read as a dismissal of the significance of human capital. Nor do the two chapters he devotes, in *Capital,* to exploring the pay of "supermanagers".

How is Piketty's model constructed?

Piketty combines the elements defined above into three fundamental equations, which he calls 'Laws' of capitalism. The first two equations Piketty invokes are accounting identities, meaning they are definitionally true. The third of these fundamental laws (equation 4, below) is derived from the accounting identities via several assumptions, and is meant to describe the long-run dynamics of the capital-labor split (equation 3). The condition $r > g$ is a shorthand expressing Piketty's conclusions from this dynamic analysis. I retrace Piketty's steps below, defining the three key equations and showing where others have disagreed.

Equation (1) expresses the stock of national wealth (W) and the annual flow of national income (Y) in ratio form. Piketty claims that this ratio is a "measure [of] the overall importance of capital in a society" (2014a, p. 51), in the sense that it expresses how much capital has been accumulated relative to the level of economic activity in a single year. A high ratio means that a considerable amount capital has been stored up, and therefore capital plays a significant role in that society.

$$\beta \equiv \frac{W}{Y} \qquad \textbf{(1)}$$

Equation (2), the second accounting identity, says that capital's share of national income in a given year is the capital-income ratio multiplied by the annual rate of return on capital. In other words, owners of capital may expect to receive a certain amount of yearly income from their capital.

$$\alpha \equiv r \cdot \beta \qquad \textbf{(2)}$$

Equation (3) simply states that annual national income can be divided into the income that capitalists receive from their capital, and the income that workers receive from their labor. This is called the "capital-labor split".

$$\text{National income} = \alpha + \text{labor income} \qquad \textbf{(3)}$$

Equation (4) gets to the dynamics of the model, moving past accounting identities. It asserts that the long-run stable equilibrium value of the capital-income ratio is simply the ratio of savings and growth rates. To call this is a stable equilibrium is to say that the capital-income ratio may take on many different short-run values, but the internal dynamics of the system are always trying to drive it back to the savings rate-growth rate ratio. Piketty derives this in his technical appendix (2014b, p. 28) and I will repeat the derivation here in order to critique it. Say that wealth next year is equal to current wealth, plus anything saved during the year:

$$W_{t+1} = W_t + S_t$$

Multiply this equation by $\frac{1}{Y_{t+1}}$ and rearrange it so that the following substitutions can be made: $\beta = \frac{W_t}{Y_t}$, the capital-income ratio; $s_t = \frac{S_t}{Y_t}$, the savings rate (net of depreciation); and $\frac{Y_{t+1}}{Y_t} = 1 + g_t$, the growth rate. This yields the equation:

$$\beta_{t+1} = \beta_t \cdot \frac{1 + s_t/\beta_t}{1 + g_t}$$

If long-term rates of s_t=s and g_t=g are assumed, then this equation simplifies algebraically to:

$$\beta = \frac{s}{g} \qquad \textbf{(4)}$$

This is Piketty's controversial law. He presents it with several qualifiers. First, it is only valid in the long-run—something on the order of "several decades"—because "the accumulation of wealth takes time" (Piketty, 2014a, p. 168). Second, it does not apply to natural resources that might otherwise be counted as capital. Third, it depends on the assumption of similar trends in asset prices and consumer prices. If house prices climb rapidly, for example, then the capital-income ratio increases purely in reflection of this trend but *s*, the value that matters in the longer term, is not affected; this severs the connection between the capital-income and savings rate-growth rate ratios. This third restriction seems least defensible and hardest to assess.

What are the dynamics of Piketty's model?

Piketty explains the dynamics of his third law as follows. He expects future growth to be low, citing Robert Gordon's forecasts as well as historical precedents for growth, which stay between 0.1 and 2% for much of world history (Piketty, 2014a, p. 94). If the long-run growth rate drops, then (depending on *s*) the capital-income ratio should increase, and (depending on *r*) capital should take a larger share of national income. In his opinion this is the most likely scenario, but by no means certain.

What happens to s when g goes to zero?

With the intersection of energy costs and environmental damage, I am inclined to agree that the growth rate will drop, and so I will pick up critiques past that point. If the growth rate drops, the first question is whether the capital-income ratio will increase; this depends on *s*, which is the long-run savings rate net of depreciation. Krusell and Smith (2014) assert that Piketty's model requires constant *s* but that a constant *s* is unreasonable to assume at the limits (that is, where growth goes to zero). In growth modeling, it is more common to assume a constant rate of *gross* savings. Doing so in this case yields less alarming predictions: "[standard] theories predict that wealth-to-income ratios increase only modestly as growth falls" (Krusell and Smith, 2014, p. 1).

Reading Krusell and Smith's presentation of their models in contrast with Piketty's illuminates an important difference: Krusell and Smith take their models very seriously. Piketty does not. As a consequence, they approach his model in a very different spirit from how it is intended:

> 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 … (Piketty, 2015, p. 70).

I think it is fair to say that Piketty creates and reads models differently from many in his audience of economists: not as rigorous truths, but as illustrative over some limited range. More specific than this general point, Piketty has since clarified that he does not assume constant *s* in his book:

> 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 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 (Piketty, 2015, p. 81)[1].

Steinbaum (2014) clarifies what Piketty means here by "most agents", and in so doing provides a second reason to expect that falling growth will translate to a higher capital-income ratio. In circumstances of highly concentrated wealth, he argues, it *is* reasonable to think the majority of savings-capable households (i.e., rich households) will save a very high fraction of their wealth. Krusell and Smith, he says, are wrong in "assuming that the 'representative household' [used in standard growth models] 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" (p. 9).

Based on these arguments, I am willing to accept that the savings rate-growth rate ratio is a plausible approximation of the long-run equilibrium, and that a decrease in long-run growth rate may translate into a significant increase in the capital-labor ratio, β.

What happens to r when β increases?

Provided β increases, the next hurdle for Piketty's model is whether such an increase translates to an increase in α, capital's share of national income. It might not. In technical terms, this is a question

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[1] It is reasonable to ask why, if Piketty had such a model 'in mind', he didn't communicate it more clearly in his original book. Krusell and Smith probably wish he had, and saved them some time. Maybe Piketty was luring them.

about the elasticity of substitution between capital and labor. Only so much capital is useful; accumulated past a certain point, the marginal productivity of capital begins to drop and labor becomes more attractive. This restrains the level of returns to capital. In the terms of Piketty's equation, r falls when β increases, and the cumultative effect on α is unknown: it may be stable, or shrink, or increase only a little, depending on the relative magnitude of the changes in r and β. Rognlie (2014) does some heavy lifting to make this argument. Realizing that Picketty's argument is in net terms, he converts elasticity estimates from gross to net terms. Intuitively, once depreciation is included, capital accumulation becomes less profitable. With these more "realistically diminishing returns to capital accumulation" factored in, Rognlie argues that a rise in the capital-income ratio is not likely to exacerbate inequality (2014, p. 1). Summers (2014) agrees.

Steinbaum (2014) makes a few compelling points in response. First, he notes that "critics' inference about the future behavior of r … commits them to the odd conclusion that the long-run Elasticity of Substitution is lower than the short-run" (2014, p. 5). This seems like a logical contradiction; economists usually assume the reverse, that the elasticity rises in the long-run because there is more time for adjustments. Next, he questions the relevance of Rognlie's short-run, firm- and industry-level data. We would expect estimates of elasticity coming from this context to be systematically lower than what Piketty observes in such an aggregate way in the very long-run. Finally, Steinbaum questions some of the deeper premises of Rognlie and Summer's argument: "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" (2014, p. 7). The alternative position is that the return to capital depends, in part, on the relative social power of capital. In this view, the rich are able to use their burgeoning fortunes to grab an even larger share of resources. Moreover, he notes, Piketty does not assume (as they do) that solely productive capital is accumulated for solely productive purposes. Rognlie and Summers are working off different suppositions.

For his part, Piketty's argument is mainly historical. In theory, he agrees, the return on capital is a function of its marginal productivity and its abundance (Piketty, 2014a, p. 216). It is his long-run observations that show capital accumulation can become quite high without driving r down. This brings us back to McCloskey's concern about whether Piketty grasps the role that market mechanisms should play in pushing back against rising r (2014a, pp. 91-93). It seems he does. His argument is not, in fact, that capital may accumulate forever without triggering a decrease in r. As he notes in the technical appendix to *Capital*, "there is no need to assume an infinite elasticity of substitution to conclude that the capital share can easily take extreme values" (2014b, p. 39). Instead, he is concerned that his stabilizing mechanism might take effect 'too late', after very high levels of inequality are reached and not before.

Is r > g a good indicator that inequality is increasing?

The expression $r > g$ has become the popular representation of Piketty's argument, taken to mean that when r exceeds g, inequality is increasing. This is a basically accurate summary of his conclusion, albeit in danger of being misunderstood. It is worth delving a bit into Piketty's explanation:

> 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 … 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 (2015, pp. 73-74).

I have usually found the word "intuitively" to precede the toughest sentences in economics and math textbooks. I am not perfectly confident in my understanding of this, but I will do my best to break it down. Piketty's inequality, $r > g$, relates to the long-run distribution of inequality corresponding with the equilibrium ratio (of savings rate to growth rate). A bigger gap between r and g corresponds to a more unequal distribution. As before, this is a long-run process that does not manifest in the short term. (In particular, you should not be running around comparing current interest rates with the most recent GDP figures.) Although the observation that r usually exceeds g is empirical, I believe the interpretation of its long-run significance rests on a mathematical derivation:

> once the rate of return *significantly and durably* [my emphasis] exceeds the growth rate, the dynamics of the accumulation and transmission of wealth [playing out over generations] automatically lead to a very highly concentrated distribution … With the aid of a fairly simple mathematical model, one can show that … the distribution of wealth tends toward a long-run equilibrium and that the equilibrium level of inequality [a distribution] is an increasing function of the gap $r - g$ … (Piketty, 2014a, p. 364)

The main point to take away from this is that r somewhat greater than g is a common and not especially worrisome reality; but the further apart these two quantities drift, the greater the long-run forces pulling the economy towards inequality.

Summers (2014) takes issue with Piketty's derivation, claiming it relies on the assumption that all returns to capital are saved, not consumed. If these assumptions are violated, then $r > g$ does not necessarily entail an increase in the capital-labor ratio. If I understand Summers correctly, I think his objection is based on a misinterpretation that seeks to derive the short-run effect of $r > g$ on the capital-labor ratio. That is, in the short-run, if capital grows at an annual rate r, then β grows; but if r is partly spent and partly reinvested, then there are effects in both the numerator and denominator of β, and these effects are ambiguous (β could increase, decrease, or be left unchanged). If I understand Piketty, though, $r - g$ has an effect in the longer run, and this line from the derivation is offered by way of explanation, not as a necessary assumption: "Intuitively, the difference $r - g$ measures the rate at which capital income diverges from average income if none of it is consumed and everything is reinvested in the capital stock" (Piketty, 2014a, p. 364). If Summers is not referring to this line or to short-run effects, then he is speaking about the 'constant *s*' in Piketty's model, addressed above.

Conclusion

It seems inappropriate to venture an overall verdict on whether Piketty's argument is correct. This is a monumental piece of scholarship that I have only read though, without delving into the data and modeling that underlie it. From my research for this paper, though, I can summarize points where I am satisfied with Piketty's position and points where I have lingering concerns. I feel Piketty spoke adequately to concerns about whether he assumed a constant rate of savings, and whether the return to capital is likely to fall as the capital-income ratio increases (due to capital accumulation). These points pertain to the basic dynamics of his model; I can't assess his conclusions regarding $r - g$.

The more interesting and troubling problems precede the dynamics. I am reluctant to trust Magness and Murphy's (2014) critique per se, because it seems so obviously motivated by a burning desire to defend human freedom, i.e., the Market. But I think the data do require verification and augmentation before the analysis means much. The fact that Piketty's work is painstakingly empirical by economists' standards means little; what would a historian say? What kind of conclusions can the data really support?

My other concern is about the timescale of Piketty's work. I think Piketty is justified to exclude human capital and focus on other processes if that's what he wants to do. But when it comes to extrapolating his process to the future, what matters most (I think) *are* the new trends in inequality. This relates to points raised by Rognlie, first about Piketty's requirement that consumer and asset prices average out, and second regarding how "[r]ecent trends in both capital wealth and income are driven almost entirely by housing, with underlying mechanisms quite different from those emphasized in *Capital*" (2014, p. 1). Both of these touch on whether the dynamics of the future might be radically different in ways that are not foreshadowed by Piketty's data or included in his modeling.

I began this piece with some comments about what makes Piketty's work unusual in the context of the economics discipline: his empirics, his ambitious question, his intention to be accessible (an intention that I consider genuine, and cannot understand how it translated itself into a 600+ page book). Within in the paper, I also highlighted a difference in his attitude towards modeling. McCloskey, in a similar vein, praises him for his avoidance of regression and existence theorems, two dominant approaches in economics against which she has railed for a long time (2014, pp. 73-74). Steinbaum is equally glad to see economics done without undue reverence for "microfoundations", "representative agents", and "marginalism" (2014, p. 4). For what little it's worth, in my opinion this is Piketty's most important contribution: not any conclusions about the past or future dynamics of inequality, but the precedent he's established for serious economics that departs from disciplinary conventions. I am glad to have had the opportunity to read him.

Works cited

Burcharth, M. (2014). Thomas Piketty responds to his critics. *Challenge, 57*(4), pp. 103-114.

Cohn, E. (2014, April 22). Thomas Piketty is No. 1 on Amazon right now. *The Huffington Post.* Retrieved from http://www.huffingtonpost.com/2014/04/22/thomas-piketty-amazon_n_5191566.html

DeLong, B. (2014, April 12). Notes and finger exercises on Thomas Piketty's "Capital in the twenty-first century": The honest broker for the week of April 19, 2014. *The Washington Center for Equitable Growth.* Retrieved from http://equitablegrowth.org/2014/04/12/notes-finger-exercises-thomas-pikettys-capital-twenty-first-century-honest-broker-week-april-12-2014/

Ellenberg, J. (2014, July 2). The summer's most unread book is … *The Wall Street Journal.* Retrieved from http://www.wsj.com/articles/the-summers-most-unread-book-is-1404417569

Erlanger, S. (2014, April 19). Taking on Adam Smith (and Karl Marx). *The New York Times.* Retrieved from http://www.nytimes.com/2014/04/20/business/international/taking-on-adam-smith-and-karl-marx.html

The Initiative on Global Markets (IGM). (2014, Oct. 14). Survey: Piketty on inequality. *Chicago Booth.* Retrieved from http://www.igmchicago.org/igm-economic-experts-panel/poll-results?SurveyID=SV_5v7Rxbk8Z3k3F2t

Krusell, P. & Smith, A. A. (2014, Oct. 21). Is Piketty's "second law of capitalism" fundamental? Retrieved from http://aida.wss.yale.edu/smith/piketty1.pdf

Magness, P. W., & Murphy, R. P. (2014, Dec. 26). Challenging the empirical contribution of Thomas Piketty's *Capital in the twenty-first century*. Retrieved from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2543012

McCloskey, D. (2014). Measured, unmeasured, mismeasured, and unjustified pessimism: A review essay of Thomas Piketty's *Capital in the twenty-first century*. *Erasmus Journal for Philosophy and Economics, 7*(2), pp. 73-115.

The New York Times (NYT). (2014, Sept. 21). Best sellers - Hardcover nonfiction. Retrieved from http://www.nytimes.com/best-sellers-books/2014-09-21/hardcover-nonfiction/list.html

O'Brien, M. (2014, Oct. 15). Top economists say Piketty is wrong about wealth inequality. They misunderstood him. *The Washington Post.* Retrieved from http://www.washingtonpost.com/blogs/wonkblog/wp/2014/10/15/top-economists-say-piketty-is-wrong-about-wealth-inequality-they-misunderstood-him/

Piketty, T. (2014a). *Capital in the twenty-first century.* (A. Goldhammer, Trans.). Cambridge, MA: Harvard University Press.

Piketty, T. (2014b). Technical appendix of the book *Capital in the twenty-first century*. Retrieved from http://piketty.pse.ens.fr/files/capital21c/en/Piketty2014TechnicalAppendix.pdf

Pikettty, T. (2015). Putting distribution back at the center of economics: Reflections on *Capital in the twenty-first century*. *Journal of Economic Perspectives, 29*(1), pp. 67–88.

Rognlie, M. (2014, June 15). A note on Piketty and diminishing returns to capital. Retrieved from http://www.mit.edu/~mrognlie/piketty_diminishing_returns.pdf

Ruccio, D. (2015, Feb. 26). Human capital controversy. *Progress in Political Economy.* Retrieved from http://ppesydney.net/human-capital-controversy/

Steinbaum, M. (2014a, May 29). Piketty versus Hassett: A primer on after-tax income and inequality. *The Washington Center for Equitable Growth.* Retrieved from http://equitablegrowth.org/2014/05/29/piketty-versus-hassett-primer-tax-income-inequality/

Steinbaum, M. (2014b, Sept. 2). Piketty's theory of inequality and its critics: A white paper. *The Washington Center for Equitable Growth.* Retrieved from http://ms.techprogress.org/ms-content/uploads/sites/10/2014/09/Piketty-explainer-WP1.pdf

Stillwell, V. (2014, July 14). Inequality Piketty doesn't examine is U.S. human capital. *Bloomberg.* Retrieved from http://www.bloomberg.com/news/articles/2014-07-15/the-inequality-piketty-didn-t-examine-it-starts-in-womb-in-u-s-

Summers, L. H. (2014). The inequality puzzle. *The Democracy Journal*. Retrieved from http://www.democracyjournal.org/33/the-inequality-puzzle.php?

Thoma, M. (2014, Nov. 18). When Piketty, argued for income redistribution, he changed economics. *The Fiscal Times*. Retrieved from http://www.thefiscaltimes.com/Columns/2014/11/18/When-Piketty-Argued-Income-Redistribution-He-Changed-Economics

Wolfers, J. (2014, Oct. 16). Have economists actually read Thomas Piketty? They say they have. *The Upshot*. Retrieved from http://www.nytimes.com/2014/10/17/upshot/have-economists-actually-read-thomas-piketty-they-say-they-have.html?abt=0002&abg=0