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Is an increasing capital share under capitalism inevitable?☆

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ABSTRACT

Piketty's influential book *Capital in the Twenty-First Century* and its prominent review by Milanovic in the *Journal of Economic Literature* both assert the inevitability of an increasing share of capital in total income, given a higher rate of return to capital than the rate of growth in income. This paper shows by a specific example, a logical argument and its intuition that the alleged inevitability is not valid. Even just for capital to grow faster than income, we need an additional requirement that saving of non-capital income is larger than consumption of capital income. Even if this is satisfied, the capital share may not increase as the rate of return may fall and non-capital incomes may increase with capital accumulation.

Capital in the Twenty-First Century, April 2014 (French edition *Le capital au 21^e^ siècle*, 2013), the *magnum opus* of the renowned French economist Thomas Piketty has caused a sensation. Apart from extensive reports in the popular press, it has been quickly and prominently reviewed by Branko Milanovic in the *Journal of Economic Literature* as early as June 2014. This note shows that both the book and the review got an important relationship wrong, making the alleged inevitability of an increasing capital share (in income) under a higher rate of return to capital than the rate of growth in income (and other general conditions of Piketty's analysis) invalid. Even just for capital to grow faster than income, we need an additional requirement that saving in non-capital income is larger than consumption of capital income. Even if this is satisfied, the capital share may not increase as the rate of return may fall and non-capital incomes may increase with capital accumulation. Our largely conceptual analysis is much supported by the arguments with strong empirical evidence by Rognlie (2014), not to mention the much stronger critic by McCloskey (2014).

1. The inevitable increase in capital share under capitalism?

The current concern with inequality is related to the big increases in the degrees of inequality in income and wealth distribution after the 'golden age' of capitalism in 1945–1975. Piketty regards the period leading to the golden age with decreasing degrees of inequality as abnormal; the norm is for increasing inequality under capitalism. This note shows that this basic thesis is partly based on an incorrect logical deduction. Milanovic also queries some arguments supporting this thesis, but he and Piketty have got a basic

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relationship incorrect. As argued below, the capital share may either increase or decrease and a market economy may become more or less unequal, even under conditions satisfying Piketty's requirements, depending on how various opposing forces offset each other.

The basic point of Piketty's 'new theory of capital' is very simple. He focuses on the ratio of incomes of capital K (which is defined more in the sense of wealth, as correctly pointed out by Milanovic, since items like land and intellectual property are included) or Y^K as a proportion α of total income Y; i.e. $\alpha \equiv Y^K/Y$. His main point is that this ratio will increase with the development of capitalism and even approaches one (at least in Milanovic's interpretation), leading to most incomes going to the capitalists, unless offset by government intervention. This astonishing conclusion is very simply, but not quite correctly, derived.

Denote/define the (average) rate of return to capital as $r \equiv Y^K/K$ and the (average) capital/output ratio $\beta(\equiv K/Y)$, where Y^K is capital income, K is the value of capital, and total (real) output and total income are equal and both denoted as Y. We then have the important (for Piketty's argument) identity (called the 'first fundamental law of capitalism') for the share of income from capital in national income (called here as 'capital share' for short), denoted as α ($\equiv Y^K/Y$):

$$\alpha = r \times \beta \tag{1}$$

This is an identity as from the definitions of r and β, their multiplication gives Y^K/Y which is the definition of α. Piketty focuses on this capital share α and argues that it is in the nature of capitalism for this share to increase over time, at least under the normal condition (shown to hold historically except the period leading to the golden age and argued to be likely true for the future) that the rate of return to capital r is larger than the rate of growth g in national income. The higher capital share is then related to inequality through the fact that the rich tend to have higher proportions of incomes from capital than the poor (This channel may also have some complications but they are not the main concern of this note, except a relevant remark at the end of Section 2.).

In the words of Piketty, 'Nevertheless, the dominant dynamic, which explains most of the concentration of wealth, was an inevitable consequence of the inequality $r > g$. … The inequality $r > g$ implies that wealth that accumulated in the past grows more rapidly than output and wages. This inequality expresses a fundamental logical contradiction. The entrepreneur inevitably tends to become a rentier, more and more dominant over those who own nothing but their labor. Once constituted, capital reproduces itself faster than output increases. The past devours the future. The consequences for the long-term dynamics of the wealth distribution are potentially terrifying' (p. 395 and p. 571). This unfortunate outcome is inevitable under capitalism except through government intervention like taxing capital incomes.

In the words of Milanovic, 'Now, if the rate of return on capital remains permanently above the rate of growth of the economy (g)—this is Piketty's key inequality relationship $r > g$—then α increases by definition. This, combined with the increasing β, drives the share of capital in national income arbitrarily close to one' (p. 522). Capital takes increasingly more and eventually almost all!

Moreover, 'The process has a positive feedback loop: as α increases, not only do capital owners become richer, but, unless they consume the entire return from their capital, more will remain for them to reinvest. The increased saving in turn makes the growth rate of capital exceed further the growth rate of national income and raises β. Thus, not only does higher β lead to higher α but higher α leads to higher β.' (Milanovic, 2014, p. 522).

From Eq. (1), one can easily see that if the capital-output ratio β increases with capital accumulation, capital share α must increase unless the rate of return r falls proportionately more as a result. Piketty shows with data that r did not fall substantially but remained typically at around 4–5%. More importantly, both Piketty and Milanovic believe that, logically, the condition of $r > g$ is sufficient for the capital share to increase over time. This is the crucial point challenged in the next section.

2. The inevitability logic challenged

A numerical example of non-inevitability even under conditions satisfying all Piketty's requirements is first given, before an intuitive explanation and a more general mathematical demonstration.

2.1. A numerical counter example and intuitive explanation

Our counter example to the Piketty-Milanovic inevitability of increasing capital share under the condition of $r > g$ is shown in Table 1. Though the table shows only three periods for simplicity, it could be extended indefinitely without changing the result of a decreasing capital share α under conditions satisfying all the Piketty-Milanovic requirements. As illustrated in Table 1, the economy

Table 1
Possibility of decreasing capital share under r > g.

Period	1	2	3
K	200	220	242
Y	100	110	121
β	2	2	2
r	20%	19.1%	18.29%
g	10%	10%	10%
s	20%	20%	20%
Y^K	40	42.02	44.2618
α	40%	38.2%	36.58%