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# **Critical Remarks on Piketty's 'Capital in the Twenty-first Century'**

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*Abstract:* This paper is about “Capital in the Twenty-first Century” by Thomas Piketty. It identifies his central macroeconomic claims and examines them, arguing that the contentions are theoretically and empirically unwarranted.

*Keywords:* Capital, wealth, income distribution,  
taxes

*JEL-Classification:* D31, E, H24

## 1. Introduction

At present, Thomas Piketty's book "Capital in the Twenty-first Century" is being passionately discussed by economists and in the public press. This interest may be due to the strong policy recommendations, among them a top income tax bracket of 80 percent and a top wealth tax of 10 percent. If one follows Piketty in assuming a normal return on capital of 4 percent for the 21<sup>st</sup> century, a 10 percent tax on wealth is equivalent to a 250 percent tax on the resulting capital income. Combined with the 80 percent income tax, taxpayers would face effective marginal tax rates of up to 330 percent<sup>1</sup>. Such figures seem to fit the spirit of the age.

This paper does not pertain to the political suggestions. Nor is it a comprehensive review. Rather, the following text identifies the book's central macroeconomic claims and examines them: logically, theoretically, empirically. Section 2 starts with the allegation that a return on capital in excess of the growth rate, formally  $r > g$ , implies that wealth grows faster than output and wages. This is demonstrably false. Section 3 is about Piketty's "first fundamental law of capitalism" and its relationship with the capital-labor split. Section 4 discusses the so-called "second fundamental law of capitalism" which attributes changes in wealth-income ratios to savings and growth rates. The central objection to the text, which regards the equalization of capital and wealth, is outlined in section 5 which demonstrates that recent increases in wealth largely reflect increases in land values. Section 6 concludes the paper.

## 2. The "Central Contradiction of capitalism"

The return on capital ( $r$ ) represents the sum of interest payments, dividends, rents, and other forms of annual income, except labor income, as a percentage of total wealth. The growth rate  $g$  represents the annual growth of national income or GDP. Both rates are understood in real terms, i.e. they exclude inflation. Piketty (2014: 571) states that the return on capital exceeds the growth rate. He sees this relationship as "the central contradiction of capitalism", and continues: "The inequality  $r > g$  implies that wealth accumulated in the past grows more rapidly than output and wages."

This is false. The standard dynamic textbook model, invented by Diamond (1965), tells just the opposite. In this model, young persons born in period  $t$  act in accordance with their budget constraints

$$(1) \quad \begin{aligned} \text{i) } & C_t^1 + S_t = w_t, \\ \text{ii) } & C_{t+1}^2 = (1 + r_{t+1})S_t, \end{aligned}$$

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<sup>1</sup> The supposedly "optimal" top tax rates are to be found in Piketty (2014), p. 512 and p. 572. For the normal return to capital cf. p. 206. As a numerical example, a taxpayer's wealth of 100 yields a pretax income of 4. The wealth tax is 10, the income tax is 3.2 and the total tax 13.2 or 330 percent of the capital income.

where  $C_t^1$  denotes consumption when young,  $C_{t+1}^2$  denotes consumption when old,  $S_t$  denotes the stock of desired wealth,  $r_{t+1}$  is the return on capital, and  $w_t$  is the wage rate. In the simplest case, preferences and production technologies are represented by Cobb-Douglas functions, depreciation is disregarded, and there is neither population growth nor technical change. Under these assumptions, which are overly strong but useful to concentrate on the essence, the economy approaches a stationary state ( $g=0$ ) with a strictly positive return on capital ( $r>0$ ). The return on capital exceeds the growth rate. But contrary to Piketty's claim, wealth does by no means grow faster than output. Rather, it stays constant. And so do the wealth-income ratio and the functional distribution of income which are determined by the coefficients of the Cobb-Douglas functions.

Operative bequests, as considered by Weil (1987), do not affect these results: In a stationary state, each generation inherits a certain amount from the preceding generation and hands it over to the next. And if one admits population growth, a steady state is reached where wealth and income grow at the same rate. Again, the wealth-income ratio is constant and independent of the relationship between  $r$  and  $g$ .

Piketty's erroneous claim is due to the implicit assumption that savings are *never* consumed, nor spent on charitable purposes or used to exert power over others. It is only under this outlandish premise that wealth grows at the rate  $r$ . If people use their savings later on, as they do in the Diamond model as well as in reality, the growth of wealth is independent of the return on capital. This holds all the more in the presence of taxes.

Piketty's allegation that the relationship  $r>g$  implies a rising wealth-income ratio is not only logically flawed, however, but also rebutted by his own data: On p. 354, the author reports that the return on capital has consistently exceeded the world growth rate over the last 2,000 years. According to his "central contradiction of capitalism", this would have implied steadily increasing wealth-income ratios. Yet, over the last two centuries or so, the period for which data are available, wealth-income ratios have remained relatively stable in countries like the United States or Canada. In countries such as Britain, France, or Germany, which were heavily affected by the wars, wealth-income ratios declined at the start of World War I and recovered after the end of World War II<sup>2</sup>. The book's references to these wars and the implied destruction of capital abound. They are intended to rescue the claim that  $r>g$  implies an ever rising wealth-income ratio. The United States and Canada as obvious counter-examples remain unmentioned in this context.

As a final remark concerning this point, the relationship between  $r$  and  $g$  is not only important for capitalistic societies but also for planned economies, where  $r$  represents an imputed capital rental rate. In both systems, a return on capital in excess of the growth rate does not represent a problem but is socially useful because it pre-

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<sup>2</sup> See Piketty (2014) p. 151 for the U.S., p. 157 for Canada, p. 116 for Britain, p. 117 for France, and p. 141 for Germany.

vents dynamic inefficiency: In the opposite case  $r < g$ , one could make some generation better off without making other generations worse off, as is well known. Piketty has no idea why the return on capital should be greater than the growth rate. On p. 353 he starts a long-winded explanation, which leads nowhere, but he does not cite his compatriot Jacques Turgot (1766). According to Turgot, the return on capital is strictly positive ( $r > 0$ ) in a stationary economy ( $g = 0$ ) because otherwise land values would become infinite; hence the return on capital exceeds the growth rate. This fundamental insight can be generalized to arbitrary growths paths, see Homburg (1991), provided that the land income share is uniformly positive.

### 3. The “First Fundamental Law of Capitalism”

The first law reads  $\alpha = r \times \beta$ , where  $\alpha$  represents the capital income share and  $\beta$  denotes the wealth-income ratio. The equation is a pure accounting identity, as Piketty notes. However, it is given a causal interpretation on p. 221, where Piketty claims that an increase in  $\beta$  is likely to induce a subsequent increase in  $\alpha$  because “the accumulation effect will outweigh the decrease in the return on capital”. This text passage contains the book’s central point: Due to strong accumulation and low growth, the wealth-income ratio rises and so does the capital income share—with the effect that workers get a correspondingly smaller piece of the total cake.

On p. 200 f. Piketty presents British and French capital income shares over the periods 1770–2010 and 1820–2010, respectively. These long-run series suggest anything but an upward trend in capital income shares. Quite on the contrary, capital income shares were lower in 2010 as compared with 1820 or 1900, reaching record lows in the 1970s and 1980s. Rising capital income shares show up only in time series starting in 1975, just around the all-time minimum, see Piketty (2014: 222). Hence the premise that the functional distribution is apt to change against labor income is unconvincing, and the author acknowledges this by pointing out the possibility “that technological changes over the very long run will slightly favor human labor over capital, thus lowering the return on capital and the capital share” (p. 233). The future development of the income shares is simply a matter of speculation.

### 4. The “Second Fundamental Law of Capitalism”

The second law reads  $\beta = s/g$ , where  $s$  represents the savings rate. Denoting wealth as  $S$ , its change as  $\dot{S}$  and the growth rate as  $\dot{Y}/Y$ , the equation can be rewritten as

$$(2) \quad \frac{S}{Y} = \frac{\dot{S}}{\dot{Y}} \times \frac{Y}{\dot{Y}},$$

which makes clear that the second law holds only in a steady state where wealth and income grow at a common rate. Piketty treats  $s$  and  $g$  as two independent variables which jointly determine the wealth-income ratio. This is in accordance with the old Harrod-Domar-Solow tradition and raises a serious division-by-zero problem in case of a stagnant economy ( $g = 0$ ). In the Diamond model, by contrast, such a trouble

does not show up because in a stagnant economy each generation wishes to hold the *same* wealth  $S$  as its predecessor. Changes in desired wealth, i.e. savings  $\dot{S}$ , only result from population growth or from changing technologies or preferences. Looked at this way, the coefficient  $s$  is not exogenous but an increasing function of the growth rate,  $s(g)$ , running through the origin. Low growth does not drive wealth-income ratios to infinity, and has never done so, but results in lower savings. On the other hand, as will become clear in the next section, wealth-income ratios can rise markedly without changes in savings or growth rates. The latter changes being neither necessary nor sufficient, the second law appears to be a red herring.

## 5. Capital versus Wealth

Piketty treats the terms *capital* and *wealth* interchangeably, and deliberately so (p. 47), because he believes distinguishing reproducible capital and nonreproducible land were cumbersome. However, the SNA (2008) as the present standard of national accounting provides separate stocks of capital and land, and an increasing number of countries actually publish the corresponding figures. It is hard to see why one should disregard these official statistics. Of course, macroeconomic textbooks and many theoretical models also equalize capital and wealth and use the symbol  $K$  to represent both. Within an empirical approach, however, distinguishing reproducible capital and its components from nonreproducible land is crucial and overturns many of Piketty's results and speculations. To make matters concrete, let  $K$  denote the stock of reproducible capital,  $L$  the stock of pure land, and  $q$  the land's price, measured in output units per square meter. In some period  $t$ , national nonfinancial wealth  $S_t$  is given by

$$(3) \quad S_t = K_t + q_t L.$$

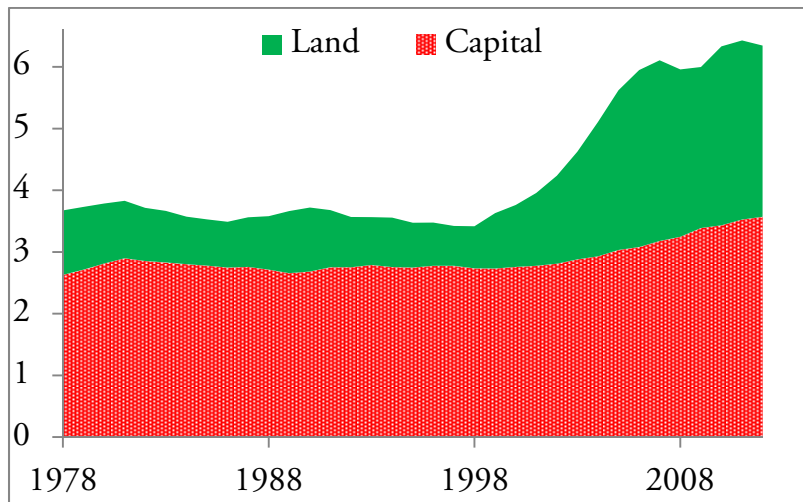


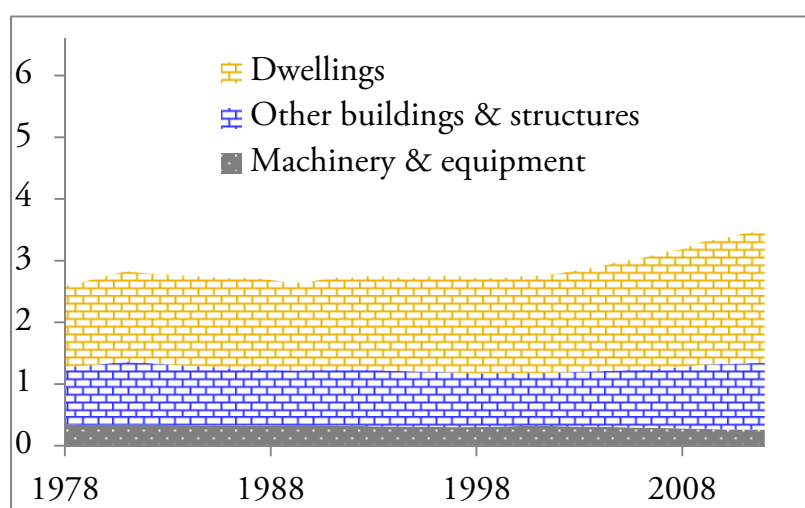
Figure 1: Capital, land, and public debt as multiples of GDP.<sup>3</sup>

<sup>3</sup> The figure displays “fixed assets” and “land” which make up the bulk of reproducible and nonreproducible assets, respectively. The dataset (retrieved April 24, 2014) is available under <http://stats.oecd.org>, an-

Increases in wealth can either be due to savings (capital accumulation) or to rising land prices (revaluation). Taking France as a typical example, figure 1 shows the decomposition of national wealth into capital and land between 1978 and 2012.

The development depicted in figure 1 resembles the corresponding figure in Piketty (2014: 117). France’s net financial worth is left out here and national nonfinancial wealth is expressed as a multiple of GDP rather than of national income; but these differences are immaterial. The crucial point is that the strong increase in the wealth-income ratio, which commenced in 1999, the year of the introduction of the euro, was driven by an increase in land values which almost tripled by 2012. The rise in the wealth-income ratio, rather than proving how much capital is amassed through savings, essentially stems from a revaluation.

When one decomposes capital into its three main components, i.e. i) dwellings (excluding land values), ii) other buildings and structures (also excluding land values), and iii) machines and equipment, it becomes clear that Piketty’s subtext of “sophisticated robots” (p. 221) which replace employees and “claim” ever higher shares of national income—at the expense of the middle class—is oddly at variance with the data. Figure 2 demonstrates that reproducible capital consists mostly of dwellings and other buildings and structures. In fact, the item “machinery and equipment” is trifling—it makes up 5 percent of total wealth. Moreover, machinery and equipment as well as other buildings and structures, expressed as percentages of GDP, remained almost constant over the last 34 years. Dwellings were the only component of capital that showed a noticeable increase.



**Figure 2:** Components of reproducible capital as multiples of GDP.<sup>4</sup>

To sum up, if one interprets “capital” narrowly as the value of produced means of production, its ratio to GDP has almost stayed constant over the last decades. A cer-

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nual national accounts, detailed tables, table 9B: Balance sheets for non-financial assets. The time series start in 1978.

<sup>4</sup> Source: See footnote 3.

tain rise in this ratio is detectable if one includes dwellings. The really considerable increase in the ratio of wealth to GDP, however, is partly due to dwellings but predominantly to the sharp rise in land values. These facts rebut Piketty's claim that "capital is back" in a sense that pertains to production and income distribution. They also question his method to ignore the official distinction between reproducible assets (AN1) and nonreproducible (AN2) assets and to dice both types of assets up under the label "housing", which obscures what has been going on.

The above figures suggest that the increase in the wealth-income ratio is largely a middle-class matter: Beginning right after the Volcker revaluation, North America and Western Europe enjoyed a prolonged period of declining interest rates that still lasts today. This made home purchases affordable for middle-class families and pushed up land prices. With inflation and interest rates back at their 19<sup>th</sup>-century levels, land values also returned to their historical values, with an important shift from agricultural use to urban use. There is nothing dramatic in this story. However, a decline of land prices to their previous levels—e.g. in case of a euro zone breakup— would pose a major challenge since land constitutes the most important part of bank collateral.

## 6. Conclusion

From a macroeconomic perspective, Piketty's book, written in a truly dialectic style, makes for hard reading. It lacks a coherent analytical framework and spreads its theses over several hundred pages. Almost every contention is repealed or qualified later on, and every strong statement has a "possibly" attached. In a nutshell, the book's core message is that something terrible *may* happen over the next hundred years unless governments start expropriation now.

The present paper has scrutinized the pompous allegations on which this outlook is based, among them the "central contradiction of capitalism", the "first fundamental law of capitalism", and the "second fundamental law of capitalism". All these were found unwarranted: The relationship  $r > g$  does by no means imply a permanently rising wealth-income ratio; an increase in wealth does not imply a rise in the capital-income share; and the wealth-income ratio is not determined by independent savings and growth rates. Conceptually, however, the book's most significant pitfall is the misleading equalization of the terms "capital" and "wealth". Due to this semantic maneuver, readers are liable to get the impression that recent rises in land prices indicate an industrial revolution which will change the income distribution in favor of capital. Such a presumption is unfounded because rising land values boost wealth but leave production processes unaffected.

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