

Okishio Theorem: Japanese discussion and empirical evidence

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Abstract

This paper introduces the full story of the Okishio theorem. Although it has been considered to be an objection to Marx's law of the fall in the rate of profit, the real purpose of the theorem was to clarify an absurd character of the capitalist choice of technique. Also Okishio argued that the reason of the constant or falling rate of profit should be the rise in the real wage rate. When Okishio submitted the theorem, the real wage was rising but the rate of profit was not clearly falling. With the theorem Okishio argued that capitalists had succeeded in coping with the real wage rise and that real wage rise wasn't sufficient for the working class to improve its situation.

Although his arguments perfectly fitted into Japanese economy at the time, they cannot apply to capitalism in general. And Japanese capitalism has considerably changed since he submitted the theorem. Close cooperation between the state and monopoly capitals is necessary for the theorem, but it has been undermined since the 1980s. Now Japanese capitalism are facing the law of the fall in the rate of profit more than ever.

Introduction

While Marx considered the “[g]eneral law of the fall in the rate of profit with the progress of capitalist production” as “the most important law of political economy” (1975-2004 Vol.33: 104), many economists including Marxists have cast doubt on the law. Among other things, Okishio (1961) gave a critique based on his unique solution of the transformation problem (Okishio theorem). Since then, it has produced endless debate not only in English but also in Japanese.

However, the situation surrounding the Okishio theorem is complicated. Theoretically, Okishio's argument is different between in English and in Japanese: Okishio (1961) lacks some crucial discussions including its concluding remarks. Naturally this has led to misunderstandings and confusions in the English literature. Furthermore, Okishio recanted the Okishio theorem in his last article (2000), while his students and followers had strenuously defended and generalized it. However this recantation is little known, and even Okishio's students seem to struggle to understand its true meaning.

Empirically, capitalism has evolved in a different way from what Okishio predicted. Okishio wrote Okishio (1961) with the analysis of Japanese capitalism enjoying a rapid economic growth at the time. But the situation began to change in the 1970s and Japanese capitalism now experiences a long depression. Although Okishio estimated that the rate of profit would not fall in a capitalist economy, we now see the reverse: the rate of profit in Japan has been falling in the long run.

Introducing the full story of the Okishio theorem in section 1 and Japanese discussion in section 2, this paper first clarifies the theoretical points. Analyzing Japanese capitalism since the Okishio theorem established in section 3, it is argued that the conditions of the theorem has been undermined and Japanese capitalism are now facing the law of the falling rate of profit.

1 The Full Story of the Okishio Theorem

1.1 The Prehistory of the Okishio Theorem

In posthumous Volume III of *Capital*, Marx elucidated the “law of the tendential fall in the rate of profit.” As Marx had already explained in Volume I, the development of capitalist mode of production raises labor productivity: “the same number of workers or the same quantity of labour-power as a result of the specific methods of production that develop within capitalist production, sets in motion, works up, and productively consumes, within the same period, an ever-growing mass of means of labour, machinery and fixed capital of all kinds, and raw and ancillary materials — in other words, the same number of workers operate with a constant capital of ever-growing scale” (Marx 1991: 318). Therefore the rise of labor productivity also means a “progressive decline in the variable capital in relation to the constant capital, and hence in relation to the total capital as well, [which] is identical with the progressively rising organic composition, on average, of the social capital as a whole and the direct result of this is that the rate of surplus-value, with the level of exploitation of labour remaining the same or even rising, is expressed in a steadily falling general rate of profit (318-319). Thus “[t]he progressive tendency for the general rate of profit to fall is simply *the expression, peculiar to the capitalist mode of production, of the progressive development of the social productivity of labour*” (319).

When Marx first showed this law with a famous numerical example (317), he assumed an unchanged level of rate of surplus value. In the 1940s, Sweezy raised an objection to this assumption. He pointed out Marx’s assumption in Volume I of *Capital* that the rate of surplus value rose with capitalist development:

Like every other instrument for increasing the productivity of labour, machinery is intended to cheapen commodities and, by shortening the part of the working day in which the worker works for himself, to lengthen the other part, the part he gives to the capitalist for nothing. The machine is a means for producing surplus. (Marx 1990: 492, cited in Sweezy 1942: 101)

Citing this, Sweezy pointed out:

A rise in the organic composition of capital must mean an increase in labor productivity, and we have Marx’s own word for it that higher productivity is invariably accompanied by a higher rate of surplus value. In the general case, therefore, we ought to assume that the increasing organic composition of capital proceeds *pari passu* with a rising rate of surplus value.

If both the organic composition of capital and the rate of surplus value are assumed variable, as we think they should be, then the direction in which the rate of profit will change becomes indeterminate. (1942: 102)

The rate of profit (r) can be expressed as follows:

$$r = \frac{S}{C+V} = \frac{S/V}{C/V+1} \quad (1)$$

where C denotes constant capital, V denotes variable capital, and S denotes surplus value. As is apparent, the rate of profit rises if the rate of surplus value (S/V) rose sufficiently in comparison to the organic composition of capital (C/V). Therefore Sweezy claimed that the direction to which the rate of profit will change is “indeterminate” unless we have enough information on the rise in both the organic composition of capital and the rate of surplus value. This claim was, however, refuted by Tomizuka in the 1950s.¹

In Japan, Tomizuka cast a doubt on the validity of Sweezy’s claim:

Even if the rate of surplus value rises infinitely, the absolute limit of the increase of the mass of surplus value is given by the mass of living labor which is determined by the production technology, because the mass of surplus value is determined by the mass of surplus labor. Development of the method of production, i.e. the decrease in living labor in comparison to means of production due to the development of forces of labor production, causes the decrease in variable capital in comparison to constant capital, though such comparative decrease is countered by the more rapid decline in means of production than the decline in value of means of subsistence which is identical with the value of labor power. As a result, living labor, which is united with objectified labor, comparatively decreases as productive forces develop. This decrease in living labor in comparison to dead labor means decrease in the mass of labor employed by advanced capital, in comparison to advanced capital. This frees capital to accumulate despite the limit of absolute increase in labor force. However, progressive decrease in the mass of living labor applied by advanced capital in comparison to the capital due to development of productive forces means progressive decline of the limit that surplus labor can increase by the decrease in necessary labor, and therefore progressively weakens the effect of the rise in the rate of surplus value to counteract the fall in the rate of profit. (Tomizuka 1954: 121, emphasis deleted, my translation)

According to Tomizuka, the crux of Marx’s argument is not the relation between the rise of the organic composition of capital and the rate of surplus value but the limit that surplus labor can increase. In contrast to Sweezy’s claim, the rate of profit is limited by the ratio between living labor and constant labor:

$$r = \frac{S}{C+V} < \frac{N}{C+V} < \frac{N}{C} \quad (2)$$

where N denotes living labor. Tomizuka pointed out the inevitability for the rate of profit to fall when the rise in the composition of capital causes the mass of living labor to diminish. This argument attracted mass support in Japan, because it was based on a careful reading of *Capital*. Marx explains the law of the tendential fall in the rate of profit as follows:

Since the mass of living labour applied continuously declines in relation to the mass of objectified labour that it sets in motion, i.e. the productively consumed means of production, the

¹ Similar critique is Rosdolsky (1956).

part of this living labour that is unpaid and objectified in surplus-value must also stand in an ever-decreasing ratio to the value of the total capital applied. But this ratio between the mass of surplus-value and the total capital applied in fact constitutes the rate of profit, which must therefore steadily fall. (Marx 1991: 319)

Therefore the law is not such a simple idea that the rise in the organic composition of capital causes a tendential fall in the rate of profit if the rate of surplus value does not rise sufficiently, but a fundamental law that the mass of value product, a part of which is surplus value, decreases with the development of productive forces. Thus in Japan the law was seen to be correctly interpreted and proved by Tomizuka in the 1950s. This is the starting point of Okishio's inquiry.

1.2 Okishio's Inquiry

Okishio supported the critique of Sweezy and Tomizuka's interpretation of the law. Okishio first endorsed Tomizuka's argument with a mathematical formulation (1987: 163; 2000: 494n):

$$\frac{C}{V} = \frac{C}{S+V} \cdot \frac{S+V}{V} = \frac{C}{N} \left(\frac{S}{V} + 1 \right) \quad (3)$$

This shows that the organic composition of capital is determined by the rate of surplus value as well. Therefore the rise in the rate of surplus value also raises organic composition of capital. Okishio writes:

The critiques [such as Sweezy] are logically inconsistent. They wrongly hold that e [the rate of surplus value] and μ [the organic composition of capital] are mutually independent. Owing to this they hold r [the rate of profit] can increase to infinity if e reaches infinity. But if e reaches infinity, μ also reaches infinity, so r cannot exceed $[N/C]$. $[N/C]$ sets the upper limit of the rate of profit r . The rate of profit cannot exceed net-output-capital ratio! (1972: 4)

Also he argued that the rise in the value composition of capital caused by the rise in the rate of surplus value was not what Marx considered as the rise in the "organic" composition of capital. In Volume I, Marx defined the organic composition of capital as follows:

I call the value-composition of capital, in so far as it is determined by its technical composition and mirrors the changes in the latter, the organic composition of capital. Wherever I refer to the composition of capital, without further qualification, its organic composition is always understood. (1990: 762)

Citing this definition, Okishio argued that what Marx considered as the rise in organic composition was not the rise due to the rise in the rate of surplus value but due to the rise in C/N , the ratio between constant capital and living labor (1987: 163-164).² From (2) and (3), the upper limit of the rate of profit falls with the rise in C/N and hence the rise in the organic composition of capital. This was Okishio's "formal proof" (the title of Okishio 1972) of Marx's argument, which had been showed by Tomizuka literally.

² Hodgson dubbed C/N the "organic composition of capital" for the same reason (1974: 60). But his dubbing is clearly different from Marx's definition.

However, Okishio added a footnote to the title when he included the paper into a book. Although he endorsed Tomizuka's interpretation and argument, Okishio questioned Marx's assumption of a capitalist choice:

This "proof" means to prove Marx's theorems logically from Marx's assumption. But here I don't inquire into either reasonableness of Marx's assumption or the condition for Marx's assumption. It is the issue of the next section [Okishio 1961]. (1987: 170n)

Although Okishio didn't put in English, he sometimes wrote the motive of his inquiry in Japanese. For instance, he explained the necessity of the inquiry as follows:

If the rise in labor productivity *inevitably* raises C/N, capitalists have no choice but to stop the rise in labor productivity so as to stop the fall in both the rate of profit and the demand of labor. But this is made impossible by both the pressure of capitalist competition and the desire for relative surplus value. Therefore it seems that there is no exit and capitalists have no choice but to go to ruin by themselves.

However, if there is a new technique available that raises labor productivity without raising C/N, capitalists should desperately try to introduce it. In order to make it possible, they should ask the state for a full support. We should notice that this is what's going on. (1987: 170, emphasis in original, my translation)

Thus the aim of Okishio (1961) was not to criticize Marx but to analyze the desperate behavior of capital in the mid 20th. Using Okishio's formulae (1961: 86), value of the i th commodity is determined by the following equations:

$$t_i = \sum a_{ij}t_j + \tau_i \quad (4)$$

where t_i denotes the amount of labor directly and indirectly necessary to produce a unit of the i th commodity, a_{ij} denotes the j th commodity directly and indirectly necessary to produce a unit of the i th commodity and τ_i denotes the amount of labor directly necessary to produce a unit of the i th commodity.

A new technique that raises productivity of labor in the k th industry is such that

$$\sum a_{kj}t_j + \tau_k > \sum a'_{kj}t_j + \tau'_k \quad (5)$$

where $(a'_{k1}, a'_{k2}, \dots, a'_{kn}, \tau'_k)$ denotes the new technique in the k th industry. Marx assumed it is possible with mechanization which raises C/N and therefore lowers the upper limit of the rate of profit.

On the other hand, there might be another new technique such that

$$\sum a_{kj}q_j + \tau_k > \sum a'_{kj}q_j + \tau'_k \quad (6)$$

where $q_j = p_j/w$, p_j and w denote the price of the j th commodity and the rate of money wage respectively. This kind of new technique lowers cost price and hence raises the rate of profit, even if it raises both C/N and the organic composition of capital. If capitalists can find this kind of technique,

they should desperately try to introduce it. However it doesn't raise the productivity of labor except an unusual case that $q_i = t_i$ for all i (86). Therefore,

Capitalists' criterion regarding the introduction of new production techniques is not whether the technique raises productivity of labor, but whether it decreases cost of production. "Productivity criterion" differs from "cost criterion". *This is an expression of the obstacles the capitalistic economy sets on the progress of production power.* (86-87, emphasis added)

This distinction of two criteria and the absurdity of capitalists' criterion is pointed out by Marx in Volume I of *Capital*:

The use of machinery for the exclusive purpose of cheapening the product is limited by the requirement that less labour must be expended in producing the machinery than is displaced by the employment of that machinery. For the capitalist, however, there is a further limit on its use. Instead of paying for the labour, he pays only the value of the labour-power employed; the limit to his using a machine is therefore fixed by the difference between the value of machine and the value of labour-power replaced by it. The Yankees have invested a stone-breaking machine. The English do not make use of it because the 'wretch' who does this work gets paid for such a small portion of his labour that machinery would increase the cost of production to the capitalist. Hence we nowhere find a more shameless squandering of human labour-power for despicable purposes than in England, the land of machinery. (1990: 515-517)

Thus, for Okishio, one of the conclusions of the Okishio theorem is the absurdity of the capitalist mode of production in which new techniques that raise productivity of labor aren't introduced and human labor is squandered. The same is pointed out in Chapter 15 of Volume III as well:

For capital, therefore, the law of increased productivity of labour is not unconditionally valid. For capital, this productivity is not raised simply because more living labour in general is spared than is added in past labour, but only if more of the *paid* part of living labour is spared At this point the capitalist mode of production falls into a new contradiction. Its historical mission is ruthlessly to expand the productivity of human labour, to derive it onwards in geometrical progression. It is untrue to its mission as soon as it starts to inhibit the development of productivity, as it does here. It thereby simply shows once more that it is becoming senile and has further outlived its epoch. (1991: 371, emphasis in original)

Citing this, Okishio remarked that the theorem clarified it inevitable for the working class to overthrow capitalist mode of production (1978: 155-156).

There is another line of argument by which Okishio proved the absurdity of capitalist mode of production. In Okishio (1978), he inquired into the case the real wage rate moves. If the rate of real wage is constant, capitalists can raise the rate of profit by introducing a new technique that lowers the cost price. On the other hand, when the rate of real wage rises capitalists might introduce a new technology that raises the organic composition of capital, in order to counteract the decrease of profit caused by the rise in the real wage rate.

To explain the case, Okishio distinguished two kinds of new technical progress (1978: 148-149). The first is an introduction of a new technique that raises the rate of profit even if the rate of real wage is

constant, which corresponds to a technology drawn as $A''B''$ in (1977: 96-97). Okishio named this kind of technical progress “innovative technical progress.” The second is an introduction of a new technique that doesn’t raise the rate of profit unless the rate of real wage rises, which corresponds to a technology drawn as $A'B'$ in (1977: 96-97). Okishio named this kind of technical progress “substitutive technical progress.” It is chosen because it is better than to stay in the original technology. But the rate of profit falls from the level before the rise in the real wage.

Consider a case in which no “innovative technical progress” is available but some “substitutive technical progress” available. When the rate of real wage rises, capitalists should introduce the “substitutive” technology in order to counteract the effect of the rise in the real wage rate. However, it raises the cost price and therefore lowers the rate of profit, though it counteracts the decrease in profit caused by the rise in the rate of real wage. Of course, capitalists would choose an “innovative technical progress” if it was available. But in this case, it is unavailable and capitalists introduce a “substitutive technical progress.” As a result, the organic composition of capital rises and the rate of profit falls.

Therefore Okishio concluded “if the rate of profit had tendentially fallen, then the reason should be the rise in the rate of real wage; on the other hand, if the rate of profit had tendentially risen without the decline in the real wage rate, then the reason should be innovative technical progress available” (1978: 153-154, my translation). And he statistically checked the long-run movement of N/C , which is the maximum rate of profit. But he did “not find any such strong tendency for this ratio to fall” (1977: 97), and concluded “capitalists had so far succeeded in introducing new technical progress that raises labor productivity without raising $[N/C]$ ” (1987: 203, my translation).

The concluding remark of these two lines of argument is as follows:

The meaning of this theorem is that as far as the working class is concerned only with winning a rise of the real wage and shortening of hours capitalists can get more than concessions they made with rationalizations (introductions of new techniques). (.....)

We can ascertain a crucial meaning [of the capitalist mode of production], in which capitalists own means of production and hence the power to make decisions of new production methods.

The biggest factor that enables the fall in the rate of profit is the rise in the real wage rate. The most powerful force keeping the rate of profit constant or even growing is the introduction of “innovative technical progress.” This force is sustained by capitalist ownership of the means of production. (1978: 156, my translation)

Thus the Okishio theorem was a theory to prove the necessity for the working class to overthrow monopoly capitalism.

2 Critiques by Tomizuka and Okishio himself

2.1 Tomizuka’s Critique

Ever since Okishio proposed the theorem in 1961, many scholars have raised objections inside and outside Japan. In the English literature, the pivot of the debate has been the effect of introducing

fixed capital, which Okishio didn't argue in English.³ On the other hand, the pivot has been the way of capitalist accumulation in the Japanese literature. Among other things, Tomizuka's critique (1965: 540-542) has been the most supported precisely because it is based on a careful reading of Marx. In sharp contrast to Okishio, Tomizuka pointed out that capitalists seek not for the rate of profit but for the extra surplus-value. Marx writes:

No capitalist voluntarily applies a new method of production, no matter how much more productive it may be or how much it might raise the rate of surplus-value, if it reduces the rate of profit. But every new method of production of this kind makes commodities cheaper. At first, therefore, he can sell them above their price of production, perhaps above their value. He pockets the difference between their costs of production and the market price of the other commodities, which are produced at higher production costs. This is possible because the average socially necessary labour-time required to produce these latter commodities is greater than the labour-time required with the new method of production. His production procedure is ahead of the social average. But competition makes the new procedure universal and subjects it to the general law. A fall in the profit rate then ensues —firstly perhaps in this sphere of production, and subsequently equalized with the others— a fall that is completely independent of capitalists' will. (1991: 373-374)

The profit individual capitalists earn comes not from the difference between the average cost of production in the sector and the price of production but from “the difference between their costs of production and the market price of the other commodities.” Therefore their interests are their individual values of commodities and their productivity of labor. Even if their choices cause the fall in the general rate of profit, they don't care! Thus the criterion that individual capitalists introduce new techniques is not “cost criterion” but “productivity criterion.” If there is a capitalist planner, capitalists might act on “cost criterion” and succeed in a rise in the rate of profit. However, capitalism is not such a “socialistic” society.

Marx thought the rise in the labor productivity is possible with introducing machine. In the debate, the increase of fixed capital has often been pointed out as the main factor of rising composition of capital. But Marx stressed the increase of the other component of constant capital as well.

The value of the raw and ancillary materials goes at a single stroke into the value of the product for which they are used, while the value of the elements of fixed capital goes in only to the extent of their depreciation, and thus only gradually. It follows from this that the price of the product is affected to a much higher degree by the price of raw material than by that of fixed capital, even though *the rate of profit is determined by the total value capital applied*, irrespective of how much of this is consumed or not. Thus in any branch of industry that uses raw materials the increasing productivity of labour is expressed precisely in the proportion in which a greater quantity of raw material absorbs a certain amount of labour, i.e. in the increasing mass of raw material that is transformed into products, worked up into commodities, in an hour, for example. *In proportion therefore as the productivity of labour develops, the value of the raw material forms an ever-growing component of the value of the commodity produced,*

³ As Nakatani (1980) points out, Okishio argued the case in (1978).

not only because it enters into it as a whole, but because in each aliquot part of total product, the part formed by the depreciation of the machines and the part formed by newly added labour both constantly decline. (1991: 203-204, emphasis added)

Thus the rise in the labor productivity increases the ratio of the value of the raw material to newly added labor. Such increase results in the decrease of N/C , which is the upper limit of the rate of profit. Therefore the rate of profit, which is determined by the ratio of the mass of surplus-value and *the total value capital applied*,⁴ has a tendency to fall.

However capitalists can increase the mass of surplus value even if the rate of profit falls.

The number of workers employed by capital, i.e. the absolute mass of labour it sets in motion, and hence the absolute mass of surplus labour it absorbs, the mass of surplus-value it produces, and the absolute mass of profit it produces, *can* grow, and progressively so, despite the progressive fall in the rate of profit. This not only *can* but *must* be the case —discounting transient fluctuations— on the basis of capitalist production. (1991: 324, emphasis in original)

Even if the rate of profit falls, capital as self-valorizing value, is satisfied with growing the mass of surplus value. Such growth is possible with the increase of advanced capital. Therefore “[a]s the profit rate falls, so there is a growth in the minimum capital that the individual capitalist needs in order to make productive use of labour” (Marx 1991: 359). To achieve it, both concentration and centralization of capital are inevitable. However they provoke the “competitive struggle”:⁵

[T]he fall in the profit rate that is bound up with accumulation necessarily gives rise to a competitive struggle. Compensation for the fall in the profit rate by an increase in the mass of profit is possible only for the total social capital and for the big capitalists who are already established. New and independently operating additional capital finds no compensatory conditions of this kind ready made; it must first acquire them, and so it is the fall in the profit rate that provokes the competitive struggle between capitalists, and not the reverse. (Marx 1991: 365)

This competitive struggle forces the mass of small fragmented capitals onto “adventurous paths: speculation, credit swindles, share swindles, crises” (Marx 1991: 359). Tomizuka argued these “internal contradictions” were the basis of Marx’s theory of crisis:

Accumulation → a fall in the rate of profit → the competitive struggle → an additional fall in the rate of profit → intensification of the competitive struggle → etc. Thus a reason causes its result which turns to a cause again. The self-accelerating but contradictory development of

⁴ See also Marx 1991: 355. Therefore the rate of profit differs from the ratio between the mass of constant capital as a component of the cost price and the mass of the average profit, both of which constitute the price of production. In the transformation process, only a part of the value of fixed capital goes into the value of the product. On the other hand, the denominator of the rate of profit is the *total* value of capital advanced. This distinction between the general rate of profit in both Part One and Part Two and the rate of profit in Part Three of Volume III is the focal point of Tomizuka’s critique of the Okishio theorem.

⁵ The “competitive struggle” is also mentioned in Volume I of *Capital* in which Marx discussed the “general law of capitalist accumulation,” though “Konkurrenzkampf” is translated as “battle of competition” there (1990: 777). Tomizuka interpreted the law of the tendential fall in the rate of profit as the conclusion of the general law of capitalist accumulation. His proof of the law of tendential fall in the rate of profit is based on this interpretation.

capitalist accumulation and production speeds along the road to crisis, which is both a collective explosion and a violent solution of accelerated internal contradictions hidden behind capitalist accumulation. (Tomizuka 1965: 527, my translation)

This argument by Tomizuka enables us to understand Marx's explanation as follows:

A fall in the profit rate, and accelerated accumulation, are simply different expressions of the same process, in so far as both express the development of productivity. Accumulation in turn accelerates the fall in the profit rate, in so far as it involves the concentration of workers on a large scale and hence a higher composition of capital. On the other hand the fall in the profit rate again accelerates the concentration of capital, and its centralization, by dispossessing the smaller capitalists and expropriating the final residue of direct producers who still have something left to expropriate. In this way there is an acceleration of accumulation as far as its mass is concerned, even though the rate of this accumulation falls together with the rate of profit.

On the other hand, however, in view of the fact that the rate at which the total capital is valorized, i.e. the rate of profit, is the spur to capitalist production (in the same way as the valorization of capital is its sole purpose), a fall in this rate slows down the formation of new, independent capitals and thus appears as a threat to the development of the capitalist production process; it promotes overproduction, speculation and crisis, and leads to the existence of excess capital alongside surplus population. (1991: 349-350)

Thus Tomizuka interpreted that the “solely historical and transitory character of the capitalist mode of production” (Marx 1991: 350) was clarified by crisis, while Okishio interpreted that it was the capitalist technological progress which squanders human labor.

2.2 Okishio's own Critique

Okishio appears to have believed the validity of the Okishio theorem until at least the late 1980s, when he published a book consisted of papers on the theorem including (1961). But his study in the 1990s forced him to recant it. Reflecting his study with computer programming, he criticized his own theorem in his last article (2000).⁶

Although he continued to believe the logical validity of the theorem, he argued the assumptions were “inappropriate” (493). They are (1) that the real wage rate is constant, and (2) that new production prices are established. The first assumption, however, doesn't play an important role on Okishio's argument. As we saw in section 1, a conclusion of his argument is that “[t]he biggest factor that enables the fall in the rate of profit is the rise in real wage rate” (1978: 156). Therefore Okishio didn't assume constant real wage rate when he argued his theorem. He argued the case the real wage rate moved as well.

On the other hand, the establishment of an equilibrium with positive profit plays a crucial role. If the rate of profit is zero in any equilibriums, a comparative statics that compares an old equilibrium and

⁶ Okishio (2000) is merely a summary of his study in the 1990s. He wrote several related papers in Japanese before Okishio (2000).

a new equilibrium is meaningless. If the rate of profit is zero in both equilibriums, capitalists have no motive to adopt a new technique. But if capitalists can get extra surplus-value until a new equilibrium is established, then it becomes the sole object for capitalists. This means that Tomizuka's critique makes a valid point.

There is another important implication of this. In Okishio (2000), he admitted the meaningfulness of the way to define the rate of profit historically, which the "temporal single system (TSS)" interpreters stress:

[This] definition shows the rate of return on the money advanced. This rate is meaningful for capitalists who estimate the *present* profitability of the sector. (2000: 497, emphasis in original)

Okishio, however, adopted not the historical profit rate but the "simultaneist" profit rate. He explained the reason as follows:

Though [the historical rate of profit] expresses the *present* profitability of the sector, the [historical rate of profit] does not give enough information to allow a decision as to whether or not it is profitable to invest in this sector We prefer [the simultaneist rate of profit]: capitalists need information on the profitability of investment in the near future, not the historical record (2000: 497, emphasis in original) ⁷.

If the rate of profit is zero in any equilibriums, however, the simultaneist profit rate is always zero and hence meaningless for capitalists. Then the historical rate of profit, which reflects extra surplus-value, should be the criterion capitalists make decisions.

Also Okishio pointed out "[i]n order for profit to be positive, *incessant* technical change is necessary" (2000: 501, emphasis in original). But if capitalists have a good fortune to incessantly succeed in such technical progress that gives them extra surplus-value, the equilibrium won't be reached forever! Then the historical profit rate becomes the only the one meaningful.

However, the historical profit rate reflects not only the extra surplus-value gained by the innovator but also the negative extra surplus-value due to "moral depreciation," which the other capitalists lose. If the amount of the extra surplus-value gained by the innovator is bigger than that of the negative extra surplus-value, the rate of profit would rise at the industry level. But this isn't the case. If an innovator succeeded in increasing productivity and hence producing more products with the same amount of capital advanced, she/he should sell her/his products at a lower price than the market value, in order to make consumers buy his/her products. Even if she/he sell at a lower price, he/she gets more profit than others, because individual value of his/her product is much less than the market value thanks to the productivity growth. In addition, the rise in supply also lowers the market value. Therefore the amount of the extra surplus-value gained by the innovator is smaller than that of the negative extra surplus-value the others lose, and the rate of profit would fall at the industry level. Therefore the incessant success in technical progress ironically dooms the capitalist mode of production as a whole. ⁸

⁷ Therefore Okishio adopted the "simultaneist" profit rate precisely because it showed what Carchedi termed the "future tendency" (1993: 193). This appears Okishio's reply to the TSS interpreters, though he made no particular reference to the critique by the TSS interpreters.

⁸ This is what is happening in the digital industries. For example, Sharp run into financial difficulty in the summer of 2012, due to the incessant technical change that piles up the negative extra surplus-value. In the liquid crystal

3 Japanese Capitalism since the Okishio Theorem Established

Analyzing statistics on Japanese capitalism until the 1950s, Okishio submitted the Okishio theorem. When he wrote Okishio (1961) and (1978), he seemed to have confidence that the law of the tendential fall in the rate of profit didn't work in Japan. It is no wonder that he had such a confidence because Japanese capitalism enjoyed a rapid economic growth at the time. In addition, Japanese capitalism was a "state-monopoly capitalism" then: the government (especially Ministry of International Trade and Industry) mightily regulated capitalist activities in order to accomplish an economic growth, and the *keiretsu* system represented by "Big Six" business groups set up around banks was common. Therefore it might have been possible that capitalists succeeded in adopting techniques that raised the rate of profit as a whole. The Okishio theorem was submitted against such a backdrop.

Also the real wage rate rose at the time (surged from 1966 to 1973, see figure 1). As we saw in the previous section, the second line of Okishio's argument is an inquiry into the case the real wage rate rises and he pointed out the possibility that capitalists could not choose "innovative" techniques that raise rates of profit. Of course they should introduce "substitutive" techniques to counteract the profit erosion. But the introductions might not be sufficient to maintain the original profitability.

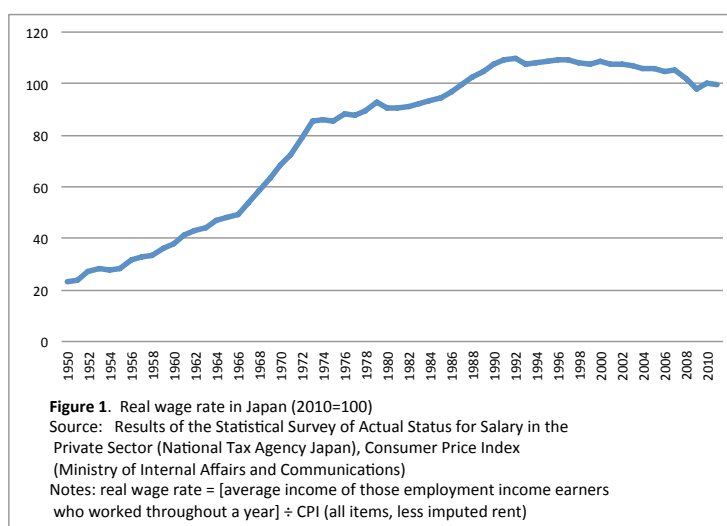
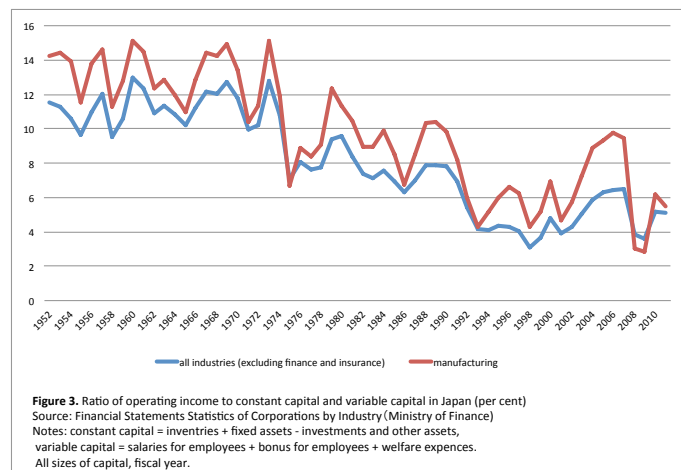
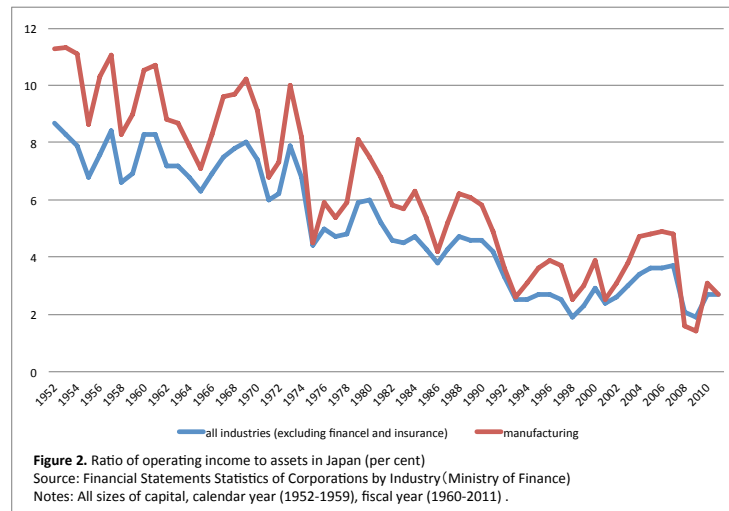


Figure 2 describes the ratio of operating income to assets in all industries (excluding finance and insurance) and in manufacturing. Figure 3 describes "Marxian" rate of profit in all industries (excluding finance and insurance) and in manufacturing, which is the ratio of operating income to both constant capital and variable capital. Here constant capital is inventories plus fixed assets minus "investments and other assets,"⁹ and variable capital is salaries for employees plus bonus for employees plus welfare

television industry, the incessant technical change didn't raise the rate of profit at the industry level, in sharp contrast to what proponents of the Okishio theorem argued.

⁹ "Investments and other assets" includes securities and loans that corporations hold to maintain *keiretsu* system. Because they are not constant capital in Marxian sense, I excluded them.

expenses. From these ratios, it is hard to say whether the rate of profit fell or rose until 1974. But both ratios fell abruptly in 1975, and since then they have never recovered the level before 1974. Due to the burst bubble, they fell sharply again. Although it was difficult to judge the movement when Okishio submitted the Okishio theorem, we can now say the rate of profit has been falling in the long run.

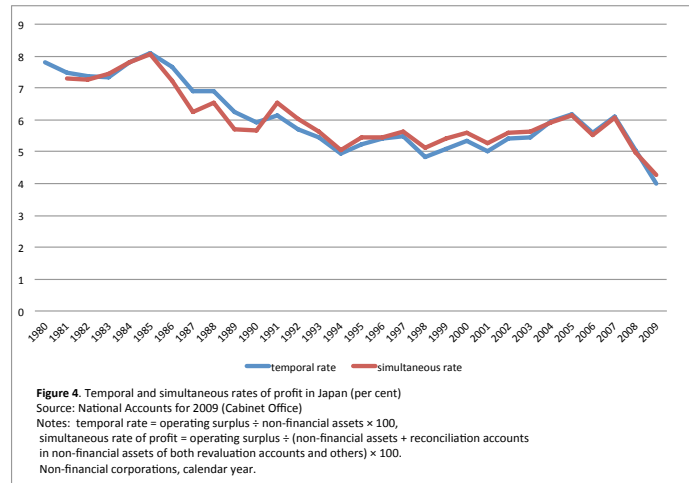


As we saw above, the rate of profit that Okishio concerned was not the historical rate but the simultaneous rate. Since Financial Statements Statistics of Corporations by Industry calculates in book value, both figure 2 and 3 show the historical rate. Therefore there could be an objection that the simultaneous rate might have risen. Although it is difficult to calculate the simultaneous rate in practice, National Account gives the data.

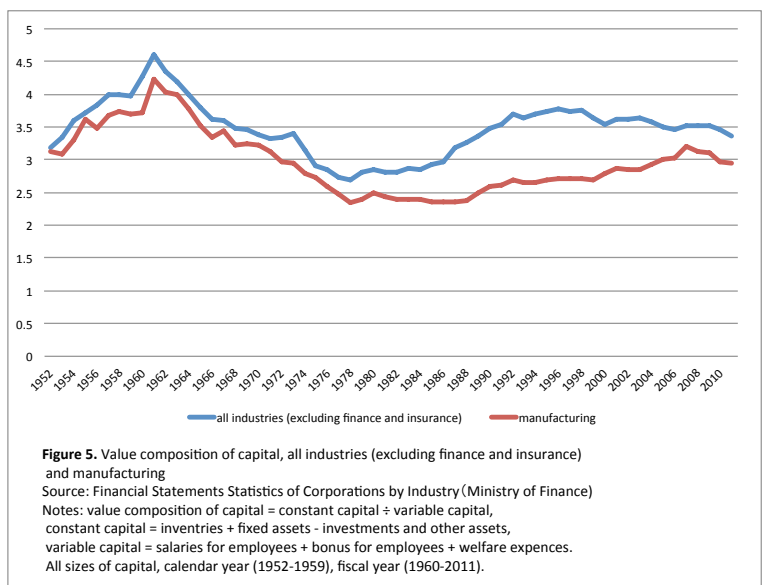
Figure 4 is the movements of both rates. ¹⁰ Although the data is available only for about thirty

¹⁰ Because National Accounts includes the public sector and here operating surplus is divided only by non-financial assets, the movement is different from those in Figure 1 and 2 calculated with Financial Statements Statistics of Corporations by Industry. That is why the ratios calculated with National Account are less volatile.

years,¹¹ there isn't so much difference between them. Even though both rates of profit recovered from 2001 to 2006, the level recovered is much lower than the first half of the 1980s and they took a nosedive from 2007. Both the historical profit rate and the simultaneous profit rate have a tendency to fall in Japan.



Another point the TSS scholars make is that it takes time to realize profits since a capitalist planned to introduce a new technique. In Japan the real wage surged from 1966 to 1973. This should have influenced capitalists' choices of technique. Okishio mentioned that a capitalist might choose a "substitutive technological progress" that raises the organic composition of capital and lowers the rate of profit, in order to counteract the rise in real wage rate.



¹¹ Since the calculation method was changed in 2010, the data after 2009 became unavailable. The data before 1980 is also unavailable because reconciliation accounts is included only in the 1993 SNA.

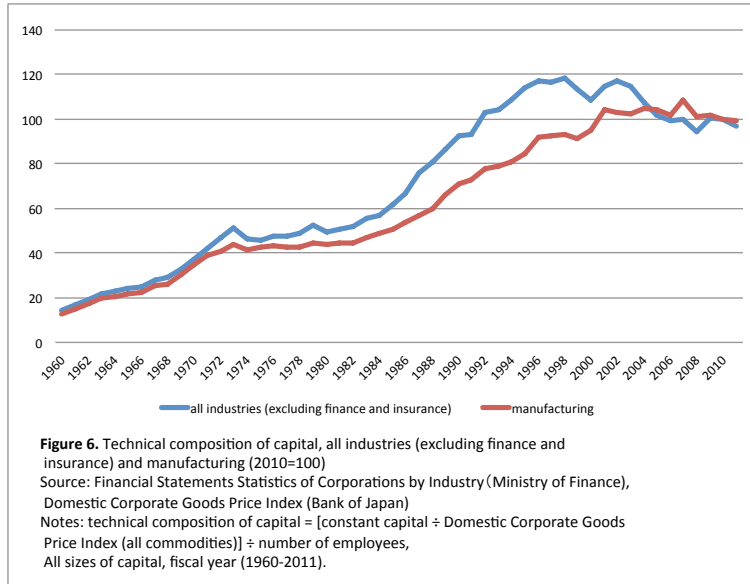


Figure 5 shows that the value composition of capital fell from 1961 to 1978 both in all industries and in manufacturing. But the movement changed in 1978 and it began to rise. While there should be several reasons, one reason should be a “substitutive technological progress” caused by the surge in the real wage rate from 1966 to 1973. It is quite possible that capitalists’ choices of technique changed to “substitutive” ones and the result is the rise in the composition of capital.

Figure 6 shows the movement of the technical composition of capital. In contrast to the value composition of capital, the technical composition has a long-run tendency to rise. Even in the 60s, when the value composition of capital sharply fell, the technical composition continually rose. But from the 80s, the technical composition started to surge and both compositions rose hand in hand, though the degree and period are different between in all industries and in manufacturing. We can say the organic composition of capital rose during the 80s and the 90s (even the 2000s in manufacturing, though the degree is smaller than in all industries) and the rise was caused by “substitutive technological progresses.”

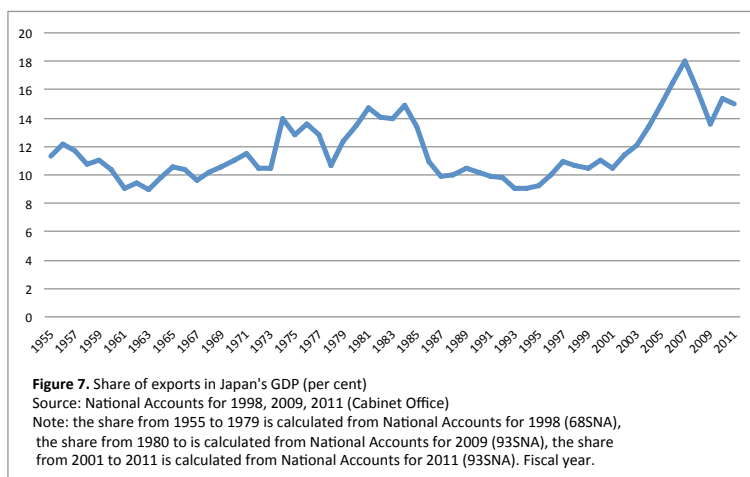
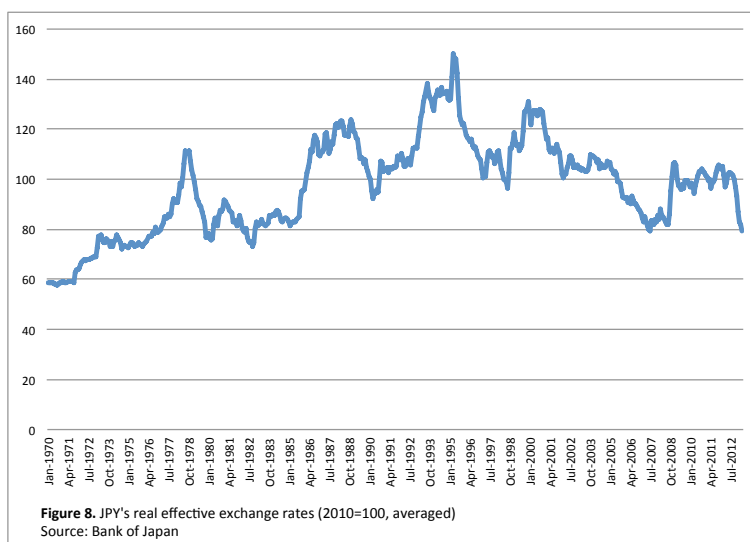


Figure 7 is the share of exports in gross domestic product. The Nixon shock and oil shock caused an abrupt fall in the rate of profit in 1974 and 1975. While the rise in the share of exports from 1974 to 1977 is merely the result of a crisis, the rise from 1979 shows that Japanese economy achieved an economic recovery from the crisis by export. Japanese capitalism overcame the crisis in the mid 1970s by finding foreign markets and the rate of profit recovered to some extent in the early 1980s.

But this wasn't a good story for Japanese capitalists with hindsight. Until the crisis in the mid 1970s, Japanese capitalism was a "state-monopoly capitalism." Government regulation and the *keiretsu* system were the bases of Japanese economy. However finding foreign markets undermined such bases. First, foreign markets are regulated by the local governments and therefore it became difficult for Japanese government to strongly control companies. Second, the expansion of export caused intensified trade frictions especially with the US. The result is the Plaza Accord that led to a rapid appreciation of the yen. Japanese capitalists coped with it by expanding local production. Because it was easier to purchase local parts than to import from Japan, the expansion of local production distressed domestic subcontractors. The *keiretsu* system began to collapse from the bottom, though many journalists and scholars worshiped it then.

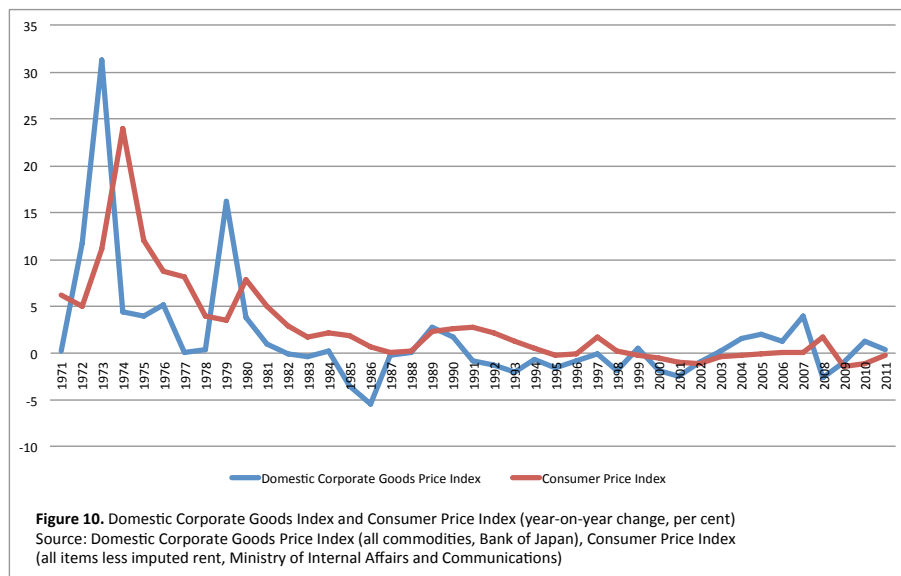


A steep appreciation continued to the mid 1990s. Figure 8 shows the level of the yen's real effective exchange rate. From the early 1980s to the mid 1990s, the rate nearly doubled. This steep appreciation fueled local production and local supply. For capitalists, it became a sound decision to move factories out of Japan and to purchase local parts which is much more inexpensive than those produced by subcontracting companies in Japan.

Figure 9 is the overseas production ratio in manufacturing companies. Although the data is only available from 1989, it shows Japanese manufacturing companies have continually shifted their production overseas at least since the late 1980s.

Figure 10 is the price indices both of domestic corporate goods and of consumer goods. While Japanese economy have experienced CPI deflation since the mid 1990s, domestic corporate goods has been in deflation since the early 1980s. This shows domestic companies producing corporate goods

have been unable to increase their prices to the extent their production costs rose. Since the real wage continued to rise until the mid 1990s, their profit should have been squeezed. If the *keiretsu* system worked well they should have been able to increase their prices. Even though the positions of subcontractors and subcompanies were weak in the *keiretsu* system, they had been able to pass on rising costs to parent companies to some extent until the 1970s. The persistent fall in corporate goods prices since the early 1980s shows such a passalong turned unable. We can say that the *keiretsu* system became dysfunctional in the recovery from the late 1970s.



4 Concluding Remarks

With the Okishio theorem, Okishio clarified three important points. First he clarified absurd characteristics of capitalist technological progress. Capitalists choose new techniques not to reduce labor but to raise profit, and a technical progress that raises profit is almost always different from one that reduces labor.

Second the reason of the constant or falling rate of profit should be the rise in the real wage rate. Facing rising real wage rate, the capitalist class try to protect the profitability with a technical progress. If any “innovative” technical progresses are available the rate of profit rises by introducing it. But if only “substitutive” technical progresses are available the rates of profit fall, though the degree is smaller than to stay in the original technique. Both technical progresses are different from one that reduces labor.

Third the falling rate of profit was not clear though the real wage had rose at the time. Pointing out capitalists’ success in “innovative” technical progresses, Okishio argued that raising real wage rates was not sufficient for the working class. No matter how much the working class won the rise in real wage, capitalists can cope with it as long as they have means of production. Therefore he concluded the need to take away means of production from the capitalist class.

As Tomizuka pointed out, Okishio’s argument was not applicable to capitalism in general. But it fitted perfectly into Japanese capitalism when Okishio submitted the theorem. Until the 1970s Japanese capitalism was a “state monopoly capitalism” in which monopoly capitals and the state closely cooperate. While the real wage was rising, the value composition was declining and the rate of profit was not clearly falling. However the situation changed after the crisis in the mid 1970s. Capitalists found a way from the crisis in foreign markets and the rate of profit recovered to some extent in the early 1980s. In this process it turned difficult for Japanese government to control capitalists’ activities and the *keiretsu* system started to collapse. The bubble burst accelerated the collapse, and now Japanese economy is far from a “state monopoly capitalism.” Japanese capitalism recovered the rate of profit from 2002 to 2007 by exporting again. The rise in the share of exports in this time is much steeper than ever. From the viewpoint of this paper, it would force Japanese capitalism to face the law of the fall in the rate of profit more than ever.

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