

# The transformation from value determination to value realization: the logical dilemma of the Okishio theorem

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## Abstract

**Purpose** – Different from Marx’s analysis of the dialectical relationship between the production and realization of surplus value, the Okishio theorem only shows one aspect of the contradictory movement of the total social capital, that is, the reverse effect of the realization of surplus value on the production of surplus value.

**Design/methodology/approach** – The production of surplus value and the realization of surplus value are simplified into one process. This simplification eliminates the contradiction between the production and realization of surplus value, and the antagonistic contradiction between accumulation and consumption and the antagonistic production-distribution relationship in capitalist society are naturally covered up.

**Findings** – Therefore, it cannot explain the actual expansion way of the falling general rate of profit as the historical development law of capitalism. Nevertheless, it should be noted that the Okishio theorem places the analysis of the general rate of profit back into the social reproduction model with department equilibrium, which points out the significance of wage income to the realization of surplus value and outlines the macro mechanism of the realization of surplus value reacting to the production of surplus value. It also strongly promotes the research progress of the law that the profit rate tends to decline.

**Originality/value** – The mistake of the Okishio theorem is that the exchange process in the labor market forms the real wage rate. It determines the production price of wage goods, which thereby determines that the production price of capital goods and general rate of profit, the production of surplus value and realization of surplus value are simplified into the same process, and only the value that can be realized is the real value.

**Keywords** Okishio theorem, The falling rate of general profit, The production and realization of surplus value

**Paper type** Research paper

## 1. Introduction

The law of the tendency of the rate of profit to fall (TRPF) has always been an important issue studied in classical political economics. Marx (1975) stated that “since this law is of great importance to capitalist production, it may be said to be a mystery whose solution has been

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the goal of all political economy since Adam Smith, the difference between the various schools since Adam Smith having been in the divergent approaches to a solution” (p. 238). In Chapter 3 of *Das Kapital Vol. III*, Marx discussed this law in more detail and provided a “new model” totally different from the previous interpretation of classical political economy. This new model included three logically progressive chapters, namely, the law of the general profit rate itself, various causes of counter effects and the development of internal contradictions of the law. Since then, Western Marxist economists represented by Gillman (1957), Mandel (1964, 1983), Shaikh (1978a, b), Lebowitz (1976), Fine and Harris (1979), Weisskopf (1979), Moseley (1985) and Sweezy (1997) have carried out discussions on this law. Western mainstream economists, represented by Samuelson (1957), have also targeted this law. The reason why the law of TRPF has become the focus of theoretical research is, on the one hand, due to its academic status in the minds of most Marxist economists as the general law governing the continuous development of social capital contradiction toward the inevitable crisis; on the other hand, due to its practical characteristics as a crucial way to test Marxist economics based on realistic corresponding indicators.

In the debate about the law of TRPF, *Technical Changes and the Rate of Profit* published in 1961 by Nobuo Okishio (2010) is of important theoretical significance. It is not only because he adopted a more rigorous mathematical form of reasoning but also because his conclusion was exactly the opposite of Karl Marx’s. Nobuo Okishio’s reasoning was then referred to as “Okishio theorem”, becoming an essential basis for challenging Marx’s law of TRPF. Samuelson (1957) previously stated that it was impossible to meet three conditions simultaneously: technical progress, constant real wage and a falling rate of profit, assuming that the known behavior of capitalists was rational, that is, if technical progress did not increase real wages, it would necessarily increase the rate of profit. The conclusion of the Okishio theorem repeated the above view and raised a question similar to Samuelson’s within the Marxist camp: Capitalists always chose technical progress that could achieve higher rates of profit. How could this rational behavior of individuals trigger an irrational result of a falling general profit rate at the level of total social capital? Around this issue, the debate about the Okishio theorem has become an important topic of Marxist political economics.

## 2. Concise demonstration of the Okishio theorem

The core of the Okishio theorem is shown as the following conclusion: capitalists introduce new technologies to meet the cost criteria, not the labor productivity criteria. Under constant real wage rates, a new technological change, when introduced to a “non-basic sector”, will not affect the general rate of profit but necessarily raise the general rate of profit when introduced to a “basic sector” (Okishio, 2010).

According to Nobuo Okishio’s hypothesis, capitalist production includes three departments, namely production of means of production, wage goods and luxury goods. The quantity of factor inputs per unit commodity determined by its production technology is shown in Table 1. Taking department II as an example, the production of one unit of wage goods requires an input of 1/4 unit of means of production and the direct labor that 15 units of wage goods correspond to.

Assuming that the constant real wage rate is 1/45 per unit wage goods, and the three departments obtain the general rate of profit ( $r$ ), the equilibrium input-output ( $q$ ) of each department per unit product can be expressed as the following simultaneous equations:

	Means of production I	Wage goods II	Luxury goods III
Means of production I	1/2	1/4	1/5
Labor	10	15	16

**Table 1.**  
Factor input per unit of  
commodity

$$q_1 = (1 + r) \left( \frac{1}{2} q_1 + 10 \right) \quad (1)$$

$$q_2 = (1 + r) \left( \frac{1}{4} q_1 + 15 \right) \quad (2)$$

$$q_3 = (1 + r) \left( \frac{1}{5} q_1 + 16 \right) \quad (3)$$

$$1 = \frac{1}{45} q_2 \quad (4)$$

Solution:  $r = 50\%$ ,  $q_1 = 60$ ,  $q_2 = 45$ ,  $q_3 = 42$ . Nobuo Okishio (2010) stated that equations (1) and (2) were basic sectors, and equation (3) was the nonbasic sector, which was not essential to maintain production in basic sectors. According to equations (1), (2), and (4), the equilibrium solutions of  $r$ ,  $q_1$  and  $q_2$  can be obtained. The value of  $q_3$  in equation (3) depends on the  $r$  and  $q_1$  that have been calculated, which means that the nonbasic sector is not involved in the determination of the general rate of profit in any way.

Assuming that there is a cost-saving technical progress  $A$  in department II, its production equation is  $q_2 = (1 + r) \left( \frac{1}{3} q_1 + \frac{35}{24} \right)$ , where the constant capital is increased from  $\frac{1}{4} q_1$  to  $\frac{1}{3} q_1$ , the variable capital is decreased from 15 to  $\frac{35}{24}$  and the total cost is decreased from 30 to  $21 \frac{11}{24}$ . The balanced input and output of commodities in the two departments established can be expressed as a new simultaneous equation system:

$$q_1 = (1 + r) \left( \frac{1}{2} q_1 + 10 \right)$$

$$q_2 = (1 + r) \left( \frac{1}{3} q_1 + \frac{35}{24} \right) \quad (5)$$

$$1 = \frac{1}{45} q_2$$

From equations (1), (5), and (4), the following can be obtained:  $r = 60\%$ ,  $q_1 = 80$ ,  $q_2 = 45$ . Apparently, after technical progress  $A$  occurs, the general rate of profit rises from 50% to 60%. In this regard, Nobuo Okishio (2010) concluded, “our conclusion is contrary to Karl Marx’s law of the tendency of the rate of profit to fall. Unless the real wage rate rises to a sufficiently high level, technological innovation introduced by capitalists will not reduce the general rate of profit. Technological innovation in the basic sector will increase the general rate of profit. In contrast, that in the nonbasic sector has no impact on the general profit rate level.”

Since the 1970s, many Marxist economists have conducted in-depth discussions on several issues of the Okishio theorem, mainly including the following aspects: first, the impact of large-scale fixed capital production mode on the general rate of profit; second, the issue of multisectoral joint production and third, the rationality of the constant real wage hypothesis.

Shaikh (1978a, b) and Alberro and Persky (1979) argued that if fixed capital were introduced, the rate of profit would fall. Shaikh (1978a, b) believed that the Okishio theorem, excluding fixed capital, illustrated that a “technical progress” that reduced the cost of capital “flow” would lead to an increase in the rate of profit in the flow capital accounting. However, in a capitalist economy, technical progress required introducing substantial fixed capital,

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which would increase the rate of profit calculated by stock. Hence, technical progress would reduce the rate of profit, which was not contradictory to the Okishio theorem. Shaikh quoted the view of [Schefold \(1976\)](#), who proved under the framework of the Okishio theorem that if there was fixed capital, the “mechanization” introduced by technical progress would lead to a decrease in the “maximum rate of profit”. However, [Roemer \(1979\)](#) pointed out that the maximum rate of profit was not the real rate of profit, and the fall in the former did not necessarily mean the fall in the real rate of profit. Schefold’s argument (1976) could not form a valid criticism of the Okishio theorem. [Roemer \(1979\)](#) thought that although the maximum rate of profit would continue to approach the real rate of profit in the long term, they would not converge to a common extremum if the vector of real wage goods remained unchanged. Under the framework of Nobuo Okishio, [Roemer \(1979\)](#) demonstrated the case with fixed capital in detail, proving that the Okishio theorem still held even with fixed capital if the real wage remained constant.

The flaws in Romer’s proof process ([Romer, 1979](#)) have attracted the attention of other scholars. [Salvadori \(1981\)](#) used a numerical example to illustrate that if the economic system equation had a solution in joint production, technical progress might lead to a decline in the rate of profit, instead of an inevitable increasing or unchanged rate of profit as advocated by Non-Okishio theorem and [Roemer \(1979\)](#). However, [Woods \(1985\)](#) verified that the Okishio theorem still held when it was assumed that only one commodity was produced, and at most one type of fixed capital was used in each sector. At the end of his paper, Woods pointed out that he once proved with a numerical example that when there was joint production in the general sense, technical progress may lead to a decline in the rate of profit. Thus, he speculated, “The single-product economy with fixed capital may be the most general occasion where the Okishio theorem holds.” On this basis, [Bidard \(1988\)](#) further explored Woods’ speculation (1985). [Bidard \(1988\)](#) gave a sufficient condition for the establishment of the Okishio theorem, explaining why the original version of the Okishio theorem and the subsequent generalization scenarios could hold. For Roemer’s conclusion, [Salvadori \(1981\)](#) and [Woods \(1985\)](#) criticized and proposed counterexamples against the Okishio theorem. In this regard, [Bidard \(1988\)](#) retorted that if the sufficient condition “positive fixed capital system” was met, and “positive standard commodities” were present, the Okishio theorem still held; otherwise, the general rate of profit might fall.

Regarding the hypothesis of the constant real wage rate, [Roemer \(1979\)](#) and [Laibman \(1982\)](#) believed that the real wage rate was not determined by the labor market but by the commodity market. The hypothesis of a constant real wage rate was just to simplify the analysis, and whether the wage rate would change was an empirical question rather than a theoretical one. In reality, workers would try to keep the share of their wage in the national income unchanged rather than maintain the real wage. Under the condition of the constant rate of surplus value, it could be deduced from the Okishio theorem that new labor saving and cost-reducing technology would cause the rate of profit to fall or remain unchanged. [Dietzenbacher \(1989\)](#) considered that a constant real wage rate was unrealistic. If new technology represented capital-saving technical progress, the increase in the real wage rate might lead to a decrease in the rate of profit. In response to these criticisms, [Okishio \(2000\)](#) stated: The hypothesis of a constant real wage rate was unrealistic, and the real wage rate would be affected by unemployment and employment. There was a cyclical movement between the employed population and the real wage rate, and this mechanism would limit the rate of surplus value within a certain range. If there was no technical progress, the amplitude of this cyclical movement would decrease, the employed population and the wage rate would tend towards a certain level, and the rates of both surplus value rate and profit would tend towards zero. That is, if there were no technical progress, competition among capitalists would destroy the surplus value, thereby destroying the foundation for the rate of profit. The increase in the real wage rate would squeeze the surplus value and cause the rate of profit to fall.

Nobuo Okishio himself is critical of the Okishio theorem (Okishio, 2000). In his view, given the hypotheses, the reasoning of the Okishio theorem is correct, but these hypotheses are not realistic, thus leaving the Okishio theorem not convincing enough to challenge Marx's law of TRPF. Nobuo Okishio (2000) criticized the Okishio theorem and analyzed one aspect of capital accumulation that affected the rate of profit: the decline in the rate of profit caused by an increase in the real wage rate due to the process of capital accumulation, that is, the so-called "wage squeeze" effect. Pei and Li (2016) summarized the above viewpoints and believed that "in the framework of the Okishio theorem, it can be proved that technical progress with an increase in the technical composition will bring about an increase in organic composition. The cost-reducing technical progress required by the Okishio theorem also has both positive and negative effects on the rate of profit, which come from the increase in the rate of exploitation on the one hand and the increase in organic composition on the other hand. Karl Marx's view is opposite to the Okishio theorem in the judgment of the total effect of technical progress. Marx believed that the negative effect of technical progress on the rate of profit was greater than the positive effect, and thus, the rate of profit would fall, while the Okishio theorem held the opposite."

### 3. Logical reasoning of the Okishio theorem: wage income determines the value of wage goods

The formula  $r = \frac{m}{c+v}$  for the rate of profit can be transformed to  $r = \frac{m'}{X+1}$ . Thus, the change in the rate of profit is decomposed into the relative relationship between the organic composition of capital ( $X$ ) and the rate of surplus value ( $m'$ ), where  $c$  is constant capital,  $v$  is variable capital and  $m$  is surplus value. On this basis, Marxist economists such as Mandel (1964, 1983), Yaffe (1973), Rosdolsky (1977), Shaikh (1978a, b) and Sweezy (1997) took the organic composition of capital and the rate of surplus value as the basic elements in analyzing the change of the general rate of profit and tried to explain the law of TRPF by comparing the characteristics and trends of their changes. Despite the disagreements on the conclusion of the falling general rate of profit, they almost all agreed that the relative relationship between the organic composition of capital and the rate of surplus value constituted the basic framework for analyzing the law of TRPF.

For demonstrating the fundamental difference between the Okishio theorem and Marx's law of TRPF, it is necessary to analyze the changes in the organic composition of capital and the rate of surplus value implicit in the model. We designed the following technical progress  $B$  as a control: compared with the initial state, the production of wage goods takes less constant capital (reduced from  $\frac{1}{4}q_1$  to  $\frac{1}{10}q_1$ ) and more variable capital (increased from 15 to 23), but the total cost is reduced from 30 to 29.

$$\begin{aligned} q_1 &= (1+r) \left( \frac{1}{2}q_1 + 10 \right) \\ q_2 &= (1+r) \left( \frac{1}{10}q_1 + 23 \right) \\ 1 &= \frac{1}{45}q_2 \end{aligned} \quad (6)$$

From equations (1), (6), and (4), the equilibrium solution can be obtained:  $r = 52.7\%$ ,  $q_1 = 64.6$ ,  $q_2 = 45$ . According to Karl Marx's definition of the organic composition of capital, the organic composition of total social capital can be expressed as  $\frac{\sum_{i=1}^2 a_i q_i}{\sum_{i=1}^2 v_i}$ , where  $a$  is the input coefficient. As the Okishio theorem gives the producer price of unit products in two departments, instead of the total producer price of the products, the weight of these

products shall be added in the calculation of the organic composition of total social capital. To simplify the analysis, we assume that the ratio of the quantities of products in the two departments is 1:1, which certainly will not change the variation trend of the organic composition of total social capital. According to the profit rate formula  $r = \frac{m}{c+v} = \frac{m'}{X+1}$ , the corresponding surplus value rate is  $m' = r(1 + X)$ . The comparison of the organic composition of capital and the rate of surplus value in the two types of technical progress with the initial state is shown in Table 2.

It can be seen that although both technical progress can achieve the same result of the increased general rate of profit, the direction of change in the organic composition of capital and the rate of surplus value therein are opposite: Both the organic composition of capital and the rate of surplus value in technical progress A are increased, while those in technical progress B are decreased. That is, the analysis of the change in the general rate of profit in the Okishio theorem is neither based on the hypothesis that the organic composition of capital continues to increase nor does it require that the rate of surplus value shall rise. The increase in the organic composition of capital and the corresponding changes in the rate of surplus value is precisely Karl Marx's basic framework to analyze changes in the general rate of profit.

Table 2 shows that the increase in the general rate of profit is directly caused by the specific combination of the change in the organic composition of capital ( $X$ ) and the rate of change in the surplus value rate ( $m'$ ). When they change in the same direction, either the rising speed of  $(1 + X)$  is slower than that of  $m'$ , or the falling speed of  $(1 + X)$  is faster than that of  $m'$ . In fact, the reasoning premise of this specific combination will inevitably lead to the conclusion of the rising general rate of profit. It should be noted that the key to criticizing the Okishio theorem is not about whether the reasoning process from this premise is rigorous and correct but whether this premise conforms to the general law of the capitalist economy. Karl Marx repeatedly stressed the general trend of the increasing organic composition of capital due to technical progress in *Das Kapital* and revealed the contradiction between the production of surplus value and the realization of surplus value in the total process of capitalist production on this basis, which undoubtedly constituted the essential content of the general law of the capitalist economy. The specific combination of the organic composition of capital and the rate of surplus value on which the numerical examples of the Okishio theorem were based deviated fundamentally from the general law of the capitalist economy described above. We can see that the result of cost-saving technical progress may correspond to a decline in the organic composition of capital and the rate of surplus value. The reason lies in the implicit prerequisite behind the numerical examples of the Okishio theorem – the value of commodities is determined by exchange.

Since the Okishio theorem replaced Karl Marx's dialectical logic reasoning with formal logic reasoning, Marx's value theory was intercepted out of context; value and value form were confused, and the determination process of value was simplified to its realization process. In the reasoning process of the Okishio theorem, the production price of wage goods depends on a given real wage rate, expressed as a mathematical format conversion from

	$r$	$q_1$	$X = \sum a_i q_1 / \sum v_i$	$m' = r(1 + X)$
Initial state	50%	60	$(\frac{1}{2} + \frac{1}{4})q_1 / (10 + 15) = 1.8$	140%
Technical progress A	60%	80	$(\frac{1}{2} + \frac{1}{3})q_1 / (10 + \frac{35}{24}) = 5.82$	409%
Technical progress B	52.7%	64.6	$(\frac{1}{2} + \frac{1}{10})q_1 / (10 + 23) = 1.17$	115%

**Table 2.**  
Changes in the organic  
composition of capital  
and the rate of surplus  
value under two  
conditions of technical  
progress



$1 = wq_2$  to  $q_2 = \frac{1}{w}$ . It is this mathematical format conversion that causes the deviation of the Okishio theorem from Marx's law of TRPF in prerequisites.

Equations  $1 = wq_2$  and  $q_2 = \frac{1}{w}$  are mathematically equivalent but express different economic meanings and include different causal relationships. Equation  $1 = wq_2$  expresses that given the producer price of wage goods ( $q_2$ ), the real wage rate ( $w$ ) is a share of the producer price of wage goods; while equation  $q_2 = \frac{1}{w}$  expresses that given the real wage rate ( $w$ ), the producer price of wage goods ( $q_2$ ) is the reciprocal of the real wage rate. In equation  $1 = wq_2$ , the given producer price of wage goods is the cause, and the real wage rate is the effect; while in the equation  $q_2 = \frac{1}{w}$  the given real wage rate is the cause, and the producer price of wage goods is the effect.

The given real wage rate determines the producer price of wage goods, which complied with the research idea that demand determines the value of commodities, the core content of the marginal revolution in the 1870s criticizing the labor theory of value of the classical political economy. Based on this research thinking, the value of commodities is not determined by the labor consumption in the production process but by consumers' effective demand for the commodities.

To show the difference of this research idea from Marx's labor theory of value, we designed two types of technical progress  $Z$  and  $Y$  in department II, which are  $q_2 = (1+r)(\frac{5}{12}q_1 + 5)$  and  $q_2 = (1+r)(\frac{1}{12}q_1 + 25)$ , respectively. We analyzed the producer price determination process of the Okishio theorem by comparing the initial states and thus revealed its implicit prerequisite – exchange determines the value of commodities.

It should be noted that in the study of the general profit rate change trend, the object is the total social capital rather than a single department or individual capital of a department. The corresponding organic composition of capital and rate of surplus value are also those of total social capital rather than a single department. Hence, the deviation of the producer price from the value in the process of profit averaged in a single department or individual capital of a department can be ignored in analyzing the changing trend of the general profit rate. As long as we recognize the two identities of Marx on the transformation from value to producer price, the organic composition of total social capital, the rate of surplus value and thus the general rate of profit will remain unchanged before or after the transformation.

Compared with the initial state  $q_2 = (1+r)(\frac{1}{4}q_1 + 15)$  of the Okishio theorem, the two technical adjustments do not change the cost but the organic composition of capital. The equilibrium solution of the equations is the same as the initial state, namely:  $r = 50\%$ ,  $q_1 = 60$ ,  $q_2 = 45$ . The value composition of aggregate social products under three technological conditions is shown in [Table 3](#).

Compared with the initial state, technical adjustments  $Z$  and  $Y$  have maintained the general rate of profit when the organic composition of capital is changed, which means that the rates of surplus value in the two technical adjustments shall be different. Compared with the surplus value rate  $\frac{7}{5}$  in the initial state, the surplus value rate of technical adjustment  $Z$  rises to  $\frac{7}{3}$  and that of technical adjustment  $Y$  drops to 1. Superficially, the change in the rate of surplus value seems to be a derivative result of the technical adjustment represented by the change in the organic composition of capital. Indeed, Karl Marx (2004a) pointed out when he described the production of relative surplus value that technical progress that leads to an increase in the organic composition of capital will reduce the value of unit wage goods and thus increase the rate of surplus value (pp. 363–373). But apparently, the increase in the rate of surplus value in the Okishio theorem is totally different from the production of relative surplus value analyzed by Marx because the value of wage goods remains unchanged therein. If the increase in the rate of surplus value is not derived from the production of

	General rate of profit $r$	Constant capital $\sum a_i q_1$	Variable capital $\sum v_i$	Surplus value $m = r(\sum a_i q_1 + \sum v_i)$	Rate of surplus value $w/\sum v_i$	New value $\sum v_i + m$
Initial state	50%	$(\frac{1}{2} + \frac{1}{4})q_1 = 45$	$10 + 15 = 25$	35	$\frac{7}{5}$	60
Z	50%	$(\frac{1}{2} + \frac{5}{12})q_1 = 55$	$10 + 5 = 15$	35	$\frac{7}{3}$	50
Technical adjustment Z						
Y	50%	$(\frac{1}{2} + \frac{1}{12})q_1 = 35$	$10 + 25 = 35$	35	1	70
Technical adjustment Y						

**Table 3.**  
Value composition of  
aggregate social  
products under three  
technological  
conditions



relative surplus value, it can only be from that of absolute surplus value. However, in our analysis of the Okishio theorem, we find no such hypotheses relating to the extension of working days or the increase of labor intensity.

In fact, the production of absolute surplus value presented as a result is irrelevant to the production process. It is entirely a derivative result of the logical reasoning that wage income determines the production price of wage goods. Because the three technical conditions have adopted the transformation from  $1 = \frac{1}{45}q_2$  to  $q_2 = 45$ , and the production price of wage goods depends on a given real wage rate, we can see that: in the initial state, the purchased labor at 25 units of value in the two departments (referring to the sum of the two main departments) creates aggregate social products of 60 units of value, with a value creation rate of 2.4 per unit labor power. In technical adjustment *Z*, the purchased labor at 15 units of value in the two departments creates aggregate social products of 50 units of value, with a value creation rate of 3.33 per unit labor power. In technical adjustment *Y*, the purchased labor at 35 units of value in the two departments creates aggregate social products of 70 units of value, with a value creation rate of 2 per unit labor power.

The production price of wage goods remains unchanged, which provides a constant anchor standard for the value determination process of the aggregate social product. Cost-saving technical progress will inevitably lead to an increase in the value amount of the aggregate social product and that of the total surplus value therefrom, which certainly means an increase in the general rate of profit.

Rong *et al.* (2016) raised some questions about the anchor standard of the Okishio theorem based on the reality of the continuous growth in real wage rates. This type of critique is concerned with whether the premises and hypotheses of the Okishio theorem are realistic rather than whether the formal logical reasoning of the Okishio theorem reflects the contradictory movement law of commodity value and that of the production and realization of surplus value in the capitalist economy. It is the latter that distinguishes the Okishio theorem from Marx's analysis and makes it unable to explain the historical trend of capitalist general profit rates scientifically.

Meng and Feng (2016) believed that the Okishio theorem failed to consider the value realization rate of the aggregate social product, and thus their conclusion represented only a special case of the law of TRPF. Compared with questioning the reality of the real wage rate, this critical perspective points to the unity of opposites between the production and realization of surplus value, which is the key to the deviation of the Okishio theorem from Marx's dialectical logic.

It is because the production of surplus value and the realization of surplus value are not directly identical, they are two different aspects in the reproduction of total social capital, and they are quantitatively inconsistent that the antagonistic contradiction between capital accumulation and social consumption is an inherent contradiction in the reproduction of total social capital, with an inevitable trend of overproduction and capital surplus and the unavoidable outbreak of cyclical capitalist economic crises. The binary opposition between the production of surplus value and the realization of surplus value, as well as the special way to eliminate such binary opposition – economic crisis, has fundamentally reflected the institutional restriction of the capitalist relations of production on the development of productivity. In this regard, analyzing the unity of opposites between the production of surplus value and the realization of surplus value is an essential basis for Marxist economics to become a scientific theory and surpass classical political economics and modern mainstream Western economics. However, in the analysis of the Okishio theorem, capitalist production is subordinate to capitalist circulation; value and surplus value are essentially determined by the capitalist circulation process and the capitalist production process is only a “necessary burden” of passive adjustment.

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#### 4. Unity of opposites between the production and realization of surplus value

In the analysis of commodities in *Das Kapital Vol. I*, Karl Marx (2004a) first analyzed value entities and then discussed various historical value forms (exchange value) from simple, individual or accidental value forms to the aggregate or expanded ones, then general value forms and ultimately, monetary forms. The distinction between value entities and value forms is one of the fundamental differences between Marxist political economics and mainstream Western economics, which is conducive to our understanding of the unity of opposites between the production of surplus value and the realization of surplus value in the capitalist economy.

Marx (2004a) stated that value entities were general human labor in commodities, “the labor that forms value entities is the same human labor, and the consumption of the same human labor” (p. 52). This general human labor is invisible and intangible and can only be expressed as the use value amount of other commodities in the exchange process. “Any commodity, as value entity, however you place it, is always elusive. But if we remember, commodities only have value objectivity when they are measured in the same social unit, that is, the performance of human labor. Therefore, their value objectivity is purely social and, evidently, can only be expressed in the social relationship between commodities. In fact, we also start with the exchange value/relationship of commodities to explore their implicit commodity value” (p. 61).

As a pair of corresponding categories, value entity and value form present themselves as the relationship of content and form; the content determines the form and the form reflects the content. Hence, “the value-form or value expression of a commodity is generated by the nature of commodity value, not the other way around. Value and value amount are produced by their way of expression as value in exchange” (Marx, 2004a, p. 76). When analyzing money, Marx pointed out more clearly that “it is not money that renders commodities commensurable. Just the contrary. It is because all commodities, as values, are realized human labor, and therefore commensurable, that their values can be measured by one and the same special commodity, and the latter be converted into the common measure of their values, i.e. into money. Money as a measure of value, is the phenomenal form that must of necessity be assumed by that measure of value which is immanent in commodities, labor-time” (Marx, 2004a, p. 114). That is, it is the general human labor in production that determines the amount of commodity value, and a certain amount of money only represents the amount of commodity value. Moreover, the amount of money can express the amount of commodity value simply because an equal amount of ordinary human labor is condensed in the equal amount of money.

Mainstream Western economics confuses entities and forms of value. A certain amount of currency is regarded as commodity value rather than a manifestation form of commodity value. As for this mindset, Karl Marx criticized, “This is exactly an illusion of the mercantilists and their modern revivalists such as Ferrier and Garner, as well as their opponents, modern free trade thinker Bastiat . . . in their view, the value and value amount of commodities only exist in the performance due to the exchange relationship, that is, they only exist in the daily market” (Marx, 2004a, p. 76).

The value of commodities expressed by a certain amount of money is not accomplished in one commodity exchange but countless repeated exchanges with the fluctuations of prices. According to Karl Marx (2004a), “The exchange ratio of between commodities and currency can either represent the value of commodities or a larger/smaller amount. Under certain conditions, commodities are transferred based on this larger/smaller amount. Hence, the possible inconsistency between price and value amount, or the possibility of price deviating from value amount, has been included in the price form itself. Rather than a defect of this form, it makes this form an appropriate expression of such production mode, in which rules can only be taken as a law of average without regularity that works blindly to blaze a path for oneself” (pp. 122–123). The actual process of price fluctuations around value clearly shows

that the entity and the form of value are not the same. The former is created in production and expressed gradually based on the law of average in exchange.

In the capitalist mode of production, the law of capitalist appropriation replaces that of commodity ownership, and surplus value becomes an integral part of the value entity. Whether the value entity can acquire the corresponding value form in the exchange is directly related to the transformation of commodity capital into currency capital, a necessary link for the smooth development of the total social capital movement. This issue is the unity of opposites between the production and realization of surplus value, which is a critical link in understanding the law of TRPF associated with the movement of total social capital.

There are two production modes of surplus value. Absolute surplus value production constitutes the general foundation of the capitalist system, which is the start of relative surplus value production. However, the law of TRPF reveals the historical trend of capitalism, which inevitably includes the development of productivity and its influence on capitalist relations of production. Hence, the relative surplus value production is the logical start for understanding the law of TRPF. In the production of relative surplus value, technical progress has driven the increase in the organic composition of capital and labor productivity, which is conducive to increasing the rate of surplus value by reducing the value of labor power. Therefore, in the production of relative surplus value, the organic composition of capital and the rate of surplus value are prone to a rising trend in the same direction.

When analyzing such changes in the same direction, Marx believed that the increase in the rate of surplus value could not cover the loss of surplus value amount due to the increase in the organic composition of capital. "For example, it is impossible to squeeze as much surplus value out of 2 as out of 24 workers. As long as each of the 24 workers provides 1 hour of surplus labor in 12 hours, a total of 24 hours of surplus labor is provided, while the total labor of the 2 workers is only 24 hours. Hence, the use of machines to produce surplus-value contains an inherent contradiction: In the two factors of surplus-value provided by a certain amount of capital, if one factor is increased by machine, the only way to increase the rate of surplus-value is to reduce the other factor (number of workers)" (Marx, 2004a, p. 468). This argument shows that technical progress under capitalist conditions takes a special form of replacing living labor with machinery, which is reflected in the increasing organic composition of capital in the structure of prepaid capital. This special form is the concrete manifestation of the contradictory movement of productivity and production relations in the capitalist production process. It is based on the general trend of replacing living labor with machinery that the amount of value created by wage labor grows relatively slowly. It constitutes the ultimate constraint on the production of surplus value, which may completely offset or even reverse the increase in surplus value created by the production of relative surplus value. The increase in the rate of surplus value is nothing but redistributing the total amount of new value in a way that is more favorable to capital, except that it cannot increase the total amount of new value. Hence, the increase in the rate of surplus value only partially offsets the decline in the general rate of profit.

In the example given by the Okishio theorem, technical progress in department II has improved the organic composition of capital, and the production equation is changed from  $q_2 = (1+r)(\frac{1}{4}q_1 + 15)$  to  $q_2 = (1+r)(\frac{1}{3}q_1 + \frac{35}{24})$ . According to Marx's logic above, when the variable capital drops from 15 to  $\frac{35}{24}$  the input of wage labor in production will inevitably have a substantial decrease. Although capital can increase the rate of surplus value by increasing the intensity of labor, the increase in surplus value is insufficient to cover the decline in the amount of surplus value due to unemployment, and the total output value of department II will drop significantly accordingly. Given the increase in labor productivity due to the technical progress, the value of commodities in department II will further decline and cannot be maintained at the level of 45. So far, we have only considered the production

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process of surplus value without involving the realization of surplus value in the circulation process. It is such analysis that constitutes the fundamental difference between the Okishio theorem and Marx's law of TRPF. That is, whether the value of commodities (production price) and the general rate of profit are determined by the demand of wage laborers in circulation or the general human labor in production, which is the key.

Some Marxist scholars studied the change in the general rate of profit from the relative change of the organic composition of capital and the rate of surplus value. They followed the analytical logic of *Das Kapital Vol. I*, focusing on the production process of surplus value. In their opinion, the law of TRPF, as an essential law, pointed to the change in the share of surplus value in value production, which is irrelevant to the manifestation form of value, so it is not necessary to consider the realization of surplus value in circulation. Some scholars expressed different opinions on this research method and emphasized the importance of the realization of surplus value to the law of TRPF, focusing on the increase of circulation costs, the extension of circulation time, the reaction of the contradiction between distribution and exchange links on production, etc (Gillman, 1957; Lebowitz, 1976; Fine and Harris, 1979).

We believe that excluding the realization of surplus value from the law of TRPF ignores the unique narrative methodology of *Das Kapital* from the abstract to the concrete, which precisely constitutes the way of unfolding basic contradictions. As the analysis focus of *Das Kapital Vol. III*, the law of TRPF reveals the contradictory movement of total social capital, the organic unity of the capitalist production and circulation process, so the realization of surplus value should not be excluded.

In the above example of relative surplus value production, the analysis of the influence of the organic composition of capital and the rate of surplus value on the surplus value amount belongs to a more abstract level. With the smooth development of the capitalist circulation process as the hypothesis, it is assumed that commodity capital can be converted into equivalent monetary capital and the surplus value produced can be fully realized in circulation. Karl Marx chose this hypothesis in the first half of his analysis not because the issue of surplus value realization was insignificant, but because it complied with the objective process of capitalist contradictions. The issue of surplus value realization is not a new contradiction in capitalist circulation but an inevitable manifestation of the existing capitalist production contradictions in circulation. Without analyzing the realization of surplus value, the complete development process of capitalist contradictions cannot be accurately understood; nor an accurate overall perspective of the law of TRPF can be formed.

If we understand the law of TRPF from the organic unity of the capitalist production and circulation processes, the profit rate formula  $r = \frac{m}{x+1}$  is a misleading start for research because it is an abstract analysis of the capitalist production process and does not involve the realization of surplus value. When discussing the law itself, Marx (2004b) pointed out that "The rate of surplus value tends to express itself in a falling general rate of profit when the intensity of exploitation of labor remains unchanged or even increases" (p. 237). Following the development process of contradictions between value entities and value forms, the "express itself in" hereto certainly means the development of contradictions, the development of capitalist production process contradictions in the circulation process and the presentation of the surplus value realization issue. In other words, the surplus value and profit, rate of surplus value and general rate of profit are categories at different levels of abstraction, and conversion based on mathematical equations will inevitably lead to the loss of its true economic meaning. The surplus value and rate of surplus value refer to the capitalist production process, which is a more abstract department in *Das Kapital*; while profit and general rate of profit refer to the movement process of total social capital, the unity of the capitalist production and circulation processes, which are more specific categories in *Das Kapital*. Profit, as the monetary expression of surplus value, is the realized surplus value; general rate of profit, as the result of industrial capital after the completion of profit

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averaging, certainly requires the conversion of surplus value into profit first, that is, industrial capital shall complete the cycle of  $G-W'-G'$ .

If we exclude the capitalist circulation process and consider the capitalist production process only (without considering the realization of surplus value involved in the monetization of commodity capital), the basic contradictions in the capitalist production process cannot be developed, and thus the law of TRPF cannot be realized. In the profit rate formula  $r = \frac{m'}{X+p}$ , it is expressed as any combination of the organic composition of capital and the rate of surplus value, and the general rate of profit may rise, fall or remain unchanged. Moreover, if there are no obstacles to the realization of surplus value, capital accumulation will continue to absorb workers who are unemployed due to the increased organic composition of capital. Hence, the overall constraint imposed on the general rate of profit by the fall in the total input of labor will no longer exist. However, if we follow Marx's dialectical logic for the development of basic contradictions of capitalism, incorporate the process of capitalist circulation into the scope of the investigation and consider the realization of surplus value, then we can respond to the above questioning about the law of TRPF.

Karl Marx pointed out that "the last cause of all real crises always remains the poverty and restricted consumption of the masses as compared to the tendency of capitalist production to develop the productive forces in such a way, that only the absolute power of consumption of the entire society would be their limit" (p. 548). [Luxemburg and Bukharin \(1982\)](#) further stated that "a chain of related industries providing each other with markets which follow a certain definite order determined by the technical-economic continuity of the whole process of production. This chain ends, however, with the production of means of consumption because it no longer enters any production process directly in a material form (as use value), but enters the personal consumption process . . . as a result, a situation in which there is over production in every link of this chain can be imagined, which is manifested as an over production of the means of consumption, that is, over production related to the consumer market, precisely the manifestation of general over production." [Sweezy \(1997\)](#) concluded that "since the actions of capitalists who control the use direction of resources and capital will cause a steady decline in the ratio of consumption growth rate to means of production growth rate, and the nature of the production process forces the ratio of the growth rate in consumer goods output to that in the means of production to be approximately stable at least, the growth of consumption tends to lag behind that of consumer products output. As stated before, this trend can be manifested in crisis, stagnation or both."

As for capital, although it can deepen the production of relative surplus value based on technical progress in production, thereby increasing the intensity of exploitation and the rate of surplus value continuously, the resulting increase in surplus value still needs to be realized in circulation. The labor value, different from the surplus value to be realized, is prepaid in the form of monetary wages, which is the main entity of the value form of products in department II. The increase in the intensity of exploitation and the rate of surplus value means that the growth in this form is relatively slow, which will cause the failure to realize part of the surplus value produced in department II. According to the equilibrium conditions of reproduction in the two departments, the over production in department II will inevitably lead to that in department I, and part of its surplus value cannot be realized either. The objectively existing problem of surplus value realization means that part of the surplus value produced cannot be expressed in circulation or transformed into the profit of prepaid capital, which is an indispensable factor for our understanding of the law of TRPF.

## 5. Summary

The mistake of the Okishio theorem is that the exchange process in the labor market forms the real wage rate. It determines the production price of wage goods, which thereby

determines that the production price of capital goods and general rate of profit, the production of surplus value and realization of surplus value are simplified into the same process, and only the value that can be realized is the real value. It is but a step from the fallacy to the truth! The hypothesis of the Okishio theorem that the share of real wages determines the production price of commodities in department II can be regarded as a response to the ignorance of the realization of surplus value in the analysis of the law of TRPF. It has highlighted the importance of the realization of surplus value in the movement of total social capital and emphasized the macro mechanism by which the realization of surplus value reacts to the production of surplus value. In this regard, the Okishio theorem has broken through the mindset of analyzing the law of TRPF from the relative relationship between the organic composition of capital and the rate of surplus value and put the general rate of profit back into the social total capital reproduction model for analysis, which is more in line with Karl Marx's original meaning in *Das Kapital Vol. III*.

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