

Numeration of Value

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This study explores the principle of numeration of value as a problem in the theoretical standpoint of economics, and in the process of the examination re-considers Marxian labor theory of value critically. Numerical value is determined at a market, and value changes depending on measures. Then, we present a new principle of numeration of value wherein profits are added at exchange. Profit at exchange is unobservable and absolutely indivisible from value, but was not included in Marx's conception of economics. Profit at exchange implies that labor is not the sole origin of surplus value. Then the long-standing transformation problem is settled. Next, examining prices as a structure from structuralism, we refer to the point where the value turns into prices as a singular point. In the singular point, value and prices are discontinuous. Our analysis concludes that a price is not a natural phenomenon but an artifact of human culture.

Keywords : Transformation problem, Fundamental Marxian Theorem, Measurement, Profit at Exchange, Structuralism, Retroactive Causal Recognition

JEL codes : A13, B14, B40

1 Introduction

As the most important critique of the Marxian labor theory of value, the transformation problem has long been discussed. It is century-long controversy and has not perfectly been settled. Why has not it been settled? We consider that behind the Marxian labor theory of value, an important problem currently exists in our understanding of numeration of value, which is the process that underlies all economic activities. The purpose of this study is to explore this problem as the theoretical standpoint of economics.

Numeration of value is the process of converting commodity values into prices. We assume that a price has relation with value. Many people suppose, like neo-classical economists do, that a price is determined by supply and demand at a market. However, the marginal utility theory cannot move back before the determination at a market to explain the mechanism how a price is generated. Therefore, the theory of supply and demand cannot argue value before markets.

This theoretical limitation is linked with the fact that in economics the theory of supply and demand and the labor theory of value have not been united. In economics after the marginal revolution neo-classical economics became to be a mainstream school, it does not mean the two theories united. Theoretically, there is a significant gap between the theory of supply and demand and the labor theory of value.

There is the gap within the Marxian theory too, and it became an issue of the transformation problem. In the disputation of the transformation problem, the labor theory of value was difficult to be reconciled to a price, and arguments have been entangled. The reason is that the mechanism of numeration of value is not understood.

Marx explained this process through the concept of transformation. He presumed that value and prices naturally coincide and therefore ‘equivalents are exchanged’ (Marx 2014 [1867]: 117). The concept of numeration of value is similar to Marx’s transformation as both are processes of conversion. However, the two concepts differ in their underlying mechanisms and assumptions. The term ‘transformation’ is not used to explain our theme because we regard Marx’s transformation concept as being erroneous.

The transformation problem has long been discussed primarily as an instance of internal inconsistency within Marxian theory. This study, however, seeks to reconsider the domain of numeration of value separate from Marx to reframe the concept. When or how is value numerated? We define prenumerated value as ideas. The labor theory of value is one of the ideas and the expectation of supply-side and demand-side is too. This is a different definition with Marx’s.

Many problems are entangled in a complex way, and we discuss two types of approaches to disentangle them. The first step is examining the numeration of value and the measurement problem. The disputation in economics what point of time numerical value is determined has not been settled. The reason is a confusion of causal recognition. After resolving it, we reveal a deeper issue: a fundamental confusion over the mechanism of numeration of value. Although the transformation problem delves into an extremely mathematical argument, a mechanism of numeration of value cannot be represented as equations. In the process of explaining our proposed conception, we highlight the crucial error in the Marxian labor theory of value and, thus, settle the long dispute plaguing the transformation problem.

Second, we use a structuralist approach¹¹ Structuralism has developed under the influence of the Marx’s historical materialism. We appreciate the contribution of Marx to structuralism.. Numeration of value includes currently unknown dynamics. Marx was interested in the mystery of value to argue the fetishism of commodities (Marx 2014 [1867]: 46). We seek another path from Marx to determine this mystery by structurally exploring the process by which value turns into prices. We refer to the point where prestructural value turns into a price within a structure as a *singular point*. The problem surrounding the singular point is related to the theoretical change that occurs at the point where economic thought shifts from the classical to neoclassical school. It marks a change in the theoretical standpoint of economics. By the structuralist approach, it is clarified that the standpoint of all economics has a fundamental problem.

2 Numeration of value and two measures

2.1 Statement of the problem

Numeration of value is such a fundamental concept in economics that it hardly discussed. However, we focused on this concept in our examination of the Marxian labor theory of value.

The most important previous criticism of the Marxian labor theory of value has focused on the transformation problem. It was first raised in 1896 by Böhm-Bawerk as follows: in volume 1 of *Capital*, Marx asserted the labor theory of value, but in volume 3 of *Capital*, he asserted the production price theory, which differs from the statements made in volume 1. Subsequently, Bortkiewicz returned to the problem algebraically, and Sweezy took it up in 1942. Then, Steedman, Samuelson, Neumann, and Morishima, among others, examined

the problem in the 1970s. As a result, the problem has been debated for more than a century, resulting in a highly mathematical argument that became very difficult to settle.

After Bortkiewicz, the discussion focused on how the internal inconsistency within Marxian theory could be resolved. The two theories of Marx espouse inconsistent logic, leading to a serious discrepancy that emerges when value is transformed into a price. In Marx's calculations, adding a general rate of profit to the cost price results in a production price. However, in these calculations, the rate of profit is not proportional to the quantity of labor inputs. The points of dispute in the transformation problem are (1) whether surplus value can be transformed into profit, and (2) whether value can be transformed into prices. Both are difficult to resolve. Despite sufficient arguments provided by econometrics, the transformation has only been proven in the simple Leontief economic model and evidence for a general transformation was not provided (Morishima1973).

In the 1980s, new approaches, such as the so-called New Interpretation (NI), Simultaneous Single-System Interpretation (SSSI), and Temporal Single-System Interpretation (TSSI), appeared¹¹ Such arguments have been relatively accepted in the West, in contrast, not so much known in Japan., and arguments over the transformation problem entered a new phase. The dual system of value and prices was self-evident in a conventional reading of Marx, but the NI, SSSI, and TSSI criticize the dual system, taking a single system instead. Then, based on the monetary expression of labor-time' (Foley2000:21, Kliman 2007: 25), they considered that the relation between money and labor time 'preserves the rigorous quantitative relation between paid and unpaid labor on the one hand and the aggregate wage bill and aggregate gross profit on the other' (Foley2000), in an attempt to make sense of Marx by interpretation. They, however, abolished the transformation problem; they only put a supposition in the definition that no problem exists. Their approaches are criticized as a 'contentless trick,' or 'ex post accounting identities' (Foley 2000). In any case, the controversy surrounding the transformation problem, which has been rendered as a question of internal inconsistency or interpretation, has not yielded a true solution.

One of the known problems associated with the transformation problem is the proof of exploitation. In the 1960s and 1970s, Okishio proved existence of exploitation mathematically, and Morishima named it the 'fundamental Marxian theorem.' Thereafter, the 'generalized commodity exploitation theorem' was proved by Bowles-Gintis and Roemer. Their studies, which belong to so-called analytical Marxism, do not solve the internal inconsistency of Marxian theory despite exploring the existence of exploitation and origin of profit. They concluded that not only labor but also goods input into production are exploited. This can be understood as a criticism against Marxian theory if construed as saying that it is impossible to regard labor as special. However, the conclusion that commodities are exploited is not acceptable for our common belief.

According to their arguments, even if workers yield zero surplus labor, profit can still be positive, because of exploitation of inputs resources (Bowles and Gintis1981: 19). Because this is a refutation of Marxian theory, Kliman, a proponent of the TSSI, strongly criticized it.²² Kliman insisted that the standard fundamental Marxian theorem is disproved on the grounds that even if surplus labor of workers is zero, profit can be positive (Kliman 2007: 179). However, it is not proved. Something unknown may be the source of the profit. However, if something unknown serves as the source of profit, what could it be? This is an unresolved issue.

We posit that this failure to reach a comprehensive answer reflects another unrecognized problem underlying the transformation problem. How does a prenumerated value turn into a numerical figure? The conversion mechanism has not been identified, a gaping hole at the center of the transformation problem. Accordingly, all arguments developed based on the transformation suffer the same central weakness, and their mathematical solution becomes difficult. Unlike past discussions, we return to the fundamental principle of numeration of value.

Since the NI, SSSI, and TSSI are hermeneutics to make sense of Marx's theory, their arguments are useless for examining the numeration of value. Thus, our discussion continues without using their claims. The analysis presented in this study is therefore able to show that the NI, SSSI, and TSSI suffer from the same error as Marx.

2.2 Value measured by labor time and money

First, let us consider a problem of the past arguments. To numerate value we need a measurement. Two approaches exist when discussing how to measure value. One approach considers that value is measured by the amount of labor. Especially, Marx insisted that measurement of value is labor time. He asked in the first section of volume 1 of *Capital* how the magnitude of this value to be measured. Then he answered that ‘plainly, by the quantity of the value-creating substance, the labour, contained in the article’ (Marx 2014[1867: 28]). It is ‘the labour time socially necessary for its production’, which is ‘that required to produce an article under the normal conditions of production, and with the average degree of skill and intensity prevalent at the time’ (Marx 2014[1867: 28]).

The other approach discusses numerical value as measured by money, that is, price. Prices are determined by the market, and this approach therefore focuses on the demand side, i.e., at the sale. Since this measurement is in fact widely used, particularly in mainstream economics, we hereafter describe it as the numerical value. Although Marx used the first approach, he also treated production prices as being measured by money in volume 3 of *Capital*.

Thus, we present the following question. If adopted measures differ, like those used for money and labor time, are the values they produce in fact comparable? To discuss this question, a necessary prerequisite is to find out at what point in time each approach determines values. Value measured by labor time is determined at production, whereas price is determined in the market. However, in economics, there is no consensus regarding the answer to this question because classical economics emphasizes the supply side in the determination of value, and neoclassical economics emphasizes the demand side.

The issue is further complicated by economics’ split into the classical school and neoclassical school that occurred after the publication of volume 1 of *Capital*. In the 1870s, a marginal revolution occurred in economics through the work of Jevons, Menger, and Walras. The earlier classical school studied the value of property from the production side; in contrast, the new neoclassical economics school, presenting the concept of utility anew, shifted emphasis to the demand side. At that time, a dispute arose concerning whether prices are determined at the supply side or demand side. Marshall ended this dispute, concluding that ‘as a general rule, the shorter the period which we are considering, the greater must be the share of our attention which is given to the influence of demand on value; and the longer the period, the more important will be the influence of cost of production on value’ (Marshall 1907: 350). By this conclusion, the classical school sees value as determined by labor, and the neoclassical school sees prices as determined by markets—a situation that has led these schools to work in isolation. As a result, the theories of value and prices run parallel and never cross.

Marshall’s assertion, i.e., approving both theories, is a gray-area conclusion that offers tacit evidence that value is the same whether measured at the supply or demand side. However, the question remains: at what point in time are prices actually determined? This question has a long history, originating with the distinction between natural price and market price made by Adam Smith.

Substantial value is determined at production, next it is evaluated as a price in the market. It is common that even if superior products are produced, they are not adequately evaluated in the market. Marx used the term ‘salto mortale’ to express the difficulty of predicting exchange value (Marx 2014 [1867]: 71). It implies that we do not know a price before a sale is made. Such examples show that a price is determined only in the market. This empirical fact, however, is not proved in economics.

Behind this problem, there are unique causal relations. (1) Substantial value is determined at production, and (2) numerical value is determined at a market: according to this, (1) is a cause, and (2) is a result. Next, (3) added value at production is calculated after (2) and can be known numerically. Then added value is determined by knowing that the ex-post calculation can be traced back to the point of the cause, which can be found at the past production point. We refer to this as the retroactive causal recognition of added value. That is, both value and prices of commodities are determined in the normal order of causality, but the recognition of added value is not; this in fact goes backward in terms of its causality. This retroactive

causal recognition forces the discussion to contend with the issue of determining the exact moment of price determination. Of course, the present does not really affect the past. It only appears to do so.

An important problem about this process can be found in Marxian price theory. In volume 3 of *Capital*, Marx argued ‘the conversion of surplus-value into profit’ and formulized ‘the value of every commodity.’ Then he developed his price theory such that adding a general rate of profit to a cost price turns into the production price. However, although the formulas: $C = c + v + s$ and $C = k + s$ (Marx 2014 [1894]: 19) look like adequate, they have a problem about causality. The reason is because added value as numerical data never emerges before the ex-post calculation. Profit is always measured by money, and added value also does not emerge except for as money. Marx’s explanation involves predetermining the effect in causality by putting ex-post added value before the effect (price). Marx’s production price constructed by using this inadequate logic is impossible.

Nevertheless, Marx’s predetermination of the effect in causality has been accepted by economists. One reason is that the retroactive causal recognition disturbs our inference of the flow of time. The other is that economics basically argues correlation rather than causation. However, since production price of Marx’s arguments does not exist at the point of production, causation cannot be ignorable. Anyway, it is impossible to predetermine the effect without a time machine. Marshal’s assertion may be adequate as an argument of determinants of value, but it should not be regarded as evidence for the point of price determination. That is, what point of time value is determined is different according to the measurements; value measured by labor time is determined at production, and value measured by money at exchange.

Let us return to the question mentioned above: if the measures adopted differ, are the resulting values the same? We indicate here that they too differ; different measures yield different values. For example, to increase monetary value, we can improve the quality of goods to increase their value, or we can simply raise the selling price. This shows that the origin of monetary added value can be traced to two places: production and sale. Therefore, the monetary value contains monetary profits. On the other hand, value as measured by labor time cannot contain monetary profits. That is, although value is substantially the same in the two measures, their contents differ. Numeration of value is not simply a matter of conversion. This is the issue that this study adduces.

2.3 Process of transforming value into numerical units

These two approaches have differing measures of value. Why does this difference arise? To answer this question, we first construct a principle of numeration of value. Prenumerated value is an idea. Numeration of value cannot be separated from the process of exchange; it is impossible to numerate a value without an exchange taking place. For example, the manufacturing industry usually sells products to wholesale stores, which is one form of exchange. When value is numerated through this type of sale, the value that emerges not only arises in production but also in the act of exchange itself. One viewpoint holds that the manufacturing industry’s total profit was accrued by the manufacturing process itself. However, this assertion does not hold. Substantial value is created at production and profit is added through evaluation at exchange; this is the process of numeration of value in the manufacturing industry.

Here we must be cautious as the word ‘profit’ is being used in two different senses. Profit usually refers to ex-post profits, which is the sum of the added value at production and profits at exchange. In contrast, profits at exchange are prenumerical profits, and being numerated, they comprise a part of what we generally call profit.

It is difficult to recognize that profits are only added at exchange; merely observing reality does not fully reveal the mechanism. We can, however, reason it out by delving below observable reality. First, we can increase ex-post profits by efforts at the place of sale, even in the manufacturing industry. This fact proves that profit can be added at exchange.

Second, we can reason that exchange creates profit from the fact that commerce gains profit only by selling.

The profit made from commerce (i.e., wholesalers selling to retailers, and retailers selling to the public, neither of which sets of transactions involve manufacturing and thus exclude the surplus value added in the manufacturing process) indicates that the selling price is higher than the cost price. Furthermore, the manufacturing industry also obtains its profits through sales, as the act of selling is the same for commercial and manufacturing industries. If profits are negative, the manufacturing industry will stop making transactions with a wholesale store to sell directly to customers.

Third, ex-post profits fluctuate according to supply and demand. This fact proves that value is not directly converted into prices. Such fluctuations increase or decrease monetarily and do not exist at the point of production. Both classical and neoclassical economics call this element ‘profit.’ Sale prices in the manufacturing industry may also fluctuate by market. Accordingly, the manufacturing industry also has profits arising at exchange.

Judging from these facts and circumstances, profit in the manufacturing industry is added at exchange. The manufacturing industry does not exist to simply produce, but to exchange. This implies that a process of numeration involves profit. Numeration of value is not the mere conversion of measurements or units of measure. Although Marx claimed that value emerges by exchanging equivalent values, equivalent figures nonetheless include profit at exchange.

This new principle of numeration of value can explain why values differ between the two approaches mentioned above. Numerical values consider added value and profit at exchange; on the other hand, values measured by labor time cannot consider profit at exchange. Therefore, the two approaches’ measures of value encompass different factors.

Without understanding this, economists including Marx thought that since value is unitary, value must be the same whether measured by labor time or money. This lack of comprehension does not affect neoclassical economics because neoclassical economics treats mainly market prices on the framework of supply and demand concepts. In contrast, serious problems exist in the Marxian labor theory of value.

The Marxian labor theory of value cannot incorporate profit at exchange. Marx briefly examined the assertion of Condillac to represent the circulation of commodities as a source of surplus value, and denied it (Marx 2014[1867: 110]). And by overlooking profit, Marx mistakenly constructed his theory. Since value of Marx excludes profit at exchange, it does not match the price obtained at exchange, i.e., market price.

Whereas Marx’s definition of value differs from ours, so long as he defines value apart from a price and theorizes the transformation of value into a price, in the process to transform he never evades the lack of the element. Even if you adopt the monetary expression of labor-time (MELT), it cannot salvage the Marxian theory.

One further troublesome problem arises: it is impossible to numerically correct for profit overlooked at exchange. In the manufacturing industry, value is generated through two processes (value + profit) that numerically emerge in monism. Value and profit are unified and inseparable. We refer to this as ‘indivisibility of value and profit.’ This particular phenomenon comes into prominence when converting value into prices. This indivisibility means that Marx’s surplus value is in fact numerically uncertain, and mathematics cannot be used to argue value before exchange.

In Marxian theory, the existence of surplus value can be confirmed by examining the ex-post profits remaining in the hands of capitalists. However, if value is generated in two places, you cannot determine the ratio of value originating at production or exchange. When profits emerging at exchange are large, it is likely that surplus value is zero or negative.

The process of changing from dualism to monism is very difficult to recognize. Since value and profit emerge in a state of numerical unification, it is easy to assume that value alone is numerically emerging. In such a view, profit at exchange disappears and the transaction is seen as one of equivalent exchange. However, the transaction nevertheless contains unobservable profit. Therefore, Marx failed to recognize the phenomenon of numeration of value.

The Marxian labor theory of value was originated in classical economics. Furthermore, Ricardo probably considered that production alone creates the entire value of goods.³³ Ricardo stated the following in a note: ‘Mr. Malthus appears to think that it is a part of my doctrine, that the cost and value of a thing should be the same; it is, if he means by cost, “cost of production” including profits’ (Ricardo, pp. 80). This suggests that Ricardo’s concept of value includes profits. However, we can interpret Ricardo’s overall insistence that production costs are just costs and do not include profits. He did not, however, pursue the resources of surplus value; therefore, overlooking unobservable profit at exchange does greatly reduce the significance of his theory.

In Ricardo’s theory, goods have value equal to the value of their labor inputs; in short, value equals wages. Consequently, it is theoretically indefinite who creates the portion of value exceeding wages, i.e., profit. To revise Ricardo’s indefiniteness, Marx distinguished labor-power from labor, and constructed a theory where capitalists buy labor-power at the same value of the means of subsistence, which they use to produce more value than they pay (Marx 2014[1867: 120]). This is the basis of the process of increasing value, in which labor creates all surplus value. In other words, while pinpointing the source of value theoretically, Marx eliminated unobservable profit arising at exchange. Thus, Marx considered that production value is the sole value.

2.4 Value created by sales

We will now discuss profit arising at exchange. Profit most certainly arises at exchange; in other words, a sale also numerically creates value. However, what is the nature of the numerical value created by a sale? Where does it come from? To search for its origins, we explore a situation where the numerical value from sale is larger than the value at production and confirm its existence through examination of extreme examples. Here for the sake of simplicity, we omit wholesale and retail stores.

Early in the Industrial Revolution, workers long earned low wages, as Marx indicated, before wages finally began to increase from the 1850s onward. Therefore, no explicit proof exists that the high rate of profit of the Industrial Revolution era depended on labor exploitation because profits were earned in both low- and higher-wage times. In that era, obtaining a high rate of profit would be easy because industrially manufactured commodities enjoyed overwhelming predominance in competition with conventional handiwork commodities, whereas competition between factories remained rather low. The high rate of profit is often attributed to increased efficiency through the division of work, as mentioned by Adam Smith. However, generally speaking, even if innovations in industrial technology occurred, when prices decrease in line with cost savings attributable to increased efficiency, the overall rate of profit should not increase. Innovations in industrial technology occurred; moreover, in such a situation, when they competed with the conventional manufacturing system, a high rate of profit was realized. This high rate of profit is obtained by winning in the competition at sale, and it indicates that value numerically arising at the moment of sale is large.

When markets mature, advertisements are required for companies to increase sales. Advertising not only stimulates demand but also increases the rate of profit as it avoids a decline in price due to excessive competition between companies. Therefore, this indicates that as prices increase as an effect of advertising, advertisements can be said to create numerical value at sale. Moreover, in a mature market, it becomes difficult to make profit simply by producing excellent products given that competition among companies often takes the form of lowering prices. Consequently, to avoid falling into this price-cutting cycle, some other form of differentiation is needed, such as adding an idea or responding to various customer needs. Product differentiation can also therefore be used to avoid price-based competition and thus ensure that sales produce constant value. Thus, corporate efforts to increase profits in a mature market often focus on increasing the numerical value arising at the point of sale rather than on reducing costs.

ICT (Information and Communication Technology) companies such as Microsoft and Apple sometimes realize a substantial rate of profit through monopolizing an operating system used on a majority of personal computers or by creating original products that their competitors cannot produce. Their sizable rates of

profit are realized by obtaining large profit at sale. This, in turn, can be traced back to having the power to dominate prices in a market, not because value as labor embodied in a product through the Chinese factory is overwhelmingly large. According to conventional wisdom, such a high rate of profit is based on outstanding technology. However, if rivals can easily copy an innovator's new technology, the business falls into excessive competition and the rate of profit will drop. To determine the dominance of price controls, the competitive edge conferred by patent protection must be considered. Thus, the substantial rate of profit in ICT companies can be traced to value numerically created by sales. We can refer to the technological developments made by ICT companies as innovation; their value is not created solely through technology but also by them maintaining their dominant positions through their ability to control prices.

As we have indicated, several phenomena exist that we should explain with introducing the concept of value numerically created by sale. The fact that profit rates can increase when competition is not strong is proof that labor is not the source of all value. Although value created by sales is numerically unknowable, it most certainly exists, while the unobservable nature of profit at exchange led Marx to overlook it in his theory.

Marx understood that value does not always coincide with price. According to the Marxian theory, real market is in disequilibrium, and a market price deviates from value. It does not justify his theory. The value of Marx is not monetarily numeral. If it is so, what should we use as a criterion to assess the deviation?

It is interesting to explore the value numerically created by sales because it has not been argued previously; furthermore, in this study, we do not go far into this argument. The concept of value numerically created by sales can contribute to renewing the innovation study, which no more takes value created at sales into account than Marx. When this concept's validity is accepted widely, Marx's spell will be broken.

2.5 Defects in the exploitation concept

The same problem exists in Marx's exploitation concept as in his value concept. Marx considered that exploitation occurs at production, but exploitation occurs elsewhere as well. Since a sale also creates value, exploitation can also arise at the point of sale. Consequently, a phenomenon emerges that Marx entirely failed to consider.

A capitalist requires two types of people from whom to derive profit: workers and consumers. A capitalist obtains profit from workers at production. He also obtains profit from wholesale stores and retail stores when selling products. Omitting the distribution industry for the sake of simplicity, a capitalist obtains profit from unspecified consumers. A capitalist thus obtains profit from two channels: workers and consumers. A worker provides labor to a capitalist with whom he contracts to provide his labor in exchange for wages, and by whom he is exploited. A consumer purchases goods with the wages obtained by labor; in doing so, he is exploited by paying excessive prices to retail stores (for simplification, capitalists). In this way, a capitalist and a worker-consumer ensure that transaction partners change, making a loop and thus powering economic circulation. The specific value of each of the exploitations is numerically unknowable.

Value created by sales is exploitation of consumption. Workers are exploited in both labor and consumption. Because a capitalist and a worker contract over employment, exploitation in this transaction can be criticized as plunder from the result of labor. Exploitation at the retail store, however, cannot be criticized as plunder. Instead, consumers are 'exploited' through their voluntarily paying of excessive prices (providing profit) to retail stores. At that time, consumers have the freedom to choose: they can elect to buy products in pleasing stores and consent to paying excessive prices, or not. Marx did not incorporate such exploitation of consumption, claiming that exploitation only occurs in the capital-labor relationship.

Exploitation of consumption suggests that exploitation occurs in corporate transactions as well. The manufacturing industry exploits wholesale stores, who in turn exploit retail stores. Both wholesale and retail stores perform commercial transactions to obtain profit by reselling. Therefore, we consider it unsuitable to apply the exploitation concept, which implies plunder, to these transactions.

The high rates of profit that IT entrepreneurs seek are also derived from exploitation of consumption.

Successful innovation requires substantial exploitation of consumption. No matter how high the rate of profit, nobody will criticize innovation because it creates new value and generates new demand.

The state of obtaining large profits at sale is also realized through both monopoly and regulation. If monopolized goods are infrastructure such as electricity or gas, or commodity necessities such as rice or wheat, no matter how expensive they become, people have to buy them. It is not desirable for excessive payments to be extracted where no substitutes exist. This example of exploitation of consumption shows that exploitation may also occur in a national monopolistic undertaking or through governmental regulations. Marx overlooked such exploitation of consumption, suggesting that his exploitation concept lacked effectiveness as a criticism of capitalism.

Regarding the fundamental Marxian theorem, Okishio and Morishima accepted the Marxian theory's exploitation concept that only labor is exploited, and created a formula based on this premise. Distinguishing explicitly between the value accounting system and the price accounting system, Morishima sought to prove the existence of exploitation. However, just before the conclusion, he asked, 'What conditions are necessary and sufficient for the existence of a set of non-negative prices and a wage rate yielding positive profits in every industry?' (Morishima 1973: 53). He demonstrated that this would occur if and only if a 'real-wage rate' is given such that the rate of exploitation is positive. However, this is not a necessary and sufficient condition. Even if the rate of exploitation (in production) is negative, profits are still positive when the rate of exploitation of consumption is positive. That is, since exploitation occurs at both production and consumption, their argument is wrong in its premise.

After Okishio and Morishima, Bowles and Gintis presented 'the peanut theory of value and energy theory of value' (Bowles and Gintis 1981: 19) as an appendix of their paper; that is the 'generalized commodity exploitation theorem.' Their argument states that not only labor but goods that serve as inputs to production, for example, peanuts and energy, are also exploited because all inputs resources may have the same form of equation as that of labor-power (Bowles and Gintis 1981: 19). Additionally, Roemer (1982) presented 'a general theorem of exploitation and class.' Their assertions can be understood to imply that labor is not the only source of value. In this point, they moved forward from Okishio and Morishima's conclusion. However, the conclusion that goods such as peanuts and energy are exploited is too strange for our common sense to accept.

Their conclusion stemmed from their method to convert input into output without understanding the mechanism of profit at exchange or exploitation at consumption. It is true that there may be no difference analytically between labor and the other raw materials; however, they have no evidence of the exploitation of peanuts. Although their process of reasoning to the problem will be appreciated, their conclusion should be revised. It is labor and consumption that are exploited, while production and sales create value.

2.6 Failure of the transformation concept

This study has already provided the answer to the error of the Marxian value theory. Labor is not the sole origin of surplus value; that is, sales, too, create surplus value. This is the crucial problem. If so, discussions of the transformation problem do not have much meaning, but we examine it to settle the disputations.

In past discussion of the transformation problem, one focus has been on the fact that Marx's theory is inconsistent regarding the rate of profit for each segment of industry. In Marx's theory, the profit rates for each segment of industry do not correspond and the profit rate is not proportional to the amount of labor inputs. This is an evident error of Marx. Samuelson provided a case in which Marx's calculation is consistent, one where the organic composition of capital is equal. This is a singular case, and therefore it is not realistic. Then he instead considered what might be called the case of 'equal internal compositions of (constant) capitals' (Samuelson 1971). In such cases, value and price is consistent; does it prove the accuracy of Marx's procedure? Discussions of internal inconsistency cannot resolve the issue, revealing this process' own limitations.⁴⁴ Steedman's joint production (Steedman 1977: 150) is a similar example. Accordingly, we approach this issue from a different angle.

With regard to the transformation problem, after Bortkiewicz, economists have approached the problem by considering Marxian theory as a dual system: one in terms of value and the other in terms of prices. The value calculation in the dual system, however, as we have repeated above, contains no profit at exchange; it is erroneous. Although Marx sought a concrete criterion of value, in numeration of value, an abstract element is added, and the numerated economy cannot be discussed by materialism.

Furthermore, the second element of the dual system, the production price calculation is impossible. The production price theory, which Marx developed in volume 3 of *Capital*, has misunderstandings by the retroactive causal recognition. Cost prices can be calculated by adding up costs. From the Marx's formulas (Marx 2014 [1894]: 19), merely adding profit onto costs yields the price. Then, Marx insisted 'equalisation of the general rate of profit through competition' (Marx 2014 [1894]: 126), predetermined the general rate of profit and totaled it. However, ex-post profit cannot be causally added like costs. It may be possible to calculate an average rate of profit using past data on profits, but current prices are determined by the market. We refer to this flaw as the causal impossibility of adding up costs.

Steedman (1977), a Neo-Ricardian, putting a physical system before the value system and price system, takes the physical quantities approach. It is an argument without reference to value. This lets him abandon the transformation problem as a pseudo problem. This approach is based on Sraffa's (1960) framework. In Sraffa's model, Sraffa models the special case on the supposition: an annual cycle of production with an annual market (Sraffa 1960: 10). His model is simultaneous determinism mathematically realized under this condition; it also predetermines the cause substantially because in his model the rate of profit is determined earlier than the real point of determination. physical data determine the rate of profit and relative price. This approach, however, is just mathematical determinism, and the model abstracts both a numeration principle and causal relations; that is, it abstracts the both defects of the Marxian value theory and production price theory. Therefore, it will seem to indicate that Marx was right, but in fact, it predetermines the rate of profit under special conditions and does not reflect reality. Using this framework, Sraffian economists examine input and output as the physical system. However, this does not hold, if not on the condition of Sraffa.

As we have argued, the value system is erroneous and the production price system is impossible. The physical system cannot rescue the defects of the dual system. Therefore, transformation is impossible, and the transformation concept itself is flawed. Marx's so-called production price does not exist. Even if you take a macroscopic view, aggregate value never includes profit at exchange and aggregate production price is impossible. Therefore, Marx's two propositions about aggregate equalities also fail to hold too. Since in the conventional dual system approach to the transformation problem, both underlying premises are erroneous, and the disputants notice none of them, the approach would never produce valid results. Despite the many discourses in the history of the dispute over the transformation problem, a reexamination will not be productive.

After all, value can be numerated neither by labor time nor by totaling costs. Price must be derived from a market exogenously. Although classical economists (including Marx) have long argued value as economics, strictly speaking, it is impossible because of adding up costs.

Not noticing these errors, the NI, SSSI, and TSSI radically criticized the dual system approach and physicalism (Kliman 2007: 157). They emphasize their ability to interpret Marxian theory in a manner that renders it logically consistent and elaborate to interpret as the single system. We, however, have indicated the existence of dual defects in the value theory and the production price theory. Consequently, internal inconsistency is a logical outcome. We cannot make sense out of their effort to interpret.

In brief, both the Marxian value and price theories predetermine value and price in causality at the point of production. Such predetermination is incompatible with profit at exchange in numeration. Therefore, value and price calculations become inconsistent in that theory. To resolve it, the NI construes variable-capital value as the actual sum of money wages (Foley 1982, Dumenil 1983). Then, as inconsistencies still remain, the SSSI applies the same method of determination also to constant capital (Moseley 2000). Nevertheless,

inconsistencies continue to remain, thus the TSSI advances the supposition that the valuation is temporal, with value and price being determined interdependently (Kliman 2007: 2). In such ways, the proponents after the NI devised artificial methods to solve the internal inconsistency of Marxian theory. However, such ‘Band-Aid’ approaches never resolved (or interpreted) the real problem.

2.7 Impossibility of measuring labor time

Previous arguments in economics assumed that value could be determined no matter what scales of measurement were used. However, this assumption does not hold because price does not emerge before exchange by money.

For example, the price of a McDonald’s Big Mac can be used to compare the purchasing power of each country’s currency. However, despite this ability, the economy cannot be numerated by the Big Mac. Only items already used as money somewhere in the world (such as gold, silver, rice, wheat, shells, stones, and cloth) can numerate value in a society. Since measurement units of labor time are not used anywhere in the world to numerate value, these units remain an abstraction.

Nevertheless, such a measure has been accepted consistently, partly because such a measure of labor time is useful to decide wages for factory workers, who perform limited and specific tasks. However, it only determines wages, not the product’s value.

Numeration of value is the fact that we have numerated in the past, i.e., determined a price. Numeration is practice, and there is no price before practice. In addition, no measures except money can let price emerge.

In mainstream economics, GDP encompasses only economic activity that appears as prices. Domestic labor, such as household labor, is not contained in GDP because no money changes hands. Furthermore, the self-consumptive element of agricultural products is not contained in GDP by usual calculation methods; therefore, a special imputation calculation is required. The economy is the movement of money, no more than a locus of past trading.

Nevertheless, a black box exists in the process between value and price. Numeration of value is more profound than we think. This problem overlaps what Marx argued as reification. Marx considered the mystery of value as follows: the social relationship of labor is perceived to be its exchange value, as the fetishism of commodities (Marx 2014 [1867]: 46). However, this explanation seems to drive the problem out of the falsifiable world, indicating that it cannot be proved or disproved; therefore, another approach is needed. We shall examine this point in the following section.

3 Analysis by structuralism

3.1 Structure of a price

In this section, we examine prices as a ‘structure’ using structuralism. Previous researches have not analyzed prices or money as a structure and money theory has barely progressed since Marx’s value-form analysis.

Iwai (1986) examined Marx’s value-form analysis and indicated that money is realized using circular reasoning, which he called the mystery of money. Karatani (1993) considered Marx’s ‘salto mortale,’ and indicated that because money is a system of differences, price is therefore groundless. They argued from theories of money, reflecting their interest in the mystery of money. Here, we clarify that the core mystery of money in fact lies in the numeration of value.

By nature, magnitude of value cannot be measured. We can measure linen by a unit of length, such as a meter. We can measure iron by its weight, such as by the ton. However, value is measured across all types of properties, including linen and iron, using differing criteria such as usefulness, degree of desire, aesthetics, scarcity, and prestige. By nature, we have no unit that encompasses all these factors. Therefore, a certain

quantity of linen can never be determined to be inherently equal to a certain quantity of gold. Although we believe that a market exchange is equivalent, equivalence is in fact impossible. Nonetheless, people easily perform market exchanges. How is this possible?

Past arguments from the structuralist perspective are not useful in this case. According to Saussure's (1959) argument regarding language, both *signifie* and *signifiant* are structured by being articulated. Articulation is performed in an unconscious domain, and we use language without being conscious of such articulation. According to Levi-Strauss, marriage is an exchange of a woman, and humanity's incest taboo divides nature from culture. A prohibition rule serves to determine the range of kinship with whom a person can or cannot marry, and this prohibition necessitates relations with other groups to ensure marriages. We interpret that an articulation therefore exists that divides women we can marry from women we cannot. In both language and marriage, articulation therefore plays an important role in the foundation of structure. In contrast to these two examples, however, we cannot find such articulation in prices. We therefore conclude that articulation cannot resolve the issue of finding the structure of prices.

Equal value is theoretically impossible. What resolves this impossibility is not pursuing equivalent, but the fact that a price has emerged. Value is numerated through a market exchange. Although we are free to fix a price before bringing a product to market, such a price will remain a mere expectation if an exchange has not been made. Consider, for example, the case of an auction. Only when an actual transaction is finished does a price appear. A seller offers a price at which he can afford to sell. A buyer buys if he agrees with the price. The act of trading indicates an agreement, thereby determining a price.

It follows, therefore, that the common perception that prices are decided beforehand and commodities are bought by equivalent exchange is wrong. Numeration of value does not determine value objectively. Rather, numeric value emerges when a market exchange is made; it is practice. Numeration is realized by exchange, and we can exchange because value is numerated. Exchange and numeration have an interdependent relationship. Here, practice is an unconscious activity to make structure.

Then profit plays an important role at the determination of prices. Rather than pursue numerical strictness, a seller and a buyer should instead attempt to agree. A seller agrees because a buyer offers profit. If the price cannot provide profit to a seller, he can refuse the exchange. If both of them agree, an exchange is made. Although no numerical stringency exists, a seller gains profit, a buyer gains utility, the exchange is accomplished harmoniously, and a price appears. Anthropologists may call the profit invisible gift to sever the relations. No strictly equal value is determined at any point. Since a price appears only when an exchange is made, price can therefore be called performative. This mechanism is common in both the manufacturing industry and the distribution industry.

Market exchange is thus communication mediated by profit. As the need to communicate led to the emergence of language, the need to exchange yields the structure of a price. Although the structures differ in form, the structure of a price is also a form of communication between human beings.

3.2 Singular point of a structure

Prestructural value turns into structure when it acquires a numeric value at exchange. We refer to this point of conversion as a singular point of structure, as it marks the point where structure is generated. Increase in value at a singular point cannot be observed. As mentioned in the preceding section, value and profit added at exchange are indivisible and absolutely numerically unknowable. Only exchange as practice can be observed. Previous structuralist arguments have not contained any mention about a singular point that we are aware of, we thus attempt to explore the features of such a quality here.

1. In a singular point, many processes occur simultaneously. Prenumerated value is a bundle of ideas. When determining value by money, goods are evaluated not only for their usefulness but also for their scarcity, utility, expectation of future demand, and so on. Furthermore, as this marks the point where

profit is added, a price appears as an answer in which all requirements are realized, and goods can therefore be exchanged for money.

2. A price appears only once, when a market exchange is performed. Although this step can be unclear because fixed-price markets are prevalent today, a price is nonetheless theoretically determined by each agreement between buyer and seller, and reevaluated for each exchange. Since the owner changes as a result of a market exchange, the same exchange cannot be performed twice. Consequently, numeration is an ongoing practice.
3. The structure of prices is non-systematized. The shift to a structure, i.e., from value into a price, is not permanent. Price appears only at the moment of exchange, and then disappears immediately. Therefore, prices are performative, not systematized. Prices contain no element equivalent in Saussure's *langue*. Similarly, market exchange does not construct social relations. This leads to freedom of the market.
4. When determining prices, people refer to prices of similar commodities. In markets in traditional society, the equilibrium function to determine prices does not fully work, and prices are determined by custom in many cases. We consider this to repeat the exchange rate of a precedent transaction; this is also therefore a reference to prices. This reference to prior transactions stabilizes prices. If all players pursue profits, such as those assumed by economics, prices should fluctuate according to the individual diplomacy of sellers and buyers. A structure of references neutralizes such fluctuations.
5. Value and price are incommensurable in the singular point. While value and price are discontinuous, there is ambiguous causality. We are not conscious of the discontinuity, and in our recognition the world is smoothly continuous.
6. No absolute criterion exists for determining prices that can be determined with reference to a precedent. A precedent example, however, can itself be determined by referring to an even earlier precedent transaction. Prices are relative; no matter how far back in the past we may look, no original criterion can be pinpointed. This highlights the circular reasoning peculiar to structuralism. The reason that a dog is called a 'dog,' Saussure revealed, is arbitrary, and he avoided any argument beyond this. Saussure referred to this as the 'arbitrariness of the sign,' and it implies that the naming of words is groundless. In the same sense, a price is arbitrary too.
7. The addition of profit by agreement means that prices are not a unit but a sign. Prices crucially differ from other units that humans use, such as length and weight.
8. The singular point also poses a recognition problem: the retroactive causal recognition of added value. Calculating profit from ex-post prices, we recognize the existence of profit and consider what is really the effect as instead the cause. In such special recognition, the causality is reversed. This phenomenon can be considered as 'liminality': a concept of anthropology. Liminality is an in-between period of ritual, and one of the characteristics of it is that hierarchies are reversed (Turner 1969:166). Since from production to a market exchange, it is also an in-between period between a pre-structure and a structure, it could be regarded as liminality. In this suspended situation, it is supposed that we recognize the causality reversed. Given this concept, the singular point should be not a point but a period from production to sales, in which value is suspended.

3.3 Inability to grasp the economy correctly

During liminality, sometimes neophytes develop comradeship and egalitarianism (Turner 1969: 96). Such a condition as *communitas* is observed not at a factory or market places where economic activity is performed, but rather in anti-capitalistic social movements supported by the Marxism. It is interesting that ex-post speculation of the singular point compresses time and produces the liminal states. In addition, an experience in adolescence to read Marx can be a rite of passage. It is an imagined pilgrimage going back to the genesis of structure. Regardless of the way being correct or not, you can go on the pilgrimage, because the way is symbolism. However, the liminality will not be aggregated like the so-called millenarian religious movements (Turner 1969: 111).

In the real world, prices as structure emerge, and economy circulates. Then, value increases in a market

exchange. Products are not priced prior to coming to the market. When a pre-priced product is priced for the first time, changes in price are unknown. We cannot know the increment of value increase at the singular point solely from prices after that singular point. However, it is necessary for buyers in an exchange to provide profit; through this means, ex-post profit increases, that is added value increases. This forms the basis on which all of capitalistic economy circulates.

From its inception, economics has dealt with the world as measured by prices. The world of prices is conformable as long as we can treat it numerically; therefore, it is suitable for analysis. Prices involve profit at exchange. In contrast, value is no more than an idea. Classical economists (including Marx) argued value as economy; however, it is numerically impossible for theory of economics to cross the singular point. Close to when Marx constructed his theory, neoclassical economics did not explicitly understand this limitation, and by establishing utility theory, moved the emphasis from the supply side to the demand side. This would prove to be a wise choice.

This theoretical conversion led neoclassical economists to concentrate on the study of prices. Consequently, neoclassical economists stopped crossing the singular point. The concept of the marginal revolution, significance of utility is emphasized, but requires conversion from value to prices. Thus, the Copernican revolution of economics was conducted unconsciously. This revolution brought evolution to neoclassical economics; by avoiding the singular point, neoclassical economics became capable of using mathematics.¹¹ Sraffa's mathematical solution (Sraffa 1960) crosses the singular point. It is an important problem.

The numerically represented economy, however, does not correctly reflect the reality of the prestructural world, in the same way that the world grasped linguistically as a structure does not correctly reflect reality. It is impossible to perfectly understand the economy.

One of the reasons for the long-term difficulties in refuting Marxian theory stems from the fact that this theory crosses the singular point. Theory cannot mathematically cross it, because of the discontinuity of value. Marx crossed it. It is difficult for a theory avoiding the singular point to refute a theory that crosses the singular point. As a result, Marxian theory persisted long into the 19th and 20th centuries.

The fact that value increases in numeration reminds us of Heisenberg's 'uncertainty principle' in the quantum theory. Furthermore, it may remind some people of Godel's 'incompleteness theorem.' However, we should not confuse either of these with the arbitrariness involved in prices. A price is not a natural phenomenon but an outcome of human culture. Not understanding this point has long confused economists' argument concerning value.

4 Conclusion

Value is numerated in exchange. In its process, unobservable profit at exchange is added. Therefore, numerated value differs from prenumerated value, a distinction overlooked by Marx. This distinction is crucial because it implies that sales also create value and labor is not the sole determinant of surplus value. Therefore, the Marxian labor theory of value is incorrect and the exploitation concept fails to account for the exploitation at consumption.

In the domain of numeration of value, a recognition problem exists: the retroactive causal recognition of added value, which has long obscured the discussion about value and price. In fact, first, price is determined at exchange, then added value is calculated. The Marxian price theory predetermines the effect in causality. The series of discussions presented in this study have demonstrated a solution for the transformation problem. Since both the Marxian value and price theories are erroneous, transformation is impossible. The solutions by the interpretations cannot present the true solution.

Although it has been previously thought that value is only created by production, this is not so as sales also create value. Such a new perspective, we believe, upsets the value concepts that many people including neoclassical economists believe and can thus pave the way to reconstruct value and innovation theories.

In section III, we indicated that dynamics of structure lay beneath the process of value determination. Market exchange is communication mediated by profit. Price beyond the singular point is discontinuous with the value before it. Therefore it is unable to grasp the economy correctly.

Economy consists of not only a surface economic activity but a deep practice to structuralize value. Therefore, this paper consisted of the two sections. Economists will have no concern with regard to the second argument. However, we have indicated that the concept of the singular point is useful to understand the confusion of the transformation problem.

Profit at exchange cannot be definitively proven, but this study concludes that it exists between value and price as a phenomenon of the singular point of structure.

Marx's *Capital* is the myth of the value creation in the singular point. It brings many people a situation of communitas. Almost nothing has been yet known in terms of the mystery of the singular point. We suggested the possibility that ICT innovation may enlarge the inequality of economy. On the basis of new understanding of the singular point, is a new theory to replace Marx possible? It is hard to predict, but at least we have a place to begin.

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