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Reconstructing Marxian Theory of Ground Rent: Based on Japanese Development of Marxian Political Economy

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The aim of this paper is to reconstruct Marxian theory of ground rent to make it more relevant for the analysis of ecological issues, which are increasingly of importance in Marxian analysis. We make this attempt by the close examination of Japanese long discussions on the rent theory among the Koza school, Rono school, and the Uno school. These discussions have never been available in English so far. By critically integrating Japanese preceding studies, Marxian theory of rent would be reinforced more effectively in analysing the class relation between the capitalist and the landowner. In addition, we use the price equations to formulate the rent formation and theoretically examine how the landowner performs as the third class. We thereby conclude that the landowner as a class exacerbates the ecological problem in seeking for rent maximization.

In Section 1, we shall briefly overview Marx's rent theory, which is developed from Ricardo's one. Section 2 will introduce Japanese accumulations of studies on Marxian theory of ground rent. Japanese Marxian economists first discussed rent theory in relation to their historical recognition of Japanese capitalism. After the interest waned, the rent theory was redefined as the theoretical study of landed property, which we believe cannot be seen in English-speaking world. In Section 3, we shall make our own contribution to developing the rent theory of Marxian economics, using some simple mathematical formulations. In particular, we investigate how and in what cases the landowners are incentivized to form the unified interest as the third class in the capitalist society. This analysis, moreover, sheds light on the discorded relation between capitalism and nature, which we shall examine in the final section.

Keywords: Marx; rent theory; Japanese Marxism; ecological Marxism; Kozo Uno.

Introduction

Marxism has long been criticized as “Prometheanism” for its exclusive focus on the relations of production and productive forces to describe human history. However, more and more Marxian scholars have started discussing environmental issues based on Marxian insights in this century. This discussion was initiated by the publications of Burkett (1999) and Foster (2000) and, more recently, reinforced by Saito (2017, 2019), which conducted extensive studies on Marx's excerpt notebooks published in *Marx Engels Gesamtausgabe*. Thanks to these works, the term “Marx's ecology” is now nothing but “oxymoronic”.¹

On the other hand, there seems little advance in the study on the ground rent theory of Marxian

¹ Saito (2017) p.9. Japanese edition (Saito, 2019) is more complete in that he discusses Marx's view on metabolism after 1868 in more detail.

economics. The above ecological studies of Marxism are largely concerned with Marxian thoughts and social theory, not much with Marx's political economy itself. It is true that Marx discusses environmental destruction under the capitalist mode of production, as the above authors stress, yet we must consider the reasons why those texts have long escaped close notice. Is it not because of a lack of clarity of Marx's rent theory? We should reinvestigate not only Marx's thoughts but also his economics of ground rent in order to fully demonstrate the relevance of Marxian approach to ecological issues.

Indeed, Marx's rent theory is a great complexity. His theoretical studies on rent and landed property are found in Part 6, *Capital* Vol.3 titled, "Transformation of Surplus Profit into Ground Rent". It is very difficult to understand this part, especially the category of absolute rent, which Marx originally created from the arguments of his predecessors, especially Ricardo. While there are notable achievements in this field in the past, like Fine (1979) and Harvey (2006), the theoretical study of Marxian rent theory appears to have ended.²

However, we assume that Marxian rent theory could be sophisticated more and that Japanese studies of Marxian economics could provide materials for further theoretical investigations. Marxian economists in Japan have long studied the rent theory since pre-WWII period and we have significant amounts of publications about the issues of ground rent, which are not available in English. It is true that the field gains less attention even in Japan, but there is certainly a little development worth sharing with oversea readers. Meanwhile, Japanese Marxism has paid little attention to environmental matters.³ Now it is time to synthesize the environmental concerns in Western literature with economic analysis in Japanese discussions.

In Section 1, we shall briefly overview Marx's rent theory, which is developed from Ricardo's one. Section 2 will introduce Japanese accumulations of studies on Marxian theory of ground rent. Japanese Marxian economists first discussed rent theory in relation to their historical recognition of Japanese capitalism. After the interest waned, the rent theory was redefined as the theoretical study of landed property, which we believe cannot be seen in English-speaking world. In Section 3, we shall make our own contribution to developing the rent theory of Marxian economics, using some simple mathematical formulations. In particular, we investigate how and in what cases the landowners are incentivized to form the unified interest as the third class in the capitalist society. This analysis, moreover, sheds light on the discorded relation between capitalism and nature, which we shall examine in the final section.

1. Marx on the Rent Theory

Marx's theory of ground rent is inherited from Ricardo's theory. In Ricardo's *Principles* (Ricardo, 1953), he explains the origin of ground rent as follows:

If all land had the same properties, if it were unlimited in quantity, and uniform in quality, no charge could be made for its use, unless where it possessed peculiar advantages of situation. It is only, then, because land is not unlimited in quantity and uniform in quality, and because in the progress of population, land of an inferior quality, or less advantageously situated, is called into cultivation, that rent is ever paid for the use of it. When in the progress of society, land of the second degree of fertility is taken into cultivation, rent immediately commences on that of the first quality, and the amount of that rent will depend on the difference in the quality of these two portions of land.⁴

² Harvey (2006) was first published in 1982. He describes Marx's theory of rent as "a good deal of confusion" (Harvey, 2006, p.330). Fine (2019) revisits Fine (1979) and confirms its contemporary relevance, yet its theoretical basis is not changed.

³ One of the few exceptions is Tamanoi (2020). This paper was originally published in 1978 and was recently translated into English. Under the influence of Japanese Marxian traditions, especially that of the Unoist, he proposes to enhance the scope of economics to cover ecological issues in this paper.

⁴ Ricardo (1953) p.70.

Here, Ricardo points out two factors that account for the rent: the limited use of land and the difference in the productivity of land. This is what is later termed as differential rent. It also should be noted here that Ricardo assumes land cultivation begins from the land with superior productivity to the “land of an inferior quality”. This cultivation order is to be one of the controversial issues.

When the “land of the second degree of fertility is taken into cultivation”, the productivity will fall and the amount of labour per unit rises, which means the rise in the value of the product. There occurs a difference between the market value and the value of the product produced in the superior land. This forms the source of ground rent that is paid to the landowner. Therefore, “[c]orn is not high because a rent is paid, but a rent is paid because corn is high.”⁵ Ricardo’s theory of differential rent is in this sense consistent with his labour theory of value.

This is why Marx highly appreciated Ricardo’s formulation. “This direct and conscious connection which Ricardo’s theory of rent has with the determination OF VALUE is its theoretical merit.”⁶ The structure of Marx’s theory of differential rent is basically identical with that of Ricardo. However, Marx was not satisfied with Ricardo, making a critical comment in *Theories of Surplus Value*. Marx insists that Ricardo

falls into a twofold historical error: On the one hand, he assumes that the productivity of labour in agriculture is *absolutely the same as* in industry, thus denying a purely *historical* difference in their actual stage of development. On the other hand, he assumes an *absolute decrease in the productivity of agriculture* and regards this as its law of development. He does the one in order to make *cost price* on the worst land equal value and he does the other in order to explain the differences between the *prices* [of the products] of the better kinds of land and their *values*. The whole BLUNDER originates in the confusion of *cost price* with *value*.⁷

This passage could be a clue to the complicated logic in the rent theory in *Capital* Vol.3. It is assumed that Marx should have tried to overcome Ricardo to fix what he deemed as a “twofold historical error.”

First, Marx does not “make *cost price* on the worst land equal value”. If the value of the product is higher than the cost price on the worst land, there arises a possibility that the landowner of the worst land could appropriate the rent distributed from the differential. This portion of rent is investigated as what Marx calls “differential rent also on the worst cultivated soil”, which later develops into the form of absolute rent. As we shall see later in detail, Marx elucidates the origin of absolute rent by assuming that the productivity of labour in agriculture is worse than that in industry.

Second, Marx rejects “an *absolute decrease in the productivity of agriculture*” and “explains the differences between the prices of the better kinds of land and their values” exclusively from the difference in the productivity. Marx shows in *Theories of Surplus Value* “the incorrectness of the Ricardian concept that differential rent depends on the diminishing productivity of labour, on the movement from the more productive mine or land to the less productive.”⁸ Therefore, in *Capital* Vol.3, he assumes as follows:

This sequence, which represents a given product in a given condition may, considered abstractly... , descend from D to A, from fertile to less and less fertile soil, or rise from A to D, from relatively poor to more and more fertile soil, or, finally, may fluctuate, i.e., now rising, now descending.⁹

Ricardo only takes the one-sided assumption of descending fertility, but Marx reveals that this is not necessary in analysing the differential rent. This insight encouraged him to investigate the cases where the difference in productivity changes through the investment in land. Here we have two types of differential

⁵ Ricardo (1953) p.74.

⁶ Marx (2010b) p.465.

⁷ Marx (2010b) p.465.

⁸ Marx (2010b) p.490.

⁹ Marx (2010d) p.646.

rent: the first type (DR-1) is based on the existing difference in productivity; the second type (DR-2) originates in the difference in productivity that arises from additional investments.¹⁰ Marx thus rejects Ricardo's law of diminishing return in the development of agriculture, while establishing a more general law of industrial development, viz. the tendency of the rate of profit to fall.

In this vein, discovering "a twofold historical error" Ricardo made has led to Marx's development of rent theory, which mainly takes two forms: differential rent and absolute rent. The differential rent is paid by a capitalist who competes with other capitalists in order to use the land with higher productivity. The surplus profit earned in using the superior land must be transformed into the differential rent as a result of the competition among the users. On the other hand, the absolute rent arises from "an alien force and barrier"¹¹ presented by landowners, who refuse to let land to capitalist without receiving some rent. Whereas this form of rent is thus based on the landed property itself, it generally cannot exceed "the excess of value over the price of production",¹² according to Marx. If there is no such limit, the rent is monopoly rent.¹³

Meanwhile, Marx asserts that Ricardo's "whole BLUNDER originates in the confusion of *cost price* with *value*." Indeed, Marxian scholars have considered the rent theory to be related with the so-called "transformation problem", in which they study how the values are distributed through the price forms. It seems that Marx himself attributed the problem in the rent theory to the confusing relation between value and price.

In this paper, however, we shall deal with the issues that should be addressed even if we assumed there were no "transformation problem". Marxian contribution to the rent theory cannot be reduced to the distinction between value and price in spite of Marx's original intention. The evidence could be found in the Japanese discussions.

2. Japanese Discussions on Marxian Theory of Ground Rent

2.1. Exploring the "Source" of Ground Rent

Japanese Marxian economists have also long been concerned with how value is distributed in the form of rent. What characterizes the arguments in Japan is its relation to the historical recognition of Japanese development of capitalism, which aroused fierce controversy between so-called the Koza school (Koza-ha) and the Rono school (Rono-ha).

¹⁰ Marx's critique of classical theory of differential rent has its foundation in his analysis of the works of James Anderson, who preceded Ricardo and Malthus on the rent theory. See Foster (2000) pp.144-9. Fine (1979) pp.250-3 discusses how Marx's rent theory should not be identified with Ricardo's by focusing on their difference in capturing the changes in productivity. Whilst Marx deals with the case of yielding economies of scale as well as that of diminishing returns, Ricardo concentrates on the latter case, thereby "reduces the entire formation of differential rent II" (Marx, 2010d, p.673) to it. Also, "the Ricardian theory ultimately is reduced to the logic of taking the intensive margin to be based on infinitesimally small increments of capital, whereas Marx's theory is concerned with a normal size of capital." (Fine, 1979, p.256) Harvey (2006) considers the relationships between DR-1 and DR-2 as the most important in Marx's contribution and insists "[i]t is here that Marx departs most radically from Ricardo and makes his original contribution to the theory of rent in general." (Harvey, 2006, p.355)

¹¹ Marx (2010d) pp.748-9.

¹² Marx (2010d) p.749.

¹³ Establishing the monopoly rent is not Marx's own contribution. It can also be found in A. Smith's *Wealth of Nations*: "The rent of land ... is naturally a monopoly price. It is not at all proportioned to what the landlord may have laid out upon the improvement of the land, or to what he can afford to take; but to what the farmer can afford to give." (Smith, 1904, p.146)

The main point of the controversy over Japanese capitalist development is whether or not Meiji Restoration could be counted as a bourgeois revolution. The Koza school denied the bourgeois features in the Meiji political system on the grounds that it retained the imperial system and that there remained semi-feudal landed properties vastly. Both are the very features of absolutism, a still transitional state to capitalist system, the Koza school insisted. On the other hand, the Rono school maintained that the Meiji Restoration was a bourgeois revolution though it was an imperfect one; there were large capitalists like Mitsubishi and Mitsui, which could be regarded as finance capitals; the Japanese capitalism at the time was already in the stage of imperialism.¹⁴

The two schools conflicted with each other also on a theoretical subject regarding the source of differential rent. When the land of the worst productivity determines the market value of the product, the product produced in the superior land contains a smaller amount of labour, i.e. individual value, than the market value. This difference forms the rent, as we have discussed above, yet has no labour objectified in the direct production process itself, which corresponds to “a false social value” in Marx’s term.¹⁵

Both schools considered that the differential rent must be sourced somehow from the surplus value. They shared the view that total value must be equal to the total price, which is the assumption of the “transformation problem”. However, the two schools differed where the surplus value came from to cover “a false social value”.

The Koza school conceived the source of differential rent to be the relative surplus value produced within the agricultural sector: because the agriculture in Japan at the time was dominated by the semi-feudal landed property system, the living standards in an agrarian area were lower than those in manufacturing sectors.¹⁶ This allowed the agricultural sector to generate the relative surplus value that transformed into the differential rent, according to the Koza school.¹⁷

Meanwhile, the Rono school saw the above explanation unconvincing and argued that “a false social value” would be compensated by the surplus value distributed from industry to agriculture. When the agricultural products containing “a false social value” is purchased by the other sectors, there occurs an unequal exchange in value terms: the surplus values produced in the other sectors flow into the agricultural sector and turn “a false social value” into a realized value.¹⁸

As is usual with most Marxist controversies, this dispute could not be settled. As Japan recovered from the ruins of World War II, the research interest of Marxian economists shifted away from the Meiji Restoration. The agricultural sectors in Japan were quickly shrinking during the golden age of capitalism, consequently undermining the significance of the rent theory itself. The rent theory controversy was fading away.

Nevertheless, the study of the rent theory did not disappear entirely. It was because of the rise of the Uno school theorists, who did not follow either of the argument.¹⁹ In the Uno school, the concept of

¹⁴ As for the detailed explanation about the controversy over Japanese capitalist development, Hoston (1986) is available in English.

See also Hein (2004) for political activities of Rono school.

¹⁵ Marx (2010c) p.654.

¹⁶ Marx admits that “[a] much more general and important fact ... is the depression of the actual farm labourer’s wage below its normal average, so that part of it is deducted to become part of the lease money and thus, in the guise of ground rent, it flows into the pocket of the landlord rather than the labourer.” (Marx, 2010d, p.621)

¹⁷ Yamada (1948) is the representative work in this argument. The idea was taken from a Soviet Marxist, Lev Lyubimov, whose work was translated into Japanese under the title of *The Rent Theory* in 1934.

¹⁸ Sakisaka (1948).

¹⁹ The Uno school has been one of the most influential groups of scholars in Japanese Marxian economists. Kozo Uno and his followers have developed their own economic theory based on the critical studies of Marx’s *Capital*. Uno’s critique of *Capital* is shown in Uno (1980), which is to be the principles of political economy, while Uno (2016) is his study of the world history of capitalist development, which is called the stages theory. The principles are regarded as the basis of the

value is distinguished from the amount of labour. The above problem of “a false social value” cannot arise from this perspective: it is just the market value which prevails as the standard of price and there should be no room for the concept of individual value.²⁰

It is not our purpose here to go into the value theory. The point is that the Uno school continued the study of the rent theory even though they declined to discuss the source of ground rent, which must be related to the concept of value in some way. They found another problem to be solved. It was a theoretical question of the relation between capitalism and landed property. Why do we have landowners as the third class in a capitalist society? Unoist theorists tackled this issue, at first through reinvestigating the cultivation order problem, which seemed to have been cleared by Marx’s critique of Ricardo.²¹

2.2. Ground Rent and Landed Property

As we have seen above, Marx criticized Ricardian assumption of tendential fall in the productivity in land. Ouchi and Hidaka, who are the leading Unoist theorists at the time, maintained that Marx’s critique was consistent with historical facts, yet not correct as a theoretical method. The two supported Ricardo’s view and insisted that the land of the best fertility is the first to be cultivated in theory if the farmer acts reasonably as a *homo economicus*. DR-2 was also reexamined in accordance with the law of diminishing returns.²²

Ouchi and Hidaka dared to challenge Marx in order to theoretically establish the foundation of landed property under capitalism. According to them, the landed property system must not be presumed in the principles of political economy: rather, it is what we theoretically establish within capitalist relations. They argue that the Ricardian structure of rent theory is more appropriate in this respect, when it is adapted in the development of DR-1 and DR-2.

Ouchi and Hidaka start with the assumption that there are no landowners. Capitalists first use land of the best fertility, on which nobody has the ownership, with no rent. However, since capitalist production is bound to expand and the amount of the best land is not unlimited, it is expected that the inferior soil is soon to be cultivated. This expectation makes people secure land-ownership and, as soon as capitalists begin to use the land of worse fertility, the differential rent will occur. The landed property system thus arises with the rise of DR-1.

If the productivity of additional investments deteriorates, the marginal productivity of better cultivated land can be worse than the productivity of the land of the worst condition. In that case, the land

stages theory, not directly applicable to the study of the features of Japanese capitalism, over which the Koza school and the Rono school were in dispute.

²⁰ Uno (1980) p.98. Uno also emphasizes that this is a particular form of value determination under the capitalist mode of production. See Uno (1980) p.104,5. As for the concept of value in the Uno school analysis, see also Itoh (1980) and Sekine (2013). Itoh (1980) ch.3 is a useful introduction to the Unoist theory of market value.

²¹ Some ecological Marxists, like Moore (2015), have studied Marxian value theory in relation to ecological issues in order to show the theoretical comprehensiveness of Marxian thought. Though value theory is the fundamental principle in Marxism, we believe it is not an appropriate strategy for Marxism to encapsulate all social matters in a so-called “law of value”: Marxian theory contains diversified aspects, which are at the same time all related mutually and systematically. We cannot demonstrate how we understand the holism of Marxian political economy here in its entirety, limiting our study to examining the relation between Marxian price equations and the rent theory. The Unoist group has been engaged in clarifying the interrelations between various aspects of Marxian political economy and Obata (2009) is the latest attempt. Obata’s attempt is, however, methodologically different from a conventional Unoist one. See Obata (2016, 2019) to find out his idea in English. We owe our general understanding of Marxian political economy greatly to Obata.

²² Ouchi (1958) and Hidaka (1962). It is noteworthy that Uno himself was very much opposed to the idea of the two and supported Marx. See Uno (1980) pp.100,1 and 106,7.

of the worst productivity yields DR-2. This is how the “differential rent also on the worst cultivated soil” is obtained and consequently all the existing lands accrue ground rent.

Their argument on differential rent is very similar to Ricardo’s theory, though they stress the process of establishing the landed property. Thus, absolute rent, which is not found in Ricardo’s rent theory, comes to the fore in their study of Marxian rent theory.

As we have seen in the earlier section, Marx assumes the productivity of agriculture is worse than that of industry, thus the organic composition of capital is lower in agriculture than in industry. This means that the value of agrarian product is higher than its price of production, and this differential makes the origin of absolute rent, according to Marx.

It was Kautsky who first doubted this assumption. This question is posed in the form of the critique of Rodbertus as follows.

Although agriculture uses much less raw material than other branches of capitalist economic activity, its outlays on machinery and buildings – silos, stalls, drainage and so on – rise steadily in step with technical progress. It is very doubtful whether intensive agriculture could be practiced with a lower than average composition of capital.

The turnover time of capital is also relevant in the calculation of profit. The capitalist’s rate of profit is the ratio of the mass of profit obtained in a given period (say, a year) to the total capital employed. Given a uniform organic composition of capital and size of enterprise, the total amount of capital used will have to be larger, the slower the turnover of capital. In agriculture, the turnover of capital is especially slow – and a slower than average turnover can negate any surplus-profit emanating from other sources. ...

Rodbertus was therefore wrong to suppose that the lower composition of capital in agriculture necessarily produces a surplus-profit whenever agricultural products are sold at their values. First, there is nothing necessary about this lower composition, and secondly, its effects can be more than offset by the slowness of agricultural capital’s turnover.²³

Realizing this problem, Kautsky had to reduce the category of absolute rent into that of monopoly rent: absolute rent is the product “of the excess of market-prices over prices of production” and “[h]ow they did this is the method adopted by all cartels – restricting output to raise prices.”²⁴

Ouchi and Hidaka took Kautsky’s question as reasonable, but did not accept Kautsky’s answer. Certainly, it is not plausible to regard the value higher than the price of production to be the source of absolute rent: the products are sold at the price of production, not at its value, and rent is paid from the profit gained from the sale at the price of production. Thus, Kautsky was right in that he thought absolute rent to be the excess over the prices of production, yet the mechanism of absolute rent cannot be identified with that of cartel.

Ouchi and Hidaka solved this problem by extending their analysis of DR-2. In the phase where all the existing lands are privately owned and yield differential rent, the lands which are newly discovered are to be privately owned in expectation of generating rent. As a result, when capitalists use the new lands, the landowners require them to pay rent, the upper limit of which is demarcated by DR-2 in the existing lands. Ouchi and Hidaka clarified that absolute rent should be discussed not in relation to the distinction between value and price, but in relation to the landed property itself.^{25,26}

²³ Kautsky (1988) pp.78,9.

²⁴ Kautsky (1988) pp.80,1.

²⁵ Uno objects to Ouchi and Hidaka also in this regard. See Uno (1980) p.107.

²⁶ Fine (1979) also points out that absolute rent “cannot rise above the DR-II associated with the surplus profits of intensive cultivation on existing lands, for otherwise the intensive cultivation would take place at the expense of the extensive.” (Fine, 1979, p.262) Nevertheless, it is not mentioned here that the assumption that Marx made is no longer necessary if this mechanism holds.

Ouchi and Hidaka's rent theory has long achieved a standard in the Marxian political economy in Japan.²⁷ Nevertheless, it is questionable that theoretical deduction of the landed property system is indeed necessary. Capital-land relation is a class relation just as capital-labour relation is. When we consider wage labourers in theory, we do not demonstrate how the working class is formed amid capitalist industrial investments: the formation of wage labourers is a historical precondition for capitalist society, the process of which is given as a primitive accumulation. Why can we not just analyse the establishment of landed property as a historical process, as we do in discussing a primitive accumulation?²⁸

If we exclude the issue of establishing a landed property system from the theoretical subject, the category of absolute rent gains more importance, as this is the main point where Marxian rent theory departs from the Ricardian. And here we can undertake in more detail Marxian analysis of class relation between the capitalist and the landowner.

3. Ground Rent Analysed by Price Equations

According to Ouchi and Hidaka, landowners of the new soils can earn absolute rent by taking advantage of opportunities of leasing them to the capitalists. Here they ignore the case where landowners compete with each other and make rent go down themselves. It is not only capitalists but also landowners who face competition. We have to consider two cases here at least: when landowners have caught up in a price war, the absolute rent will be reduced to zero in theory; absolute rent can be gained only insofar as the landowners are in collusion with each other and can effectively prevent their competition.

Obata is the first indicating the idea that the collusion between the landowners is a precondition of absolute rent. Based on this finding, he simplifies the rent theory as follows. Suppose two kinds of land with different fertility. Each kind of land is owned by two or more landowners. When the social demand for the product is sufficient for cultivating all lands, the landowners of the superior soil get differential rent. On the other hand, even if the current social demand falls short of using the inferior land, capitalists can want to use it in expectation of expanding production. In this latter case, absolute rent can arise as long as the landowners of the inferior soil avoid their price war. If the landowners of the inferior soil compete with each other, there is no rent for using the inferior land.²⁹

There occurs a class struggle between the capitalist and the landowner over the formation of absolute rent. Absolute rent indicates the strong bargaining power exerted by the landowning class, just as high wages are the fruit of collective bargaining of the workers against capitalists. Capitalists are keen to undermine the alliance of landowners in order to reduce rent. The trajectory of the struggle should be followed by historical and empirical studies.

Marxian class analysis thus covers not only the capital-labour relation but also the capital-land relation. By investigating absolute rent as such, we eventually can grasp how "all three classes – wage labourers, industrial capitalists, and landowners" constitute "together, and in their mutual opposition, the framework of modern society."³⁰ Indeed, in the final part of *Capital* Vol.3, Marx maintains "[c]apital – profit, land – ground rent, labour – wages, this is the trinity formula which comprises all the secrets of the social production process."³¹ Revealing these "secrets" is one of the aims of Marxian political economy and should include a careful examination of the interrelations of "the trinity formula".

²⁷ For an English available example, see Itoh (1988) pp.235-49.

²⁸ In Marx's rent theory, landed property is not only "a prerequisite and condition of the expropriation of the labourer from the means of production," but also the landowners appear "as the personification of one of the most essential conditions of production." (Marx, 2010d, p.808) Moreover, some Marxists deem landed property not only as preconditions but also as results of the capital-labour relation. See Kay (1979) pp.49,50 and Burkett (1999) pp.92,3.

²⁹ Obata (2009).

³⁰ Marx (2010d) p.612.

³¹ Marx (2010d) p.801.

Nevertheless, the class relation between the capitalist and the landowner has not been fully studied. While there are tremendous amounts of studies of capital-labour relation, we have paid too small attention to the landowning system under capitalism. This is not only because absolute rent has not gained much interest, as we have discussed above, but also the rent theory has not been sufficiently formulated. As we have not clarified how the product of the land is used in other sectors, we cannot know what kinds of effects are caused by the change in the amount of rent. If we consider the change in absolute rent as the indicator of class relation, we should investigate how its effect spreads in the capitalist economy.

Mathematical formulation has greatly proceeded regarding the theory of prices of production. This includes the formulation of input-output structure of social reproduction. Marx himself contributed to it by examining reproduction schema in *Capital* Vol.2, yet it is not used when he discusses the prices of production.³² Through the dispute over the “transformation problem”, Marxian economists become used to the analysis of price equations with input-output relations. Nevertheless, most of the discussions are devoted to the relationship between value and price, as the most important issue to be addressed was the “transformation problem”. The price equation was not applied as much to other topics of Marxian economics, including rent theory.

Here we shall use very simplified price equations to consider the effects of the changes in rent. Let \mathbf{p} be the price vector, r the scalar profit rate, \mathbf{A} the matrix of production. Assume the wages and labour are replaced with the means of subsistence and already integrated into the matrix of production. The price equation will then be

$$\mathbf{p} = (1 + r)\mathbf{A}\mathbf{p} \quad (1)$$

We shall discuss a two-sector model here for the sake of simplicity. Equation (1) can also be shown as the following simultaneous equations in a two-sector model:

$$\begin{cases} p_1 = (1 + r)(a_{11}p_1 + a_{12}p_2) \\ p_2 = (1 + r)(a_{21}p_1 + a_{22}p_2) \end{cases} \quad (2)$$

Here, the production coefficient, $a_1 = (a_{11}, a_{12})$, indicates the condition of production in sector no.1. Land is one of the conditions of production and the difference in land productivity means the difference in the production coefficient.

Let us suppose that there are two conditions of production in sector no.1: the one is only available with limited land (e.g. waterfall, in Marx’s example) and the other is available without limitation (e.g. steam engine). Meanwhile, sector no.2 has also two conditions of production, both of which are inseparable from land. Sector no.1 could represent manufacture, while sector no.2 agriculture.

In rent theory, we have been exclusively concerned with the situation like in sector no.2. However, the change in sector no.2 does affect the production in sector no.1 through an input-output relation. Take the following numerical examples for the above four conditions of production:

$$s_1 = \left(\frac{9}{20}, \frac{7}{20} \right) \quad (3)$$

$$t_1 = \left(\frac{11}{20}, \frac{1}{5} \right) \quad (4)$$

$$s_2 = \left(\frac{1}{2}, \frac{3}{10} \right) \quad (5)$$

³² Marx was aware that “for the buyer the price of production of a specific commodity is its cost price, and may thus pass as cost price into the prices of other commodities.” However, he did not go into detail, saying “[o]ur present analysis does not necessitate a closer examination of this point.” (Marx, 2010d, p.164)

$$t_2 = \left(\frac{1}{4}, \frac{1}{8}\right) \quad (6)$$

Let us assume that s_1 is the only one that is freely available: the other three, t_1 , s_2 , t_2 , are owned by landowners.

When the landowners securely obtain rent in sector no.2, the price of production in sector no.2 is determined by s_2 , since s_2 is inferior to t_2 (assume the landowners of s_2 earn no rent for simplification). The productivity of s_1 and t_1 cannot be compared without prices: it is shown as the profit rate achieved by using each condition of production.³³ To calculate the prices of production by s_1 and s_2 , we substitute equations (3) and (5) for the matrix of production in equation (2) and get

$$\begin{cases} p_1 = (1 + r)\left(\frac{9}{20}p_1 + \frac{7}{20}p_2\right) \\ p_2 = (1 + r)\left(\frac{1}{2}p_1 + \frac{3}{10}p_2\right) \end{cases} \quad (7)$$

By putting $\frac{1}{1+r} = \lambda$, we develop equation (7) and obtain

$$(20\lambda + 1)(5\lambda - 4) = 0 \quad (8)$$

thus $\lambda = -\frac{1}{20}, \frac{4}{5}$. When $\lambda = -\frac{1}{20}$, we get $\mathbf{p} = (-7, 10)$ from equation (7). This is economically nonsense. Hence, the answer should be the other λ , and here we get $\mathbf{p} = (1, 1)$, $r = 0.25$, which are economically meaningful.

Under this price, the productivity of t_1 is evaluated as follows:

$$p_1 = (1 + r)\left(\frac{11}{20}p_1 + \frac{1}{5}p_2\right) \quad (9)$$

Substitute (1,1) for \mathbf{p} and we get $r = \frac{1}{3} (\approx 0.33)$. On the other hand, the productivity of s_1 was counted as 0.25. Thus, t_1 is superior to s_1 . Consequently, the landowners of t_1 earn rent and s_1 determines the price of production together with s_2 .

This forms one case of equilibrium. However, as we have shown above, absolute rent can be undermined when the competition between landowners cannot be effectively prevented. In that case, s_2 can no longer determine the price of production in sector no.2 and the price of the product falls. When s_1 and t_2 determine the prices of production, we get $\mathbf{p} = (2, 1)$, $r = 0.6$. This price means that the productivity of t_1 should be calculated as $\frac{7}{13} (\approx 0.54)$. Hence the interchange in productivity, i.e. s_1 turns out to be superior to t_1 . Here the landowners of t_1 can no longer earn any kind of rent, since using s_1 is not limited by land-ownership.³⁴

³³ Neo-Ricardians consider this problem in relation to the change in wages. See Sraffa (1960), Kurz (1978) and Mainwaring (1984).

They discuss the change in ordering of qualities of lands with the change in wages. In our Marxian price equations, the wages are given, yet this does not mean the interchange of productivity does not occur, as we shall see later. Also, as far as I know, neo-Ricardians concentrate on studying differential rent. The study of absolute rent and the class conflict over it remains as one of the Marxian issues.

³⁴ I once studied the reversal of productivity in Marxian economics in Ehara (2018). In this paper, all four conditions of production are supposed to be freely available for capitalists. This is the assumption of the theory of market value in *Capital* Vol.3 (Ch.10, "Equalisation of the General Rate of Profit Through Competition. Market Prices and Market Values. Surplus Profit"). Considering fixed capital, the capitalists cannot swiftly change conditions of production from the inferior one to the superior one, thus different conditions of production should coexist in the same sector even if all conditions are not limited

In this vein, the loss of absolute rent in one sector can result in the loss of rent in another sector. The decrease in rent can bring a chain reaction. The landowners in our example, therefore, seek for an intersectoral alliance to protect interest as the landowning class. The capitalists are, on the other, eager to diminish the power of the landowners extended over the sectors. We can thus observe the class struggle between the capitalist and the landowner in rent theory that is reinvestigated by the price equations.³⁵

4. Land Improvements by Capitalists and Landowners

The amount of rent is not the only issue of class conflict between the two classes. If the land productivity tends to decrease with the intensive investment, as Hidaka and Ouchi suggest, it is necessary to improve productivity in due course. Even when we do not assume this tendential fall in productivity, there is an economic incentive for land improvement if possible. There is also a need for new land development as the economy expands. Nevertheless, the land improvement and development do cost. It must be a problem who bears the cost.

It is not only the monetary cost that the two classes impose on each other. The land improvement often entails environmental problems: road construction leads to an increase in CO₂ emission; dam building accompanies an ecological change; irrigation hastens desertification. As we shall see soon later, the environmental destruction caused by the land improvement is critical in nature. This ecological cost will be a conflicting issue as soon as it is revealed.

In Marx's rent theory, we find an insightful explanation on the nature of land improvement, which he calls the investment of "*la terre-capital*" or "land-capital"³⁶. He classifies it into two types: a transitory one, like "improvements of a chemical nature, fertilization, etc." and a permanent one, "as in drainage canals, irrigation works, levelling, farm building, etc."³⁷ According to Marx, both are made by the capitalist, whose intention is to increase the output.

However, "as soon as the time stipulated by contract has expired ... the improvements incorporated in the soil become the property of the landowner as an inseparable feature of the substance, the land."³⁸ The new rent is thus boosted by the incorporated improvements. "Quite aside from the movements of ground rent itself, here lies one of the secrets of the increasing enrichment of landowners, the continuous inflation of their rents, and the constantly growing money value of their estates along with progress in economic development."³⁹

Here we find an obstacle to land improvements by capitalists. For the capitalist "avoids all improvements and outlays for which he cannot expect complete returns during the term of his lease."⁴⁰ Marx seems to be aware of the problem of who bears the cost of land improvement.

by any landowners. In this paper, we assume the landed property, hence limitation to the availability of the conditions of production.

³⁵ This is one possibility. The other possibility is the opposite case where s_1 is owned by landowners (e.g. waterfall) and t_1 is freely available (e.g. steam engine). Then the reverse holds: when absolute rent is secured in sector no.2, no rent in sector no.1; when absolute rent is lost in sector no.2, rent occurs in sector no.1. In this case, there is no ground for landowners to forge an intersectoral alliance. Rather, they have an incentive to disturb the intra-collusion with each other to survive as rentiers, though they still need cooperation within the same sector to secure absolute rent. The strength and range of the class interest can differ along with the state of social reproduction on which they are based.

³⁶ Marx (2010d) p.613.

³⁷ Marx (2010d) p.613.

³⁸ Marx (2010d) pp.613,4.

³⁹ Marx (2010d) p.614.

⁴⁰ Marx (2010d) p.614.

The conflict could be grasped more clearly by using our findings in the previous section. When the power of the landowners is strong enough, they can secure rent from capitalists at any occasion. On the basis of this stable income, landowners can make capitalists invest in land improvements even when the land-capital lasts longer than the contract. Of course, landowners cannot force capitalists, yet can incentivize investment by discounting rent.

Let c be the monetary cost of land improvement, i the increase in income by the improvement, l the term of the lease. If the capitalist is to invest in the improvement, the capitalist must earn cr as the profit for this investment. Also, since the capitalist regards the land-capital as fixed capital, the depreciation must be calculated. This should be $\frac{c}{l}$ in the simplest calculation. The landowner can make the capitalist carry out this project by abandoning part of the additional income and satisfying with obtaining $i - (cr + \frac{c}{l})$. This method practically means that the landowner buys the land-capital in instalments, as it were, from the capitalist.⁴¹

The obstacle to the land improvement, therefore, is not the duration of the land-capital itself. Regardless of whether the land improvement is temporary or permanent, the capitalist can make the improvement insofar as the landowner can properly give an economic incentive.⁴²

Nevertheless, this method can be taken only insofar as the landowner can expect a regular income during the term of the lease. As we have seen in the previous section, this is not guaranteed in case of weakening power of landowning class. It is possible that the landowner loses rent when the capitalist class succeeds in trapping landowners into price wars.

At the same time, the landowners lose funds for incentivizing the improvements. Even in this case, the capitalists undertake a temporary improvement if the duration is fully covered by the term of the lease. However, no capitalist is willing to make a permanent improvement of land, as Marx points out.

It is the landowners who make permanent improvements under this situation. The landowners cannot help doing so, because they are losing rent as a result of competition. This leads to the downfall of small landowners, who do not have sufficient funds for land improvement. When the power of landed property is undermined, the landowners can survive only by spending their own money in improving the existing land or cultivating new land.

Indeed, Marx does not seem quite conscious of the role played by the landowners in land improvements. However, it is certain that Marx clearly recognizes that the landowners are responsible for ecological effects of land improvements. Marx's real insight lies in his focus on permanent improvements, which are considered as an exclusive role of landowners in the latter case of our analysis shown above. Marx revisits this topic in the last part of his analysis of differential rent as follows:

The so-called permanent improvements – which change the physical, and, in part, also the chemical conditions of the soil by means of operations requiring an expenditure of capital, and which may be regarded as an incorporation of capital in the soil – nearly all amount to giving a particular piece of land in a certain limited locality such properties as are naturally possessed by some other piece of land elsewhere, sometimes quite near by. One piece of land is naturally level, another has to be levelled; one possesses natural drainage, another requires artificial drainage; one is endowed by Nature with a deep layer of top soil, another needs artificial deepening; one clay soil is naturally mixed with the proper amount of sand, another has to be

⁴¹ Obata (2012) explains this method by giving a numerical example.

⁴² Harvey (2006) regards land improvements to be a conflicting issue in the class struggle between capitalists and landowners. But he argues that the long physical lifetime of land-capital makes the capitalist land improvement difficult (Harvey, 2006, p.364). This is true in practice due to the ambiguities of amortization, yet here we need to contemplate theoretical possibility.

treated to obtain this proportion; one meadow is naturally irrigated or covered with layers of silt, another requires labour to obtain this condition.⁴³

Levelling, drainage, deepening, sand mixture, irrigation – these are all irreversible changes of nature by humankind. Hence, the damage possibly incurred is also irreversible. Certainly, the environmental damage caused by a temporary land improvement is also seriously predatory, as shown in Marx's famous example of plundering guano.⁴⁴ Moreover, even if we find another way of improvement without relying upon predatory activities, the alternative method can be unexpectedly harmful.⁴⁵ We do not mean a temporary land improvement is always environmentally friendly. However, while a temporary improvement might be averted in some way, a permanent land improvement causes permanent effects upon the environment and thus cannot be fixed anymore.

Marx discusses how the fruit of the improvements should be understood in the following sentences.

It is indeed a truly amusing theory, whereby here, in the case of one piece of land whose comparative advantages have been acquired, rent is interest, whereas in the case of another piece of land which possesses these advantages naturally, it is not interest. ... However, land yields rent after capital is invested not because capital is invested, but because the invested capital makes this land more productive than it formerly was. ...

This rent too, which may be resolved into interest, becomes pure differential rent as soon as the invested capital is redeemed. Otherwise, one and the same capital would have to exist twice as capital.⁴⁶

Here Marx maintains it is “a truly amusing” to consider rent as interest for capital investment. Rent is based on land, not capital, “because the invested capital makes this land more productive than it formerly was.” It necessarily follows that the landowner exists as an independent class and gains rent, not interest, for the permanent land improvement.

Hence Marx does not forget to refer to the landowner when he discusses the damage caused by the land improvement. In the final chapter of his rent theory, he states:

[1] Here, in small-scale agriculture, the price of land, a form and result of private landownership, appears as a barrier to production itself. In large-scale agriculture, and large estates operating on a capitalist basis, ownership likewise acts as a barrier, because it limits the tenant farmer in his productive investment of capital, which in the final analysis benefits not him, but the landlord. In both forms, exploitation and squandering of the vitality of the soil ... takes the place of conscious rational cultivation of the soil as eternal communal property, an inalienable condition for the existence and reproduction of a chain of successive generations of the human race. [2] In the case of small property, this results from the lack of means and knowledge of applying the social labour productive power. In the case of large property, it results from the exploitation of such means for the most rapid enrichment of farmer and proprietor.⁴⁷

In the above quotation, Marx compares the large landed property with the small one and insists that both forms necessarily cause “exploitation and squandering of the vitality of the soil”. In the first part signed with [1], it is maintained that the large land-ownership is “a barrier” to the “productive investment of capital”, because it does not benefit the capitalist. This notion is the same with the claim we have seen in the upper part of this section that the capitalist “avoids all improvements and outlays for which he cannot expect complete returns during the term of his lease.” The large landed property would be regarded as

⁴³ Marx (2010d) p.733.

⁴⁴ See Marx (2010c) p.247.

⁴⁵ See Saito (2017) p.202-12. Saito does not, however, distinguish the effect of permanent change from that of capitalist expansion in general.

⁴⁶ Marx (2010d) p.734.

⁴⁷ Marx (2010d) p.798,9.

favourable from this viewpoint so long as it limited the “productive investment of capital” that results in “exploitation and squandering of the vitality of the soil.”

However, we have confirmed that the capitalist invests in land improvements provided that the capital-land relation is properly coordinated. In addition, the landowners themselves also have an interest in permanent land improvements. Hence, when environmental destruction occurs as a result of land improvement, the landowner as well as the capitalist should be considered as an undertaker. Indeed, in the latter part of the above quotation with the sign of [2], Marx admits that “exploitation and squandering of the vitality of the soil” is precipitated by “the most rapid enrichment” of “proprietor” as well as “farmer”. In this view, the landowner is also responsible for the “exploitation and squandering” as a matter of course.

Conclusion

We assume the above reconstruction contributes to further understanding of the following quotation from *Capital* Vol.3, which has provoked a heated debate over Marxian ecology:

It [large landed property] thereby creates conditions which cause an irreparable break [Riß] in the coherence of social interchange [Stoffwechsel] prescribed by the natural laws of life. As a result, the vitality of the soil is squandered, and this prodigality is carried by commerce far beyond the borders of a particular state (Liebig).⁴⁸

This recognition of the “metabolic rift” or „Riß des Stoffwechsels“ has been emphasized by ecological Marxists, while anti-Marxists condemn the lack of systematic view of ecological issues in Marx’s theory. Ecological Marxists have devoted great effort to show the coherence of Marx’s ecological thought in this argument.

Nevertheless, in order to complete ecological Marxism, we consider it indispensable to finish Marxian rent theory as a critical standpoint of studying the landed property system under capitalist mode of production. True, the “prodigality is carried by commerce”, viz. by the capitalist. However, it is not “capitalist mode of production” itself but “large landed property” that Marx deems causes the “metabolic rift”. It is here necessary to clarify how landowners as well as capitalists take part in the exploitation of nature.⁴⁹ This study must be at the same time consistent with Marxian analysis of class struggle. We believe Japanese long discussions of rent theory give us a clue to solving this conundrum.

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⁴⁸ Marx (2010d) p.789.

⁴⁹ Foster (2000) p.156 quotes Marx’s following passage in order to highlight capitalist activities which are to be the centre of “metabolic rift”: “[t]he soil is to be a marketable commodity, and the exploitation of the soil is to be carried on according to the common commercial laws. There are to be manufacturers of food as well as manufacturers of twist and cottons, but no longer any lords of the land.” (Marx, 2010a, p.333) This article of Marx, which first appeared on *New-York Daily Tribune* dated August 25, 1852, begins with the description of the capitalists who are “to eradicate the last arrogant remnants of feudal society.” (Marx, 2010a, p.333) In this context, the landowners who are to be eradicated should be taken as feudal landed aristocracy: the above passage does not mean that there should be no land-ownership worth considering in capitalist societies. It remains to be assessed how the landed property is transformed under the capitalist mode of production.

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