REVIEW ARTICLE

Morishima on Ricardo

Heinz D. Kurz and Neri Salvadori*

(Reviewing: Michio Morishima, Ricardo's Economics. A General Equilibrium Theory of Distribution and Growth, Cambridge, CUP, 1989)

1. Introduction

As Professor Morishima tells the reader in the Preface to his book *Ricardo's Economics*. A General Equilibrium Theory of Distribution and Growth, 'this volume is not primarily a book on history of economic analysis but a reappraisal of past great economists from the viewpoint of contemporary economic theory' (p. vii).¹ Together with Marx's Economics (1973) and Walras' Economics (1977) it forms a trilogy. Originally intending to conclude with a book on Keynes, Professor Morishma instead chose to write on Ricardo because the latter was 'Marx's and Walras' common guru' and thus occupies an important place in the history of the emergence of economic ideas. More particularly, Ricardo, who advocated 'Say's law of markets', seems to be the natural author to start with in order to study the 'transition' to Keynes, who rejected the law. It is indeed the investigation of this transition which forms the main concern of Ricardo's Economics (p. viii). Therefore, the book is almost as much about Marx, Walras and Keynes, as it is about Ricardo.

Professor Morishima claims to concentrate on the main work: Ricardo's On the Principles of Political Economy, and Taxation. In the Introduction he writes:

I have never been a historian of economic thought but have been an economic theorist throughout my life. With such a speciality, I believe, I am allowed to concentrate solely on their main works; and by making this constraint I am able to read these works more deeply and more rigorously than specialists in the history of economic thought, so that present-day economists can learn from them (p. 3).²

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¹ References to *Ricardo's Economics* are indicated by page numbers alone. Ricardo's writings are referred to as *Works*, volume number and page number (Sraffa edition).

² On p. 4 of his book Professor Morishima points out 'that, for all editions [of the *Principles*] published while Ricardo was alive, there was a comma between "political economy" and "and taxation" in the title'. While this is correct, it seems to have escaped Professor Morishima's attention that the title reads 'On the Principles ...' rather than 'The Principles ...' (p. 2, footnote 5).

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This is not the only limitation of Professor Morishima's book. Apart from setting aside most of Ricardo's correspondence, his other published and non-published works and his parliamentary speeches as they are available in the eleven volumes of *The Works and Correspondence of David Ricardo*, edited by Piero Sraffa with the collaboration of M. H. Dobb (1951 ssq., hereafter *Works*), Professor Morishima leaves out of consideration almost all the secondary literature on Ricardo. Indeed, there are few references to books or articles devoted to an investigation of Ricardo's analysis as a whole or specific parts of it. Yet there is an abundance of cross-references to Professor Morishima's own works. It should come as no surprise that the entire volume is largely Professor Morishima in the garb of Ricardo.

The main message of the book is that the analyses of Ricardo, Marx and Walras are much more similar than is generally held in contributions to the history of economic doctrines. Professor Morishima, in comparing the three approaches, sees essentially a *unité de doctrine*. Existing differences in the theory of value and distribution are 'of minor or secondary importance':

We may thus conclude that Ricardo, Marx and Walras constitute a trio. The first developed a general-equilibrium model of economic growth verbally, logically, and the second extended it in a number of directions and examined interesting novel mathematical properties that were concealed within it, again with no explicit use of mathematical formulas, while the third put the model into a rigorous mathematical form and, by doing so, made it operationally more workable (p. 4).

The book is divided into five parts, each of which is subdivided into two chapters, except the fifth part, which contains three chapters. Part I deals with Ricardo's theory of value and his explanation of extensive and intensive rent. Chapter 1 contains an attempt to establish the view that Ricardo's approach to the theory of prices is based on marginalism; chapter 2 is concerned with refuting Pasinetti's 1960 interpretation of Ricardo's theory of the rent of land. Part II is dedicated to a discussion of wages and profits. Chapter 3 focuses on the inverse relationship between the two distributive variables; in it Professor Morishima launches a frontal attack on Sraffa's concept of the Standard commodity and the distribution formula based on it. Chapter 4 is devoted to yet another exposition of what appears to be one of Professor Morishima's favourite subjects: the so-called 'Fundamental Marxian Theorem' and the generalised version of it. Professor Morishima takes the opportunity to reply to some of the critics of his earlier contributions on the matter. Part III turns to the theory of accumulation and growth. In chapter 5 the problem is discussed within the framework of a closed economy; the alternative interpretations suggested by Casarosa (1985) and Samuelson (1966) are rejected on the grounds that they 'distort Ricardo's theory immensely' (p. 121). Chapter 6 deals with the open economy and attempts to 'correct', 'revise' and 'modernize Ricardo's theory of foreign trade' (p. 134). In part IV Say's law is discussed. In chapter 7 it is interpreted in such a way that it 'rules out unemployment of labour and capital' (p. 153). On the basis of this interpretation chapter 8 then argues that Ricardo, who advocated the law in the Principles, was wrong in maintaining that the introduction of machinery may cause unemployment. Finally, part V compares what are called the 'three paradigms', which are now identified as the economics of Ricardo, Walras and Keynes, respectively. Chapter 9 deals with several authors, ranging from Marx and J. S. Mill to Walras, Wicksell and Schumpeter, certain elements of whose analyses point in the direction of an abandonment of Say's Law. It is in fact Professor Morishima's contention that the various contributions to economic theory should be divided into two groups only: those which are based on Say's Law, and those which are not. Chapter 10 highlights what Professor Morishima considers to be the main difference

between the economics of Ricardo and Walras and that of Keynes in terms of a twosectoral model. The concluding chapter is concerned with the problem of the periodisation of economic theory and attempts to locate what is called 'the epoch of Ricardo's economics'. To this effect an 'anti-Say's Law index' is constructed, which relates that part of investment which 'is decided entirely independently of savings' (p. 237) to total investment undertaken in the economy.

In what follows, attention will focus on those parts and passages of the book, which, in our view, are either based on a misreading of Ricardo or major interpreters of Ricardo, such as P. Sraffa and L. Pasinetti, or are difficult to sustain from a theoretical point of view. We shall not enter into a discussion of Professor Morishima's extensive digressions into Marx's and Walras's economics. Taking the title of the book seriously, emphasis is placed on what *Ricardo's Economics* has to offer on the economics of Ricardo.

While the present paper is mostly critical of Professor Morishima's book on Ricardo, the authors wish to emphasise that in their view his book deserves the credit for having enriched the debate about the interpretation of the classical economists, and in particular Ricardo, with new and original ideas. Moreover, Professor Morishima has contributed in important ways to the time-honoured question of how different schools of economic thought relate to one another. Last but not least, the authors wish to express how much they owe to the works of Professor Morishima for their own training as economists. Therefore, the critical remarks that follow should be seen in the light of Ricardo's last letter to T. R. Malthus, dated 31 August, 1823 (see Works, IX, p. 382).

The structure of the paper is as follows. In Section 2 we shall briefly deal with the length of the period of production in agriculture and manufacturing, respectively. Section 3 turns to theory of rent and Professor Morishima's criticism of the interpretation put forward by L. Pasinetti some thirty years ago. Section 4 deals with the treatment of fixed capital in Ricardo's theory of value. In Section 5 Professor Morishima's discussion of the problem of the standard of value will be scrutinised. Next, in Section 6, we shall briefly comment on his view of Ricardo's dynamical analysis. Section 7 turns to Ricardo's approach to trade theory. Say's law and Ricardo's opinion on machinery are dealt with in Section 8. Section 9 contains some conclusions.

2. The production period

Professor Morishima contends that Ricardo 'actually assumed the production period to be 1 [year] for agriculture and 0 for manufacturing industries' (p. 20). However, he provides no textual evidence in support of his view that in Ricardo production is instantaneous in manufacturing. Indeed, no evidence to this effect exists in Ricardo's writings.

Ricardo's views on the production process are most clearly expressed in his disquisitions on the 'invariable measure of value'. As is well-known, Ricardo was of the opinion that relative natural prices are generally not fully explained in terms of the quantities of labour needed directly and indirectly in their production. The deviation of relative prices from relative quantities of labour 'embodied' derives from the differences in the technological characteristics of the various production processes. These differences Ricardo attempted to capture in various ways (see Kurz and Salvadori, 1989). In his letter to McCulloch of 13 June 1820, Ricardo hinted at what appeared to him to be the most abstract formulation of the circumstances which account for the deviation under consideration: 'All the exceptions to the general rule [i.e. the labour embodiment rule] come under this one of time'; and 'there are such a variety of cases in which the time of completing a commodity

may differ' (Works, VIII, p. 193). This idea was taken up again in his essay 'Absolute Value and Exchangeable Value', in which he emphasised: 'In this then consists the difficulty of the subject that the circumstances of time for which advances are made are so various' (Works, IV, p. 370).

The commodity Ricardo was in search of as a 'perfect' standard of value was supposed to somehow reflect the 'medium between the extremes' (cf. Works, IV, p. 372):

That commodity produced by labour employed for a year is a mean between the extremes of commodities produced on one side by labour and advances for much more than a year, and on the other by labour employed for a day only without any advances, and the mean will in most cases give a much less deviation from truth than if either of the extremes were used as a measure (*Works*, IV, p. 405).

The basic idea underlying this concept seems to be that 'the variety of circumstances under which commodities are actually produced' (*Works*, IV, p. 368) can be expressed in terms of a single variable, that is, the time that elapses between an initial expenditure of labour and the completion of the product. In other words, Ricardo appears to start from the supposition that commodities can be distinguished in terms of the length of their production periods. He explicitly rejected the standard suggested by Malthus, i.e. a commodity produced by labour employed for a day only without any advances. A particular case of such instantaneous production introduced by Malthus for illustrative purposes consists of silver picked up at the sea shore. Malthus's measure, Ricardo objected, is of such an extreme and exceptional nature that it cannot be considered to represent 'the circumstances under which the greater number of commodities are produced' (*Works*, IV, p. 372). Hence, to maintain, as Professor Morishima does, that Ricardo envisaged the entire manufacturing sector as characterised by instantaneous production appears to be in stark contrast to Ricardo's own writings.¹

To conclude, it deserves to be mentioned that with some circularity of production Ricardo's idea of a (finite) production period necessarily breaks down, while with unidirectional processes of production it is applicable in very special cases only. There is ample evidence that Ricardo was aware of the fact that most commodities are produced by means of commodities. However, he did not succeed in grasping fully the implication of the interindustry relationships for his theory of value and distribution and his specification of the standard of value. (On the latter, see Section 5 below.)

3. Rent theory

While Professor Morishima assumes all land to be homogeneous in quality in chapter 1, he extends the analysis to cover the case where land 'is differentiated in quality into several or infinitely many classes' (p. 36) in chapter 2. The assumptions underlying Professor Morishima's simplified analysis are essentially the same as those adopted by Pasinetti in his article 'A Mathematical Formulation of the Ricardian System', published in 1960.² The assumptions are (cf. Pasinetti, 1974, p. 7):

- (i) there is only one type of agricultural product, called 'corn';
- (ii) corn is the only wage-good and capital consists entirely of the wage-bill, i.e. corn is produced by labour and land only.

² See Pasinetti (1960), reprinted in Pasinetti (1974); in what follows all references will be to the 1974 collection of essays.

¹ In private correspondence Professor Pasinetti pointed out to us that since Ricardo took both the production period in agriculture and the average production period of all commodities to be one year (the first fact being acknowledged by Professor Morishima), it would have been impossible for Ricardo to assume the average production period in manufacturing to be zero.

According to Professor Morishima, Pasinetti's formalisation of Ricardo's approach to the theory of rent is fundamentally flawed. His main objection reads:

Pasinetti does not classify various sorts of land according to their quality. He instead has only one aggregate production function for agriculture as a whole, with the logical consequence that he is unable to explain the rent of a land as the surplus which it yields... His theory of rent, accordingly, can hardly be a theory of differential rent, though it may be called a marginal productivity theory of rent (pp. 50–51; similarly p. 38).

Professor Morishima maintains that, given these assumptions, 'there is no simple aggregate production function for agriculture' (p. 103), if land is diversified in quality. The solution he suggests is a separate production function for each quality of land.

This claim, however, cannot be sustained. In what follows, Pasinetti's approach to Ricardo's theory of rent will be reconstructed starting from Sraffa's chapter on 'Land' (Sraffa, 1960, ch. XI). For this purpose Sraffa's analysis of extensive and intensive rent will be summarised briefly and, given the simplifying assumptions (i) and (ii), a production function for agriculture as a whole will be constructed.

Sraffa's analysis

In his chapter 'Land', Sraffa extends his analysis to cover the case of natural resources which are used in production and, if they are in short supply, enable their owners to obtain a rent. In accordance with previous chapters, Sraffa starts from a given system of production, i.e. given quantities of the commodities produced and given methods of production in use, and a given distribution of income between wages and profits. He then indicates how such a constellation can be conceived 'as the outcome of a process of "extensive" \dots [or] "intensive" diminishing returns' (Sraffa, 1960, p. 76). Elaborating on Sraffa's approach, several contributions were concerned with the study of changes in the relations between the distributive variables (including rents) and prices, corresponding to autonomous changes in one of the distributive variables (the rate of profits r or the wage rate w) or in outputs.¹

In general, the scarcity of natural resources is reflected in the co-existence of two or more processes producing the same commodity.² In the pure case of *extensive* diminishing returns, in which there exists only one process for the production of corn for each quality of land, different qualities of land will be used side by side in order to produce the amount of corn required. If there were no scarcity, cost minimisation would imply that only one quality of land (and only one method of production), i.e. the one that allows production of the commodity at lowest cost per unit, would be used, and there could be no rent. However, if the best-quality land is in short supply, one or several additional qualities of land have to be cultivated and hence one or several additional methods of production are used to produce the required amount. That quality of land which, among all those cultivated, exhibits the highest cost per unit of product (but no higher unit cost than any of the lands lying fallow) yields no rent, whereas the scarcity of the other lands in use is reflected in positive differential rents, and rents are such that corn is produced at the same unit cost by all the processes operated.

In the pure case of *intensive* diminishing returns, in which there exists only one quality of land but a variety of methods of production to cultivate it, 'the only evidence of [the]

¹ See, for example, the papers on rent theory by Montani (1975) and Kurz (1978) reprinted in Steedman (1988, vol. II, part II), the article by Quadrio-Curzio in Pasinetti (1980), and Salvadori (1986).

² For the sake of the argument, we shall, in what follows, assume that there is only one product, say 'corn', in the production of which land is used. The complications which arise when there is more than one agricultural product have been investigated by D'Agata (1984).

scarcity [of land] to be found in the process of production is the duality of methods' (Sraffa, 1960, p. 76). If land were available in abundant supply, only the cheapest method of production would be operated and there could be no rent. However, as soon as the required amount of the product can no longer be produced by this method, even if it occupies all the land, the price of corn has to rise up to the point where an additional method becomes eligible which, although characterised by a higher cost per unit of output, yields more corn per acre. Thus, with scarce homogeneous land, two methods of production will be employed concurrently in general and will allow the determination of the (uniform) rent of land and the price of corn. With an increase in demand for corn, output will increase 'through the gradual extension of the method that produces more corn at a higher unit cost, at the expense of the method that produces less' (*ibid.*). When the second method has completely replaced the first one, further increases in output presuppose that a third method will be introduced which produces still more corn per acre at still higher unit cost, etc.

As should be clear from the foregoing, in answering questions like 'Which kinds of land (or methods of production) will be used in order to produce given outputs?' a problem of the choice of technique has to be solved. This problem consists of finding, for a given wage rate (or, alternatively, a given rate of profits), a cost-minimising system of production, in which commodity prices, rents and the rate of profits (wage rate) are non-negative and no process yields extra-profits. Since the prices of commodities and hence the cost of production cannot generally be determined independently of distribution, i.e. the level of wages (the rate of profits), the implication is close at hand that in order to produce the same vector of outputs, at different levels of w(r) the criterion of cost minimisation may lead to the cultivation of different kinds of land and/or the activation of a different pair of methods on a given kind of land. Furthermore, if produced means of production are used there is no reason to exclude the possibility that the same system of production can return at different levels of w(r); i.e. the reswitching of techniques that use non-produced means of production can occur. The view frequently to be found in the economic literature that there exists a 'natural' ranking of the various plots of land in decreasing order of profitability (or 'fertility'), and the related view that this ranking coincides with a parallel one according to rent per acre, are generally unwarranted. Both orders 'may vary with the variation of r and w' (Sraffa, 1960, p. 75) and may deviate from one another. It should also be clear that with heterogeneous capital goods no production function can be constructed. Yet this is not the case dealt with by Pasinetti and Morishima in their simplified analyses of rent.

A production function for agriculture as a whole

A production function for agriculture as a whole expresses the following 'course of events' in an economy satisfying assumptions (i) and (ii) (stated at the beginning of Section 3), in which capital is accumulated and a growing labour force has to be provided with corn. At first only one method of production will be employed, that which maximises the output per worker (since there are no produced means of production). Total output can be increased by gradually extending the cost-minimising method to the entire available amount of the quality of land (call it quality A) utilised by this method. In Fig. 1 the maximum output to be produced with this method is given by X_1^1 ; the corresponding employment on land of quality A is N_1^1 ; tg a is the output-labour ratio.

A further increase of output can take place either by taking into cultivation another quality of land (call it quality B) or by gradually replacing the first method of production by another one which utilises the same quality of land, but produces more corn per acre at a higher unit cost, i.e. a higher quantity of labour per unit of output. The farmers will choose the



cheapest method available. If the cheapest method available happens to be that one utilising land of quality B, then in Fig. 1 the maximum output to be produced with this method is given by $(X_1^2 - X_1^1)$; the corresponding employment on land of quality B is $(N_1^2 - N_1^1)$; $tg \gamma$ is the output-labour ratio. On the contrary, if the cheapest method available is another method utilising land of quality A, then in Fig. 1 the maximum output to be produced with this method is given by X_1^2 ; the corresponding employment is N_1^2 ; $tg \beta$ is the output-labour ratio.

Similarly, a further increase of output can take place either by taking into cultivation still another quality of land or by gradually replacing (one of) the operated method(s) of production by another one which utilises the same quality of land, but produces more corn per acre at a still higher labour input per unit of output. Once again farmers will choose the cheapest method available.

With a continuum of methods of production available to cultivate each quality of land, the production function for agriculture as a whole need not, as in Fig. 1, consist of a series of straight lines.

Let us now construct this function.¹ Because of assumptions (i) and (ii), the technology of the agricultural sector can be described in terms of the labour input vector **1**, the land input matrix **C**, and the output vector **b**. The number of rows of **1**, **C**, and **b** equals the number of the available methods (or processes) of production; and the number of columns of **C** equals the number of existing qualities of land. It is assumed that **1** and **b** are positive vectors and each row and column of matrix **C** is semipositive. This means that each process produces a positive amount of corn by employing a positive amount of labour (and, as a consequence, capital) and at least one quality of land. All qualities of land may be used in the production of corn.²

For each amount of labour employed in the corn production, N_1 , the following set of inequalities and equations must hold,

$$\mathbf{x}^T \mathbf{C} \leq \mathbf{h}^T \tag{1}$$

¹ Professor Samuelson in private correspondence has drawn our attention to his 1959 paper on Ricardo which contains an early discussion of the existence of a production function in the case considered above; see Samuelson (1959, pp. 28–32). The following argument draws on some of the material contained in the *Laurea* thesis submitted by Giuseppe Freni to the University of Catania (1987); we are grateful to Giuseppe Freni for allowing us to do so. It is to be hoped that he will publish his dissertation soon.

² With Professor Morishima's description of agricultural technology (cf. p. 37) each row of matrix C would have one and only one positive element, all other elements being zero. We do not need this assumption, so we can allow, for example, that corn is produced by using a particular quality of land and water, both in short supply, the water coming from a source located on another quality of land whose proprietor obtains a rent for the use of the source.

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$$\mathbf{x}^T \mathbf{C} \mathbf{q} = \mathbf{h}^T \mathbf{q} \tag{2}$$

$$\mathbf{b} \le w(1+r)\mathbf{l} + \mathbf{C}\mathbf{q} \tag{3}$$

 $\mathbf{x}^T \mathbf{b} = w(1+r)\mathbf{x}^T \mathbf{l} + \mathbf{x}^T \mathbf{C} \mathbf{q}$ (4)

$$\mathbf{x}^T \mathbf{l} = N_1 \tag{5}$$

$$\mathbf{x} \ge \mathbf{0}$$
 (6)

 $\mathbf{q} \ge \mathbf{0} \tag{7}$

$$w(1+r) \ge 0 \tag{8}$$

where x is the process intensity vector, h is the vector of the available amounts of the different qualities of land, q is the vector of rent rates, w is the wage rate in terms of corn, and r is the profit rate.

Because of the Equilibrium Theorem of Linear Programming (see, e.g., Franklin, 1980, p. 66), system (1)–(7) is satisfied if and only if the following two dual linear programmes have optimal solutions:

Maximise $\mathbf{x}^T \mathbf{b}$ subject to

$$\mathbf{x}^{T}\mathbf{C} \leq \mathbf{h}^{T}$$
(9)
$$\mathbf{x}^{T}\mathbf{l} = N_{1}$$

$$\mathbf{x} \geq \mathbf{0}$$

Minimise $\mathbf{h}^T \mathbf{q} + w(1 + r)N_1$ subject to

 $\mathbf{b} \leq w(1+r)\mathbf{l} + \mathbf{C}\mathbf{q} \tag{10}$ $\mathbf{q} \geq \mathbf{0}$

Let

$$N_{1}^{\star} = \operatorname{Max} \mathbf{z}^{T} \mathbf{l} \text{ subject to}$$
$$\mathbf{z}^{T} \mathbf{C} \leq \mathbf{h}^{T}$$
$$\mathbf{z} \geq \mathbf{0}$$

Then programme (9) has a feasible solution for each N_1 such that $0 \le N_1 \le N_1^*$, whereas programme (10) has always a feasible solution. Hence both programmes have optimal solutions for $0 \le N_1 \le N_1^*$. Moreover, the theory of Parametric Programming (see, for example, Franklin, 1980, p. 70) ensures that the function

$$X_1 = f(N_1) \tag{11}$$

where X_1 is the value of the maximum of programme (9), is continuous, concave, and piecewise linear for $0 \le N_1 \le N_1^*$. Moreover, since

$$X_1 = \mathbf{h}^T \mathbf{q} + w(1+r)N_1$$

 $f'(N_1) = w(1 + r)$ for each point in which the function $f(N_1)$ is differentiable. Finally, let

$$X_1^{\star\star} = \operatorname{Max} \mathbf{z}^T \mathbf{b} \text{ subject to}$$
$$\mathbf{z}^T \mathbf{b} \leq \mathbf{h}^T$$
$$\mathbf{z} \geq \mathbf{0}$$

and let

$$N_{1}^{\star \star} = \operatorname{Max} \mathbf{z}^{T} \mathbf{l} \text{ subject to}$$
$$\mathbf{z}^{T} \mathbf{C} \leq \mathbf{h}^{T}$$
$$\mathbf{z}^{T} \mathbf{b} \geq X_{1}^{\star \star}$$
$$\mathbf{z} \geq \mathbf{0}$$

Obviously, $N_1^{\star\star} \leq N_1^{\star}$ and $X_1^{\star\star} > 0$, where $X_1^{\star\star}$ is the maximum output producible with the given technology and the given amounts of the different qualities of land available. Therefore, for $0 \leq N_1 \leq N_1^{\star\star}$ the function is non-decreasing. Thus, for $0 \leq N_1 \leq N_1^{\star\star}$ the system (1)–(8) has a solution and function (11) is the production function used by Pasinetti to represent the production of the corn sector as a whole.

Whereas the production function just derived is not continuously differentiable, Pasinetti in his original formulation assumed the function to be so. However, this assumption is introduced by him for the sake of simplicity only (Pasinetti, 1974, p. 4). This becomes crystal clear in a note on his model published two decades later. In this note Pasinetti points out:

For didactical purposes, continuous functions are very useful. I have myself, most of the times, used the device of considering the derivative $f'(N_1)$ as a continuous function of N_1, \ldots . However there is no reason why the derivative of function $f(N_1)$ should be a continuous one. Let us remember that the first derivative of $f(N_1)$ represents the productivity of the worker who is put to work on the least fertile piece of cultivated land. Ricardo always considered the various pieces of land, ranked in order of fertility, in *finite* terms (not in infinitesimal terms) (Pasinetti, 1981, pp. 673–674; Pasinetti's emphasis).

Professor Morishima's proposition that 'there is no simple aggregate production function for agriculture' (p. 103) if land is diversified in quality, is therefore untenable, and his criticism of Pasinetti's formulation has to be rejected.

4. Fixed capital

Professor Morishima's formalisation of Ricardo's theory of relative prices contains an inadequate treatment of fixed capital. Using our notation, the price system suggested can be written as

$$\mathbf{p} = w\mathbf{l} + \mathbf{K}\delta\mathbf{p} + r(w\mathbf{l} + \mathbf{K}\mathbf{p})$$

where **p** is the vector of prices, **K** is the matrix of capital coefficients, and δ is the diagonal matrix 'with the *i*th diagonal element δ_i being the rate of depreciation of capital good *i*' (p. 20; similarly p. 62). The latter assumption is known as 'depreciation by radioactive decay' or 'depreciation by evaporation' (Hicks), an assumption which has been criticised by Professor Morishima himself (see Morishima, 1969, p. 89).

A proper treatment of durable capital goods has been suggested by von Neumann (1945–1946, p. 2) and was dealt with in some detail by Sraffa (1960, ch. X) and the literature following the publication of these two seminal contributions.¹ As is well

¹ A major author in the tradition of von Neumann is of course Professor Morishima himself; with regard to the treatment of fixed capital see Morishima (1969, pp. 89–91; 1973, pp. 164–170). Important contributions to the analysis of fixed capital in the Sraffian tradition are collected in Pasinetti (1980), Steedman (1988, vol. II, part I) and Salvadori and Steedman (1990).

known, the method of treating what remains of fixed capital goods at the end of the production period as part of the gross output allows the correct calculation of the annual charge on the fixed capital. This charge consists of the payment of profit at the uniform rate and the depreciation that makes possible the replacement of the durable instrument of production when it is worn out. It is shown that the depreciation quotas and thus the prices of ageing fixed capital items cannot be ascertained independently of distribution. Hence, *ad hoc* rules of depreciation such as 'depreciation by evaporation' cannot generally be sustained.

As Sraffa pointed out, the method of treating fixed capital as a joint product 'fits easily into the classical picture.' He added:

It was only after Ricardo had brought to light the complications which the use of fixed capital in various proportions brings to the determination of values that the plan in question was resorted to. It was first introduced by Torrens in the course of a criticism of Ricardo's doctrine . . . Thereafter the method was generally adopted, even by the opponents of Torrens's theory: first by Ricardo in the next [i.e. third] edition of his *Principles* (Sraffa, 1960, pp. 94–95).

The reference is to a passage in Ricardo, in which the value of corn, which is taken to be produced by unassisted labour, is compared with the value of 'the machine and cloth of the clothier together ... and the machine and cotton goods of the cotton manufacturer' (*Works*, I, p. 33).

While Ricardo recognised the possibility of treating fixed capital in terms of the joint production method, he did not develop it. However, as numerical examples in the *Principles* indicate, Ricardo knew the annuity formula

$$y = p_{m0} \frac{r(1+r)^n}{(1+r)^n - 1}$$

where y is the annual charge, p_{m0} is the price of the new machine, r is the general rate of profits, and n is the life of the machine (cf. Works, I, pp. 54-62). It would, of course, have been most surprising had a highly successful stockbroker, like Ricardo, not known this result. As is well known, this formula gives the correct annual charge to be paid for interest and depreciation in the special case of a machine operating with constant efficiency throughout its lifetime of n years. Ricardo was thus also well aware of the fact that the pattern of depreciation cannot be ascertained independently of income distribution, i.e. the level of the rate of profits.

5. The standard of value

Professor Morishima stresses that 'the wage-profit frontier . . . plays a most crucial role in the Ricardian economics'; he therefore considers it appropriate to 'carefully examine the various methods of deriving the frontier and discuss their merits and demerits' (p. 28). This is done in the third chapter. There he writes:

In this sort of analysis, we must clearly define, as Ricardo did, what is taken as the standard of measure of prices and wages. This is Sraffa's problem of standard commodity or the problem of numeraire, which is dealt with significantly differently by Ricardo, Sraffa and myself (p. 61).

As regards the 'significant differences' alluded to, Professor Morishima points out that his position is similar to the one entertained by Walras, i.e. that any commodity, or any bundle of commodities, could serve as numeraire. He rejects Ricardo's concept of an 'invariable measure of value' on the grounds that 'I do not assume existence of such a commodity because I do not take the labour-value theoretic approach' (p. 61).

Against Sraffa's Standard commodity, which he dubs a 'metaphysical concept' (p. 76), he objects:

Whatever terminology and rhetoric are used, the hypothetical character of the standard system is clear. It is doubly hypothetical. First, it neglects the workers' demand for commodities as well as the wage payment [sic!]. Secondly, it assumes that commodities are produced in the fixed proportions necessary for the standard economy to grow at a uniform rate. Such an imaginary state is extremely remote from the actual observed economy, and Sraffa's share W [the share of wages], as a proportion of 'the standard net product', has nothing to do with the workers' share in the actual economy. In addition to this, Sraffa's formula $[r=r^*(1-w)]$ has a defect in that this real wage rate in terms of the standard commodity ... does not accurately reflect the consumers' true 'real wage rate' in terms of their consumption bundle ... although there is some parallelism between them (p. 65).

On the construction of the Standard system he comments: 'Of course in this system too, labour is needed for producing commodities, even though no wage payment is made.' And in parentheses he adds: 'I ignore ... this paradoxical character of the standard system and do not ask whether workers will work without reward. Even slaves would not really work if they were not rewarded, in the form of food at least' (p. 64).

There are various misconceptions here, some of which are also to be found elsewhere in the literature on Ricardo and Sraffa (cf. Kurz and Salvadori, 1986, 1987, 1989).

A standard of value or numeraire is chosen by the theorist and does not depend on 'observed facts'. However, some standards have useful properties that can be utilised by the theorist. As is well known, Ricardo's search for an 'invariable measure of value' aimed at rendering precise the properties a standard would have to exhibit¹ in order to answer his concern with (i) intertemporal and interspatial comparisons, and (ii), the impact of changes in distribution on relative prices (see also Pasinetti, 1974, pp. 3-4). While the first refers to measurement with respect to different technical environments, the second refers to measurement with respect to the same technical environment, but a changing distribution of income. Ricardo considered the first property to be fulfilled by a commodity (or a bundle of commodities) used as a standard which 'now and at all times required precisely the same quantity of labour to produce it' (Works, I, p. 17 n. 3). As to the second property, he was of the opinion that the commodity (or the bundle of commodities) used as a standard had to be produced with a proportion of labour to means of production 'which may fairly be considered as the medium between [the] extremes, and as agreeing more nearly with the circumstances under which the greater number of commodities are produced than any other which can be proposed' (Works, IV, p. 372). There is, however, no reason to presume that there exists a commodity (or a bundle of commodities) which will be produced at all times with a constant amount of (direct and indirect) labour. And even if such a commodity (or bundle of commodities) existed, there would be no reason to presume that it would at all times be the medium between the extremes. Hence Ricardo's search for an 'invariable measure of value' which fulfilled both requirements resembled, as Ricardo became increasingly aware of, the search for a will-o'-the-wisp.

Scrutiny shows that Sraffa in *Production of Commodities by Means of Commodities* (1960) saw only a single analytical purpose for the concept of the Standard commodity elaborated by him: it is conceived as a tool capable of simplifying the study of the effects of changes in the distribution of income on relative prices, given the technical conditions of production. When Sraffa in his book relates the Standard commodity to an 'invariable measure of

'In the *Principles* Ricardo stresses: 'It is ... of considerable use towards attaining a correct theory, to ascertain what the essential qualities of a standard are, that we may know the causes of the variation in the relative value of commodities, and that we may be enabled to calculate the degree in which they are likely to operate' (*Works*, I, p. 17, footnote 3).

value', his intention seems to be to pay a tribute to Ricardo by using the latter's own expression. However, Sraffa's concern is explicitly with the second aspect of Ricardo's problem only, whereas the first aspect plays no role whatsoever.¹

In the literature on Sraffa there is an unfortunate tendency to assign meanings to the Standard commodity other than the one just mentioned. A case in point is Professor Morishima's interpretation quoted above. The Standard commodity was explicitly designed by Sraffa as a numeraire (with useful properties) and only that. If Professor Morishima's objections—that the Standard commodity 'neglects the workers' demand for commodities as well as the wage payment' and that it 'does not accurately reflect the consumers' true "real wage rate" in terms of their consumption bundle'—were to be taken seriously, then they would also have to be applied, for example, to the Walrasian normalisation favoured by Professor Morishima (that is, setting the price of any commodity, or any bundle of commodities, equal to one). As will become clear below, the Standard commodity was most certainly *not* designed as a method for measuring 'real wages'. Hence Professor Morishima is worried about an issue that cannot even arise with respect to the standard of value used by Sraffa.

It has been stated in the above that the numeraire chosen by the theorist does not depend on 'observed facts'. It goes without saying that the reverse is also true, i.e. the observed facts do not depend on the numeraire chosen. As Sraffa emphasised, the Standard system is 'a purely auxiliary construction' which 'may give transparency to a system and render visible what was hidden, but . . . cannot alter its mathematical properties' (1960, pp. 31 and 23).² Hence speculations like that entertained by Professor Morishima—that the construction of the Standard system implies that 'workers will work without reward'—are unwarranted.

Since Professor Morishima rejects both Ricardo's measure of value and Sraffa's Standard commodity, it is interesting to see which numeraire he proposes. He favours a bundle of commodities as standard of value which in chapter 1 of his book has been identified as 'the consumption vector at some basic level' (p. 22). He calls the wage rate in terms of units of this bundle 'the real wage rate ω ' and the relationship between ω and the rate of profits r the 'wage-profit frontier'. Professor Morishima appears to be of the opinion that the latter is in general the only meaningful expression of the constraint binding changes in the distribution of income.

This becomes clear when he confronts the wage-profit frontier with Sraffa's distribution formula. He points out that the two coincide with each other in the case in which the proportion between labour and the means of production is the same in all industries, i.e. the case in which the simple labour theory of value holds. He adds:

We may now conclude that this is the only case in which Sraffa's formula... is meaningful; otherwise it deviates from the wage-profit frontier, because of the relative price effects, and is nothing else but a law concerning the *imaginary* 'standard' system (p. 67; Morishima's emphasis).

This contention is best answered in terms of Sraffa's own argument. Sraffa begins his analysis by assuming that wages consist of the necessary subsistence of workers. Accordingly, *real* wages are given. He then observes that wages, besides the ever-present element

¹ For a detailed discussion of the role of the Standard commodity in Sraffa's analysis and its relationship to Ricardo's search for an 'invariable measure of value', see Kurz and Salvadori (1989).

² This has not always been properly understood. See, for example, the opinion expressed by Blaug that a change in distribution 'has no effect on relative prices measured in terms of the Standard commodity for the simple reason that the change alters the measuring rod in the same way as it alters the pattern of prices being measured' (1987, p. 436). If this were true, by mere choice of numeraire prices could be made independent of distribution and therefore the choice of numeraire would affect relative prices.

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of subsistence, may include a share of the surplus. Consequently, the real wage rate can no longer be considered given.¹ Hence, *if* the wage rate were still to be given from outside the system of production, it would have to be 'in terms of a more or less abstract standard, and [would] not acquire a definite meaning until the prices of commodities are determined' (Sraffa, 1960, p. 33). To start, as Professor Morishima does, from a given and constant composition of the goods bundle consumed by workers evades the issue mentioned by Sraffa: of two measures of value neither of which can be said to 'accurately reflect the consumers' "real wage rate" ' (p. 65), Professor Morishima criticises the one which has expressly been designed for a different purpose and adopts the one which was indeed meant to accomplish this task, but fails to do so.

Professor Morishima also attempts to restrict the meaningfulness of the Standard system to the case of equal proportions of labour to means of production in all industries. While the Standard system is a *construction* related to a given actual system, equal proportions is an extremely special *assumption* about the actual system. With equal proportions no question would arise whether any particular change in the relative price of a commodity is due to the peculiarities of the commodity which is being measured or those of the measuring standard, since no change in relative prices could occur. Therefore, with equal proportions no problem of a standard of value which is invariable with respect to changes in distribution could arise. Hence, rather than being the only case in which the Standard system is 'meaningful', equal proportions are the only case in which it is meaningless.

We may conclude that Professor Morishima's treatment of the problem of the standard of value is not convincing. His objections against Sraffa's Standard commodity are either wrong or not pertinent because they concern problems to the solution of which the Standard commodity has not been designed by Sraffa. The numeraire adopted by Professor Morishima, on the other hand, fails to accomplish the task ascribed to it by him, i.e. to reflect accurately the 'true "real wage rate"'.

6. On the natural wage rate

A brief comment should be made on Professor Morishima's discussion of which variables should be regarded as exogenous. In his analysis Professor Morishima considers as given the existing amounts of wage goods and capital goods and the number of workers in the economy. He contends that Pasinetti (1960) takes as given the existing amount of capital and the natural wage rate, defined as the wage rate which keeps population constant, and comments:

This means that [Pasinetti's] model ... is concerned with an 'open' economy where workers freely emigrate or immigrate so as to keep the real wage rate at a given level (pp. 51–52).

From this Professor Morishima derives a further criticism:

In the long-run analysis Pasinetti defines the long-run equilibrium as a state where the real wage rate is set at the natural rate and the profits are zero. There is no doubt that Ricardo also has the same definition. But there is a big difference between the models of the two authors. Ricardo's economy is a closed economy, whilst Pasinetti's is open. If Pasinetti had correctly taken the openness of his economy into consideration, that is, if he had not forgotten that workers can freely immigrate or emigrate, he would have seen that the long-run equilibrium real-wages need not be at the natural level, because the wage rate at which the population remains stationary has no relevance in such an 'open' economy. The wage rate can be kept at an arbitrary level even in the long run (p. 52).

¹ As Joan Robinson succinctly remarked, 'we could hardly imagine that, when the workers had a surplus to spend on beef, their physical need for wheat was unchanged' (1961, p. 54).

As against this the following may be said. In Pasinetti's analysis two dynamic processes are considered: first, a sequence of market equilibria which leads to a 'natural' equilibrium and second, a sequence of 'natural' equilibria which leads to the stationary state equilibrium. It is only in investigating the latter dynamic process that Pasinetti takes as given the natural wage rate. In contradistinction, in investigating the former dynamic process he takes as given the existing amount of capital and the number of workers in the economy.¹ Thus the forces which are envisaged to push the wage rate to a specific level are not immigration or emigration of workers, but those of Malthus's 'law of population'. Therefore, this specific level cannot be different from the natural real wage rate.

7. Foreign trade

In chapter 6 Professor Morishima deals with Ricardo's theory of foreign trade as it is expounded in chapter VII of the *Principles*. According to Professor Morishima the chapter 'begins on the wrong foot and results in confusion and incomprehensibility' (p. 128). Its main flaw, as seen by Professor Morishima, consists in Ricardo's rejection of the view advocated by Adam Smith that the opening or extension of trade leads to an increase in the general rate of profits: Ricardo's 'mistake' is already to be found 'at the very beginning of the chapter on foreign trade and therefore it affects the whole chapter' (p. 127). Professor Morishima thus attempts to demonstrate, in terms of some formal argument, that Ricardo was wrong, i.e. 'there is no reason to suppose that the wage-profit frontier will stay at the same place' (p. 127). However, as we shall see, there is no need for this 'revision' of Ricardo's trade theory, since Ricardo did not hold the opinion ascribed to him by Professor Morishima.

Professor Morishima begins by quoting the following passage from Ricardo's chapter:

It has been my endeavour to shew throughout this work, that the rate of profits can never be increased but by a fall in wages, and that there can be no permanent fall of wages but in consequence of a fall of the necessaries on which wages are expended. If, therefore, by the extension of foreign trade, or by improvements in machinery, the food and necessaries of the labourer can be brought to market at a reduced price, profits will rise (*Works*, I, p. 132).

Professor Morishima objects that 'this argument is incorrect ... [W]hen the wage-profit frontier shifts upwards the rate of profits can be increased without a fall in wages, and, in fact, this is what happens when a country embarks on international trade' (pp. 126–127).

Apparently, Professor Morishima takes Ricardo to mean *real* rather than nominal wages when the latter talks of 'a fall in wages' in the above statement, in the same way as he requires the reader of his objection to Ricardo to interpret the reference to 'a fall in wages' in it in real terms. Yet there cannot be the least doubt that Ricardo, in this context, meant *nominal* wages and assumed real wages, i.e. 'the food and necessaries of the labourer', to be given. In order to see this, it is useful to recall how Ricardo defined 'the natural price of labour', or 'natural wage', at the beginning of his chapter 'On Wages': It is 'that price which is necessary to enable the labourers, one with another, to subsist and to perpetuate their race, without either increase or diminution... The natural price of labour, therefore, depends on the price of food, necessaries, and conveniences required for the support of the labourer and his family. With a rise in the price of food and necessaries, the natural price

' The literature following the publication of Pasinetti's formulation has criticised the fact that the second process begins when the first is concluded. Yet Pasinetti was aware of the incompleteness of his analysis: in the third section of the Appendix to his paper he studies the local stability of the stationary state equilibrium when both dynamical processes are considered.

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of labour will rise; with the fall in their price, the natural price of labour will fall' (Works, I, p. 93; emphasis added).¹ It is precisely the latter constellation which is contemplated by Ricardo in the passage criticised by Professor Morishima. This becomes clear when we turn to the continuation of the passage: 'If, instead of growing our own corn, or manufacturing the clothing and other necessaries of the labourer, we discover a new market from which we can supply ourselves with these commodities at a cheaper price, wages will fall and profits rise' (Works, I, p. 132). Hence, in Ricardo's opinion the fall in (nominal) wages is due to a fall in (nominal) prices of wage goods, leaving real wages unaffected. This interpretation is further confirmed by Ricardo's subsequent remark, which refers to luxuries: '[B]ut if the commodities obtained at a cheaper rate, by the extension of foreign commerce, or by the improvement of machinery, be exclusively the commodities consumed by the rich, no alteration will take place in the rate of profits. The rate of wages would not be affected ..., and consequently profits would continue unaltered' (Works, I, p. 132; emphasis added).

Clearly, Ricardo did not deny that the extension of foreign trade may entail a rise in the general rate of profits. He rather attempted to render precise the circumstances under which this will indeed be the case. He arrived at the conclusion that profitability increases, if the extension of trade entails a lowering of the price of wage goods, whereas a lowering of the price of luxuries would have no such effect. Ricardo stressed that this finding is in harmony with the rest of his doctrine: 'The remarks which have been made respecting foreign trade, apply equally to home trade' (*Works*, I, p. 133). We may conclude, therefore, that Professor Morishima's main criticism of Ricardo's theory of foreign trade is ill-conceived.

8. On machinery and 'Say's Law'

In chapter 8 Professor Morishima deals with Ricardo's chapter 'On Machinery'.² In the chapter, added to the third edition of the *Principles*, Ricardo informed the reader about an important change of opinion concerning the effects of the introduction of improved machinery on employment. While in earlier times Ricardo had advocated the view that the introduction of machinery is beneficial to all classes of society, i.e. a 'general good' (*Works*, I, p. 386), he now attempted to establish, in terms of an argument making use of two numerical examples, the doctrine 'that the substitution of machinery for human labour, is often very injurious to the interests of the class of labourers' (*Works*, I, p. 388). For, Ricardo maintained, if the mechanisation of production involves a decrease in the circulating part of capital, which he tended to identify with wages, 'there will necessarily be a diminution in the demand for labour, population will become redundant, and the situation of the labouring classes will be that of distress and poverty' (*Works*, I, p. 390).

Professor Morishima questions the logic of Ricardo's argument and arrives at the conclusion that it is fundamentally flawed. Since Ricardo assumed 'Say's Law' in the machinery chapter as well as in the rest of the *Principles*, he 'should have stuck to his original view, because unemployment is impossible under Say's Law' (p. 11). It follows

² After this section had been written, we got the opportunity to read a paper by T. Negishi (1990) which is devoted to a critical discussion of Professor Morishima's treatment of Ricardo on machinery and which raises some similar points.

¹ It is worth mentioning that Professor Morishima earlier in his book seems to have been well aware of the mechanism contemplated by Ricardo, at least with regard to the case of a *rise* in the price of a wage good: 'Where the price of corn rises, the workers' cost of living will also rise, and therefore [sic!] wages should rise' (p. 60; see also the discussion on pp. 72–73).

that all those who have praised Ricardo because of his change of opinion on the matter, must be wrong, too. This includes, among others, Marx (1954 [1867], p. 412), Hicks (1969, 1973), and most recently Samuelson (1988, 1989).

In his discussion of Say's Law, Professor Morishima stresses that the law 'is open to interpretation and has been given diverse meanings throughout its history. It is clear that Ricardo welcomed and accepted it.' Yet, surprisingly, the focus is not on Ricardo's version of Say's Law: 'In what follows, we define the law in the same way that Keynes did' (p. 54; similarly p. 164), implying that investment tends to equality with full employment savings. While it is true that Ricardo assumed every act of saving to imply an act of investment of the same magnitude and therefore ruled out the possibility of a 'general glut' of commodities, there is no indication that this implied of necessity the full employment of labour. Indeed, it should be noticed that in Ricardo's discussion of Say's Law reference is exclusively to the employment of capital: 'M. Say has ... most satisfactorily shewn, that there is no amount of capital which may not be employed in a country, because demand is only limited by production.' And: '[T]here is no limit to demand-no limit to the employment of capital while it yields any profit' (Works, I, pp. 290 and 296). Whether the amount of capital actually in existence at a given moment of time is able to give work to all those seeking employment at the given wage rate is not answered by the version of Say's Law adopted by Ricardo, which refers to capitalistically produced commodities only. As Ricardo clarified: 'It is ... always a matter of choice in what way a capital shall be employed, and therefore there can never, for any length of time, be a surplus of any commodity; for if there were, it would fall below its natural price, and capital would be removed to some more profitable employment' (Works, I, p. 291, footnote). Hence, Ricardo's finding that the introduction of improved machinery may displace workers does not, in itself, contradict his version of the 'law of markets'.

Ricardo's argument in the chapter on machinery is centred on the following numerical example:

A capitalist we will suppose employs a capital of the value of 20,000 *l*. and that he carries on the joint business of a farmer, and a manufacturer of necessaries. We will further suppose, that 7000 *l*. of his capital is invested in fixed capital, viz. in buildings, implements, &c. &c. and that the remaining 13,000 *l*. is employed as circulating capital in the support of labour. Let us suppose, too, that profits are 10 per cent., and consequently that the capitalist's capital is every year put into its original state of efficiency, and yields a profit of 2000 *l*. (*Works*, I, p. 388).

All profits are assumed to be spent for consumption purposes, so that the business is in a stationary state. The miniature system under consideration is perhaps best seen as a vertically integrated firm which manages to make good any wear and tear of the durable capital goods utilised and to reproduce all circulating capital goods (i.e. means of production used up and means of subsistence) needed annually to carry out the business. However, since Ricardo is not explicit about the depreciation pattern of the fixed capital items employed, we may for simplicity assume that they are ultra-longlived, i.e. represent perennial capital. In addition to the reproduction of the inputs used up the miniature system generates a surplus product which consists of food and necessaries, of which the capitalist 'consumes himself, or disposes of as may best suit his pleasure and gratification' (*Works*, I, pp. 388–389). Therefore, the 'gross produce' consisting of the wages bill and profits amounts to $\pounds 15,000$, and the 'net produce' consisting of profits to $\pounds 2000$. (The rent of land, which like profits has its origin in the surplus and thus is a component of the net produce, is for simplicity set aside by Ricardo.) Hence Ricardo's accounting reads as follows:

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gross		circulating		total		rate of	
produce		capital		capital		profits	
15,000	=	13,000	+	20,000	x	0.1	(R)

On this Professor Morishima comments: '[S]ince his [i.e., Ricardo's] formulas of accounting are a bit confusing, I shall begin with correcting his numerical example' (p. 171). The 'correction' suggested by Professor Morishima consists in reckoning what in Ricardo's example is the value of the *fixed capital* employed in the business, i.e. £7000, as the *fixed capital cost*. Therefore, in terms of Professor Morishima's accounting, the value of the gross produce amounts to £22,000, and not, as Ricardo assumed, to £15,000: 'The difference between the two gross products, i.e. £22,000 versus £15,000, is not a matter of definition, but arises from incorrect methods of accounting' (p. 171). Professor Morishima thus replaces (R) by

gross		fixed capital		circulating capital			
produce		cost		cost		profits	
22,000	Ļ	7000	+	13,000	+	2000	(M)

While it is true that Ricardo is not as explicit as he could or should have been with regard to the wear and tear of the durable capital items utilised by the joint business, i.e. 'buildings, implements, &c. &c.', there is no evidence in support of Professor Morishima's contention that the \pounds 7000 was meant to represent the costs due to wear and tear, i.e. depreciation. What Professor Morishima's procedure amounts to is assuming away the existence of *any* kind of fixed capital, and the fact that he keeps using this term should not give rise to the impression that this is not so. Indeed, as in Ricardo's example, Professor Morishima takes the total capital advanced at the beginning of the production period to be worth \pounds 20,000, which in his case implies that the *entire* capital is taken to be used up in the course of the production cycle and has to be annually reproduced.

Ricardo supposes 'that the following year the capitalist employs half his men in constructing a machine, and the other half in producing food and necessaries as usual' (*Works*, I, p. 389). On the assumptions (i) that also the existing fixed capital is divided equally between the two different kinds of productive activities, and (ii) that the value of the newly constructed machine is determined by its current cost of production plus profits at the going rate of 10% on the capital advanced, Ricardo arrives at the following accounting scheme for the two intra-firm production lines:

	gross produce	circulating capital	total capital	rate of profits	
food and necessaries	7500 =	6500	+ 10,000 ×	: 0·1	(R.I)
machine	7500 =	6500	+ 10,000 ×	0 ∙1	(R.II)

The implication of the reallocation of productive resources is close at hand: 'While the machine was being made, only one-half of the usual quantity of food and necessaries would be obtained, and they would be only one-half the value of the quantity which was produced before' (*Works*, I, p. 389). On the premise that the capitalist still consumes his entire profits, which amount to £2000, 'he would have no greater circulating capital than

5500 *l*. with which to carry on his subsequent operations; and, therefore, his means of employing labour, would be reduced in the proportion of 13,000 *l*. to 5500 *l*., and, consequently, all the labour which was before employed by 7500 *l*., would become redundant' (*Works*, I, p. 389).

Given the real wage rate, the reduction in employment in the subsequent period is due to the decreased amount of food and necessaries available in the support of labour, i.e. the decreased circulating capital. The value of the total capital at the firm's disposal is still the same as before, i.e. £20,000, yet its composition has drastically changed. While originally the ratio of fixed to circulating capital was 7000/13,000 = 77/143, it has now risen to (7000+7500)/5500=377/143, i.e. it has almost quintupled. This increase in the fixed capital intensity, given total capital, is the very cause of the displacement of workers analysed by Ricardo. For, as Ricardo stresses in the entry 'Capital' in the Index to the Principles with reference to the machinery chapter: 'The increase of circulating not of fixed capital, regulates the demand for labour' (Works, I, p. 432). Here Ricardo deliberately echoes an opinion entertained by John Barton, who in his Observations on the Circumstances which Influence the Condition of the Labouring Classes of Society, published in 1817, had stated: 'The demand for labour depends on the increasing of circulating, and not of fixed capital.' Ricardo quotes the passage starting with this line and makes it clear that he approves of this part of Barton's doctrine. He does not, however, follow Barton in the latter's more radical claim that '{i}t is easy to conceive that, under certain circumstances, the whole of the annual savings of an industrious people might be added to fixed capital, in which case they would have no effect in increasing the demand for labour' (cf. Works, I, pp. 395-396 n.*). As Ricardo emphasises in the chapter on machinery, capital accumulation is the key to a compensation of any labour displacement, notwithstanding the fact that in the course of the accumulation of capital the proportion between fixed and circulating capital tends to rise: 'The demand for labour will continue to increase with an increase of capital, but not in proportion to its increase; the ratio will necessarily be a diminishing ratio' (Works, I, p. 395; similarly, p. 390).

Professor Morishima on the other hand replaces equations (R.I) and (R.II) by

	gross produce	fixed capital	circulating capital	profits	
food and necessaries	11,000 =	3500	+ 6500	+ 1000	(M.I)
machine	11,000 =	3500	+ 6500	+ 1000	(M.II)

and asks: '[W]here did Ricardo stray from the straight and narrow? Where did he admit an obstacle which would make Say's law unworkable, in spite of his superficial support of it, and resulted in a creation of unemployment?' (pp. 172–173).

The answer given by him reads: The system described by equations (M.I) and (M.II) 'is not an equilibrium' (p. 173). While there is a supply of food and necessaries worth \pounds 11,000, the demand for these items stemming from workers and the capitalist is worth \pounds 15,000 (=2× \pounds 6500+2× \pounds 1000). Hence there is \pounds 4000 'of excess demand for food and necessaries' (p. 173). On the other hand, with the total 'demand for fixed capital for replacement' worth \pounds 7000 (=2× \pounds 3500) and the supply worth \pounds 11,000, 'there is an excess supply of machines amounting to \pounds 4000'. Professor Morishima comments on this: 'We have obtained this state of disequilibrium because Ricardo arbitrarily assumed that half the workers were employed in the production of machines'. The wage fund would thus be reduced from its previous level of £13,000 to £9000 (rather than Ricardo's £5500), and, with a given real wage rate, employment would fall to 9/13 of its former size.

Seen from this perspective, the question arises, which allocation of the work force among the two production lines Ricardo, or rather the capitalist contemplated in his example, *should* have assumed in order not to end up with a 'disequilibrium'? The constellation satisfying the condition that both 'markets' internal to the firm clear, is easily calculated (p. 174):

	gross produce	fixed capital	circulating capital	profits	
food and necessaries	15,000 =	4773	+ 8864	+ 1364	(M.I*)
machine	7000 =	2227	+ 4136	+ 637	(M.II*)

Here, the total supply of food and necessaries at current prices (£15,000) matches with the total consumption demand (£8864+£4136+£1364+£637), and the total supply of machines (£7000) matches with replacement requirements (£4773+£2227). Professor Morishima concludes:

Thus, where the labourforce is distributed between the two sectors in the equilibrium proportions, 68.2 per cent:31.8 per cent, the demand for labour after the production of machines will be the same as before such an operation was commenced; thus, it does not cause unemployment. In Ricardo's example unemployment is generated because the labourforce is distributed between the two sectors in the wrong proportions, 50 per cent:50 per cent. There is, however, no reason why it should be so. Where there is an excess supply of one commodity, an excess demand arises from some other commodity. Outputs are then adjusted in order to remove excess demand and supply. When the state of equilibrium is finally brought about, the employment of labour will be as high as it was before, because Say's law is assumed (p. 174).

And a few pages later he writes: 'Thus, contrary to Ricardo, we conclude that, *under Say's law*, the substitution of machinery for human labour is not injurious to the interests of the class of labourers, provided that machines are introduced appropriately' (p. 177; Professor Morishima's emphasis).

Professor Morishima's argument cannot be accepted as a demonstration that Ricardo was wrong. In fact, the interpretation suggested has emptied Ricardo's reasoning of its very content, i.e. the analysis of the employment consequences of a physical restructuring of the joint business' capital in favour of the fixed parts via the introduction of a machine. Since, according to Ricardo, the employment capacity of the miniature system is proportional to the circulating part of capital, a shift in favour of the fixed parts entails, of necessity, a reduction in employment. In Professor Morishima's interpretation there is no such shift, indeed there is no fixed capital at all. Comparing accounting systems (M) and $[(M.I.*), (M.II^*)]$, what is dubbed 'fixed capital cost' in the former and 'fixed capital' in the latter amounts to £7000 in both cases. Similarly, the value of what is called 'circulating capital cost' in the former and 'circulating capital' in the latter is the same, i.e. £13,000. Hence, contrary to Professor Morishima's claim, his entire argument contains no discussion of 'the substitution of machinery for human labour', let alone whether this substitution is carried out 'appropriately' or not. Therefore, as a matter of logic, it cannot disprove Ricardo's opinion on the matter.

9. Conclusion

The present paper provides a critical account of Professor Morishima's recent book *Ricardo's Economics*. Emphasis is on those parts of the book, which, in our view, are either based on a misreading of Ricardo or major interpreters of Ricardo, or appear to be misconceived from a theoretical point of view. In particular, we deal with the following issues: Professor Morishima's opinion that in Ricardo production in manufacturing is taken to be instantaneous; his claim that despite the simplifying assumptions underlying his analysis of extensive and intensive rent, a production function for agriculture as a whole does not exist; his interpretation of Ricardo's approach to fixed capital and depreciation; his discussion of the problem of the standard of value in Ricardo and Sraffa; his criticism of Pasinetti's treatment of the natural wage rate; his objections to Ricardo's analysis of foreign trade; and his opinion on the (in)compatibility of Ricardo's new view on machinery and Say's Law. It is shown that with respect to the issues under consideration Professor Morishima's views are difficult to sustain.

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