

Intensive Rent and Value in Ricardo

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Abstract

Ricardo's statement that the marginal capital pays no rent is at the basis of his extension of the labour theory of value to the presence of lands. That statement has been recently criticized by Fratini in the case of intensive cultivation. We defend Ricardo's position on that point. However, the reduction of a productive system with land to a single-product system is generally impossible, and for instance the trade-off property between wages and profits does not hold in general.

1 Introduction

Non fully cultivated lands yield a zero rent. Ricardo (1817) used that property to claim that, when cultivation is extended to a land of a lower quality, the long-term prices are determined by the industrial methods and the marginal agricultural method(s). In his views, relative prices are then proportional to labour values. Ricardo also recognized the existence of another type of rent, as agricultural production can also be increased by operating a more productive method on an already fully cultivated land. Intensification of cultivation gives also rise to the payment of a rent, but Ricardo stressed the theoretical unity of both types of rents independently of the specific forms they take (Section 2). In a recent paper, Fratini (2012) argues that the rent is paid by the new and more productive method as well as by the previous method, and therefore that Ricardo's attempt to get rid of rent by taking into account the marginal method fails for intensive cultivation. The present note shows that Ricardo's analysis is right, provided that one is faithful to Ricardo's approach and its implicit formalization, and that the source of Fratini's critique lies in the

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substitution of Sraffa's (1960) framework for Ricardo's (Section 3). However, Fratini's remark does point at one of the difficulties met by the Classical theory of rent. More specifically, one can identify three main problems in the theory of intensive rent inspired by Ricardo and Sraffa (Section 4).

2 Ricardo on intensive rent

The simplest way to increase the production of corn when some land is fully cultivated is to extend cultivation on another land. Ricardo (1815, 1817) assumed that the lands can be ordered according to their fertility, as if the production of corn on a land of second quality required more of any input than on a first grade land ('more workers would be employed on the more distant or less fertile land, in order to obtain the same supply of raw produce', *Essay on Profits*). The order of cultivation of lands follows that natural order.

Ricardo introduced the notion of intensive cultivation by noticing that it may be more profitable to invest a given capital on an already cultivated land than on a new land of lower quality. Let a primitive investment of 1000 pounds produce 100 quarters of corn on land of quality 1. If an additional investment of 1000 pounds on the same land produces 85 more quarters whereas the same investment produces 80 quarters if invested on land 2, the farmers will choose to intensify cultivation rather than to extend it. A formalization of a Ricardian intensive cultivation model, for instance in two-commodity economy with homogeneous land, is immediate. Let the initial agricultural method 1 be written

$$a_1 \text{ qr. corn} + b_1 \text{ t. steel} + l_1 \text{ labour} + 1 \text{ acre land} \rightarrow 100 \text{ qr. corn} \quad (1)$$

The additional method 2 consists in depositing a supplementary layer of capital and/or labour on the same land

$$\Delta a \text{ qr. corn} + \Delta b \text{ t. steel} + \Delta l \text{ labour} + 1 \text{ acre land} \rightarrow 85 \text{ qr. corn} \quad (2)$$

Let the given industrial method be written

$$c \text{ qr. corn} + d \text{ t. steel} + \lambda \text{ labour} \rightarrow 1 \text{ t. steel} \quad (3)$$

Ricardo considers method 2 as the marginal method. That method pays no rent because it is used *after* method 1 on the same land: 'For the greater productive powers of the first £1,000, fifteen quarters is paid for rent, for the employment of the second £1,000 no rent whatever is paid' (*Principles*,

Chapter 2). Therefore prices (with advanced wages and labour as numeraire) are determined by the equalities

$$(1 + r)(p_c \Delta a + p_s \Delta b + \Delta l) = 85p_c \quad (4)$$

$$(1 + r)(cp_c + dp_s + \lambda) = p_s \quad (5)$$

which are similar to those of a single-product system and have the same properties. In particular, prices are proportional to labour values either if the rate of profits is zero or if labour is the only input. Once prices are known, the level of the rent per acre is determined by method 1 as the difference between the value of the product and the cost of production, including normal profits.

For an observer, a part of the homogeneous land is cultivated ‘extensively’ by means of method 1 and another part ‘intensively’, with more invested capital and a higher production, in spite of the decreasing efficiency of investment. The parallel with Ricardo’s representation of the extension of cultivation is perfect.

3 Sraffa’s critique

Sraffa (1960) criticizes Ricardo for assuming that, in the case of extension of cultivation, the order of cultivation is commanded by the natural fertility of soil. Sraffa argues that the decision to cultivate such or such land when the price of corn increases is taken by the farmers, whose only criterion is profitability. Therefore, when demand increases, some land is cultivated before another only because the corresponding method is cheaper. It is useless and restrictive, and partly misleading, to assume with Ricardo that the next cultivated land requires more capital and more labour than the previous marginal land. Sraffa points out that, since prices depend on distribution, the order of cheapness and therefore the order of cultivation may vary with distribution. This phenomenon is illustrated by the case of extensive cultivation proper: if the industrial methods are given and the agricultural good is unique (the reason of these restrictions will become apparent in Section 4) and if each quality of land can be cultivated by means of a unique method (hence, no possibility to intensify cultivation), then the order of cultivation for a given rate of profits coincides with the order of cheapness when rent is zero (Montani, 1975). That order varies when the rate of profits moves and crosses a switch point.

Beyond the greater generality of the analysis, Sraffa’s observation is worth-noting for two reasons. First, Sraffa is more precise on the criterion used by the farmers: when Ricardo compares the quantities produced by a given

amount of money, Sraffa refers uniquely to values and profits. The chapter on land anticipates the last chapter of *Production* (1960) devoted to the choice of methods of production in general. Second, it has rarely been noticed that Sraffa follows Ricardo's dynamic approach, in the sense that he considers how a productive system adapts itself to the evolution of demand. Most of the time, it suffices to adjust the activity levels of the presently operated methods, with the same prices and rents. Spasmodically, that adjustment is no longer possible for physical reasons and a change in the productive system is required, which goes with a new vector of prices and rents. However, that change is rather limited: it consists in introducing one new marginal method, the other operated methods being maintained.

Sraffa's critique to Ricardo is easily adapted to intensive cultivation: intensification consists in operating a more productive method on the same land. The reason why that method was not used earlier is that, in the absence of rent, it was more expensive per quarter produced. As a given level of the rent per acre weighs more on the corn produced by the less productive method, there exists a positive level of rent which uniformizes the total costs (rent included) of both methods. Again, there is no need to assume that the more intensive method uses more of each capital good and more labour. In Sraffa's formalization, the productive system is represented by methods (1), (3) and (6), where the intensive method (6) is of the type

$$a_2 \text{ qr. corn} + b_2 \text{ t. steel} + l_2 \text{ labour} + 1 \text{ acre land} \rightarrow 185 \text{ qr. corn} \quad (6)$$

When demand increases, method (6) is extended at the expense of the initial method (1). Fratini (2012) starts from Sraffa's formalization and writes down the price-and-rent equations associated with the agricultural methods (1) and (6) as

$$(1+r)(a_1 p_c + b_1 p_s + l_1) + \rho = 100 p_c \quad (7)$$

$$(1+r)(a_2 p_c + b_2 p_s + l_2) + \rho = 185 p_c \quad (8)$$

since both methods are operated side by side on the same land and pay a rent per acre. Fratini suggests that method (6) would be the marginal method and criticizes the idea that it would pay no rent. But such an idea cannot be attributed to Ricardo who, when he refers to the marginal invested capital, has in mind method (2) and not (6). That point being clarified, there is no contradiction between the equations (7)-(8) *à la* Sraffa (with advanced wages) and the previous equation (4) *à la* Ricardo (at least if labour values are identified with prices of production), as equation (4) can also be obtained by subtracting (7) from (8). The labour values to which Ricardo refers are those associated with the use of the industrial method (3) and the marginal agricultural method (2).

4 Problems with intensive rent theory

Many papers have been written on rent theory in a post-Sraffian approach, and the topic is deemed to be involved. In our views, that complexity only results from a lack of a guiding principle in these studies. In this Section, we isolate a few questions which admit simple answers. Unfortunately, these answers are all negative.

1. Reduction to single-production without land?

Ricardo intended to get rid of rent by reducing a productive system with land to a productive system without land. As shown above for intensive cultivation, the price equations (4)-(5) are formally similar to those associated with a usual single-product system. The prices once determined, one can calculate the level of the rent (that two-step procedure justifies the Ricardian causality: rent is high because the price of corn is high). Moreover, the trade-off property between wages and profits holds. However, that property is intimately connected with Ricardo's hypothesis that the intensive method requires more of any input. Under Sraffa's general assumption, at least one of the coefficients Δa , Δb or Δl is negative and the price equation (4) is not associated with a method of production (in more technical terms, the Perron-Frobenius properties do not hold because negative coefficients appear in the productive matrix). The simplest example is that of a corn model with land but no industrial commodity: then the unique price equation (4) reduces to

$$(1 + r)(p_c \Delta a + \Delta l) = 85p_c \quad (9)$$

The price of corn increases with the rate of profits if Δa and Δl have the same signs (Ricardo's hypothesis) but decreases if they have opposite signs (Sraffa's hypothesis). This means that, under Sraffa's hypothesis, the real wage and the rate of profits are positively correlated!

2. Choice of methods

A long-term equilibrium with scarce resources is defined by a set of activity levels and a set of prices and rents. The activity levels of the methods are such that they meet the scarcity constraints on lands and the 'requirements for use', which are usually identified with an exogenously given final demand vector. The price-and-rent vector is such that the operated methods yield the ruling rate of profits while the non-operated methods do not yield more; moreover, the rent is zero on the non fully cultivated lands. That post-Sraffian formalization, though correct, describes a state and ignores the Ricardian dynamics which are concerned by the reaction of the economic system to a change in final demand. When a physical scarcity is met, the price of the scarce commodity increases up to a level which allows for the introduction of a new method. That procedure defines the incoming method

in a unique way: the price cannot increase either less (no new method would be profitable) or more (the incoming method would pay either extra-profits).

Let us apply the criterion to intensive cultivation proper. Again, a simple corn model with homogeneous land is sufficient. In normal times, two methods 1 and 2 operate jointly on that land. A limit is reached when method 2 has eliminated method 1. In the face of a still increasing demand, a more productive method must then be introduced. However, the criterion used to select that method is only based on its profitability when the price of corn increases. But there is no necessary coincidence between productivity and profitability, and it is easy to build an example where the method 3 which is potentially introduced is less productive than the method 2 it replaces, even in the presence of a more productive method 4. In other words, there is no reason to assume that the incoming method is simultaneously ‘more expensive and more productive’ (it looks as if Sraffa had fallen into one of the traps of capital theory he pointed at...). The Ricardian dynamics fail in the absence of that coincidence (Bidard, 2012). It can also be shown that this phenomenon is at the origin of the multiplicity of equilibria discovered by D’Agata (1983).

3. Substitution and external rent

Besides the extension or the intensification of cultivation, Ricardo and Sraffa missed a third possibility to increase the net product: the response of the economic system may consist in the introduction of a corn-saving method in industry, say in the steel industry. The corresponding long-state equilibrium is described as follows: homogeneous land is fully cultivated by means of a unique agricultural method, while steel is produced jointly by two methods, with a progressive substitution of the corn-saving method for the other (that coexistence is reminiscent of the intensive cultivation but takes place in industry: Saucier (1981) dubbed it ‘external differential rent’). Then the prices of corn and steel are determined by both steel methods, and rent is defined in a second step by the conditions of production of corn. As the method of production of corn does not intervene in the determination of its price, these prices have no relationships with either labour values or prices of production *à la* Sraffa. It is also clear that the trade-off property does not hold.

The only simple way to discard that phenomenon is to assume that there is no choice of methods in industry (see, e.g., Kurz and Salvadori (1995)). This is why the range of post-Sraffian rent theory is very limited and presumes a unique agricultural good and given industrial methods, when no such restrictions are set in the theory of single-product systems without land. Sraffa was mistaken when he suggested that there is no difficulty to extend rent theory to several agricultural goods (similar mistake in Bidard (2010)).

5 Conclusion

Ricardo intended to show that the presence of land does not alter the basic principles of the labour theory of value. His strategy was to reduce a productive system with land to a productive system without land by considering the marginal agricultural methods which pay no rent. One may attribute the same objective to Sraffa, up to the substitution of prices of production for labour values. Sraffa shows that production with lands lets negative coefficients appear in the standard basket but does not mention any other significant gap with the behaviour of single-product systems. In particular, he does not see, or at least does not study, the analytical consequences of his critique of Ricardo's assumptions, who viewed intensification as a process requiring more of each physical input. For that reason and others, the Ricardian programme can only be completed in very specific cases. It turns out that rent matters in general and the trade-off between profits and wages has no general validity for production with lands.

References

- [1] Bidard, C. (2010) 'The dynamics of intensive cultivation', *Cambridge Journal of Economics*, 34: 1097-1104.
- [2] Bidard, C. (2012) 'Ricardo and Lemke', working paper, EconomiX, University Paris-Ouest.
- [3] D'Agata, A. (1983) 'The existence and uniqueness of cost-minimizing systems in intensive rent theory', *Metroeconomica*, 35: 147-158.
- [4] Fratini, S.M. (2012) 'A remark on intensive differential rent and the labour theory of value in Ricardo', *Bulletin of Political Economy*, 6: 133-147.
- [5] Kurz, H. D. and Salvadori, N. (1995) *Theory of Production*, Cambridge: Cambridge University Press.
- [6] Montani, G. (1975) 'Scarce natural resources and income distribution', *Metroeconomica*, 27: 68-101.
- [7] Ricardo, D. (1966 [1815]) *Essay on Profits*, vol. IV of *The Works and Correspondence of David Ricardo*, edited by P. Sraffa, Cambridge: Cambridge University Press.

- [8] Ricardo, D. (1951 [1817]) *On the Principles of Political Economy and Taxation*, vol. I of *The Works and Correspondence of David Ricardo*, edited by P. Sraffa, Cambridge: Cambridge University Press.
- [9] Saucier, P. (1981) *Le choix des techniques en situation de limitation de ressources*, mimeo, PhD thesis, University Paris II.
- [10] Sraffa, P. (1960) *Production of Commodities by Means of Commodities*, Cambridge: Cambridge University Press.