

Ricardo's Theory of International Trade and Capital Accumulation

Ken Mizuta

Higashi Nippon International University

Introduction

The core of Ricardo's theory exists in capital accumulation. While Malthus directly contrasts food with population, Ricardo incorporates food and population into the dynamics of capital accumulation. In Ricardo's theory, the land representing nature is the key, that restricts the economy in capital accumulation. Technical advances cannot overcome the diminishing returns in agriculture owing to the restrictions of nature. In section 1, we argue Ricardo's theory of capital accumulation, comparing it with the theories of Malthus, J. S. Mill, and Smith. In section 2, we discuss the inverse relationship between wages and profit in the accumulation process, since profits fund capital accumulation. We examine how falling prices of manufactured goods and rising prices of food affect wages and profit.

In section 3, we discuss two measures to check the rising wages. Ricardo regards agricultural improvements and importation of cheaper corn as these measures. Though agricultural improvements temporally prevent rise in wages, the society eventually reaches a stationary state of zero profit. He mentions another measure in his *Funding System* (1820), according to which this stationary state is endlessly postponed by food importation. It only comes from the fact that England, at that time, had a comparative advantage for manufacturing. According to him, a country whose comparative advantage lies in manufacturing grows rapidly, whereas a country whose advantage is in agriculture grows slowly; that is, there is uneven development between corn-importing and corn-exporting countries.

We argue partial specialization in section 4. In *On Protection to Agriculture* (1822), Ricardo does not assume perfect specialization. The best method to express Ricardo's intention is the two-sector model of agriculture and manufacture, as examined by Findlay (1974) and Maneschi (1998). In their model, the agricultural industry uses the two factors of labour and land, whereas the manufacture employs one factor: labor. Agricultural productivity decreases while manufacturing productivity remains constant. Therefore, the production possibility frontier is concave against the origin. In contrast to Findlay's and Maneschi's studies, we adopt the labour theory of value as assumed by Ricardo. In section 5, we examine a brief two-sector model.

The objective of the final chapter 'On Foreign Trade' is to argue the general theory of free trade. Therefore, he hardly refers to corn. The rates of profit within a country

become equal, while those among countries do not, since the movement of capital among countries does not occur. Finally, factor prices, such as wages and profit, are determined in capital accumulation within the country. Both factor prices depend on domestic agricultural productivity, namely the diminishing returns restricted by nature.

1. Ricardo's theory of capital accumulation and restriction by nature

The core of Ricardo's theory exists in capital accumulation. He says, in preface of his main work, *On the Principles of Political Economy and Taxation* (henceforth, *Principles*), 'the produce of the earth—all that is derived from its surface by the united application of labour, machinery, and capital, is divided among three classes of the community; namely, the propriety of the land, the owner of the stock or capital necessary for its cultivation, and the labourers by whose industry it is cultivated'. However, the way though which this produce of the earth is divided among those three classes of society—landowners, capitalists and labourers—differs from society to society. It depends 'on the actual fertility of the soil, on the accumulation of capital and population, and on the skill, ingenuity, and instruments employed in agriculture' (Ricardo, 1951a, p.5, henceforth PE p.5). Stating the above, he makes his subject clear.

This description of economy can also be expressed in another way. Production is achieved by combining three factors—land (representing nature), labour and physical stock—and then dividing it among the economic units having participated in this production. Why did Ricardo emphasize the produce of land, referring to 'the produce of the earth' or 'all that is derived from its surface', and also the productivity of land and agricultural technology, saying that this way of distribution of produce depends 'on the actual fertility of the soil' or 'on the skill, ingenuity, and instruments employed in agriculture'?

In economic society, we produce through combining land, labour and physical stock, using techniques that decide the amount of products and the system of production. In Malthus's theory though labour and physical stock are employed on the land, the increasing productivity owing to technological advance cannot exceed the decrease in productivity caused by the diminishing returns in agriculture. Hence, food increases only in an arithmetical progression. However, population naturally increases in a geometric progression. Thus food restricts the increasing population.

Ricardo differs from Malthus. Though Malthus directly contrasts food with population, Ricardo incorporates food and population into the dynamics of capital accumulation. However, like Malthus, Ricardo supposes that the increasing productivity due to technological advance cannot set off the decreasing productivity

caused by the diminishing returns in agriculture. Diminishing returns defeat technological advance. Hence, if capital accumulation with augmentation of population accelerates cultivating inferior lands of low productivity, it finally leads to the stationary stateⁱ.

In Ricardo's theory, endogenous supply of population caused by capital accumulation enhances the demand for food; thus it accelerates cultivation of inferior lands of low productivity, which leads to increases in corn prices. This increase in price stimulates an increase in wages. It is true that the advance of agricultural technology can prevent the rise of wages. However, Ricardo himself considers technological improvements to be temporary and the wages to rise in the long run. Hence, when capital accumulation advances with increasing population, the rising share of wages occasioned by the increasing corn price eventually amounts to just the products made by the labourers. In that case, profit as the residual share deducting wages is zero, which is exactly the stationary state. The diminishing return in agriculture by restriction of nature finally leads to the stationary state.

The reason why Ricardo, in his preface of *Principles*, referred to 'the produce of the earth', 'the actual fertility of the soil' and 'the skill, ingenuity, and instruments employed in agriculture' is attributed to his attention to the restriction of land by nature. 'The produce of the earth' made by labour and physical stock employed on the land is first distributed to the landowner as the differential rent between fertile and inferior land; the rest of the product is distributed to the labourer as increasing wages and to the capitalist as decreasing profits. As the advancing agricultural technology cannot overcome the decreasing agricultural productivity, the increasing wages are finally equal to the residual product, which means the stationary state of zero profit. Finally, the economy is restricted by nature.

Similar to Malthus and Ricardo, J. S. Mill also takes account of the diminishing returns in agriculture. Therefore he supposes the stationary state caused by the restriction of nature in the progress of capital accumulation. While Malthus, Ricardo and J. S. Mill assume the diminishing returns in agriculture, Smith assumes that capital accumulation entails increasing returns, since he also assumes the development of division of labour with capital accumulation. Augmentation of labour and capital by capital accumulation entails increasing productivity because every accumulation brings about a new system of division of labour and introduces new machinery. This is what Smith assumedⁱⁱ. Smith as the first classical economist combined capital accumulation with increasing returns, whereas his successors—Ricardo, Malthus and J. S. Mill—associated capital accumulation with diminishing returnsⁱⁱⁱ.

2. Inverse relationship between wages and profit in the accumulation process

In Ricardo's economy, increasing demand for labour in the process of capital accumulation enhances wages, by which labourers can obtain more food, and hence, increase their family size. This population-supply system enables the labourers demanded by capital accumulation to be endogenously supplied through rising wages. In this process, the increased demand for food forces the cultivation of inferior lands of low productivity. The decline of labour productivity occurs in agriculture. On the other hand, as Ricardo assumes the labour theory of value, the food price (the quantity of labour required for producing a unit of corn) is the reciprocal of labour productivity (the quantity of corn produced by a unit of labour). Therefore, corn price increases with the development of capital accumulation.

As a basket of corn and other necessities is needed for subsistence of a labourer and his family, wages have to rise to get the same quantity of corn. Unless wages rise, the population of labourers decreases because a labourer cannot get enough food. Hence, wages must increase eventually. The same holds true for other necessities. Finally, changes in the price of both corn and other necessities change wages.

The process of capital accumulation accelerates the cultivation of inferior lands of low productivity and enhances corn prices and then wages. This rise in wages next decreases profit. We name this process the inverse relationship between wages and profit. As the profit, which is the fund for capital accumulation, decreases within the inverse relationship, capital accumulation and economic growth become slow. Hence, it is necessary, for favorable capital accumulation, to prevent rise in corn price, since increasing corn prices enhance wages and decrease profit. However, the increase in wages is also caused by the increase in the price of other necessities. Thus, wages depend on the prices of both corn and other necessities.

Regarding this matter, Ricardo mentions 'manufactured commodities [are] always falling, and raw produce [is] always rising, with the progress of society'^{iv} (PE p.97). The corn price increases with the development of capital accumulation, as mentioned before. On the other hand, Ricardo says the following about the price of other necessities:

The natural price of all commodities, excepting raw produce and labour, has a tendency to fall, in the progress of wealth and population; for though, on one hand, they are enhanced in real value, from the rise in the natural price of the raw material of which they are made, this is more than counterbalanced by the improvements in machinery, by the better division and distribution of labour, and

by the increasing skill, both in science and art, of the producers. (PE p.93-94)

There are few commodities which are not more or less affected in their price by the rise of raw produce, because some raw material from the land enters into the composition of most commodities. Cotton goods, linen, and cloth, will all rise in price with the rise of wheat. (PE p.117)

From the above two quotations, we can say that the price of manufactured goods has an upward tendency because they use some raw materials produced from land. The increased price of raw material is added to the price of manufactured goods. The 'cotton goods, linen, and cloth', to which Ricardo refers, are made of cotton, flax and wool from the land. They are 'the produce of the earth' itself, which Ricardo mentioned in his preface to *Principles*. Those conditions are exactly why he focuses on 'the produce of the earth'.

Ricardo, however, regards the upward tendency of manufactured goods produced from raw materials as smaller than the downward tendency caused 'by the improvements in machinery, by the better division and distribution of labour, and by the increasing skill, both in science and art'. Hence, he can say that 'the natural price of all commodities, excepting raw produce and labour, has a tendency to fall, in the progress of wealth and population' or 'manufactured commodities [are] always falling' (PE p.97). He recognizes the advancing technique of manufacture in the days of Industrial Revolution.

Now we will consider how the falling price of manufactured goods and the rising price of food affect wages and profit. Ricardo mentions

Profits depend on high or low wages, wages on the price of necessaries, and the price of necessaries chiefly on the price of food, because all other requisites may be increased almost without limit. (PE p.119)

Ricardo recognizes that wages chiefly depend on the price of corn. He says that the price of necessities, which regulates wages, chiefly depends on the price of food. Therefore, the rising price of food enhances wages and then decreases profit. For Ricardo, the diminishing returns in agriculture, caused by the restriction of nature, is the key factor for the economy. Even though the advancing technology lowers the price of manufactured goods, Ricardo asserts that the upward tendency of the price of agricultural products is greater than the downward tendency of manufactured goods. Hence he says that 'the price of necessaries chiefly [depends] on the price of food'.

Therefore, he also says that ‘the natural tendency of profits then is to fall; in the progress of society and wealth, the additional quantity of food required is obtained by sacrifice of more and more labour’. (PE p.120)

In Ricardo’s economy, the land representing nature is the key that restricts the economy in the progress of capital accumulation with the augmentation of physical stock (fixed capital) and labour (circulating capital). The technical advance in manufacture cannot overcome the diminishing returns in agriculture. If rising productivity in manufacture can overcome the diminishing returns in agriculture, then declining prices in the manufacturing industry will exceed rising prices in agriculture. However, Ricardo regards that ‘the price of necessaries chiefly [depends] on the price of food’, and the rising price of corn enhances wages.

3. Free trade and agricultural improvement facilitating capital accumulation

In Ricardo’s economy it is needed to prevent the increase in wages because profit as the residual after deducting wages is the fund for capital accumulation. Four possibilities can be considered as measures to prevent wages rising: (1) agricultural improvements (2) technical improvements in manufacture (3) importation of cheaper corn and (4) importation of manufactured goods.

We have already considered (2) in Section 2. There we concluded that the downward tendency of price of manufactured goods by technical improvement cannot overcome the upward tendency of price of corn owing to diminishing returns in agriculture. Among the remaining measures, Ricardo regards (1) and (3) as important. Concerning (1), we have already mentioned in Section 1 that the effects of agricultural improvements cannot be so great as to offset the diminishing returns in agriculture. We will further consider (1) in this section. Regarding (4), though Ricardo indeed considers it, he does not intentionally refer to it.

As for (1) and (3), which Ricardo regards as important, he mentions

With the progress of society the natural price of labour has always a tendency to rise, because one of the principal commodities by which its natural price is regulated, has a tendency to become dearer, from the greater difficulty of producing it. As, however, the improvements in agriculture, the discovery of new markets, whence provisions may be imported, may for a time counteract the tendency to a rise in the price of necessaries, and may even occasion the natural price to fall, so will the same causes produce the correspondent effects on the natural price of labor. (PE p.93)

Corn is exactly ‘one of the principal commodities’ quoted here, and hence, Ricardo assumes that the rising price of corn, with the progress of society, enhances wages as ‘the natural price of labour’. After that, he refers to the two important measures preventing wages from rising: agricultural improvements and importation of cheaper corn. We first examine agricultural improvements^{vi}.

The natural tendency of profits then is to fall... This tendency, this gravitation as it were of profits, is happily checked at repeated intervals by the improvements in machinery, connected with the production of necessaries, as well as by discoveries in the science of agriculture which enable us to relinquish a portion of labour before required, and therefore to lower the price of the prime necessary of the labourer. The rise in the price of necessaries and in the wages of labour is however limited; for as soon as wages should be equal (as in the case formerly stated) to 720*l.*, the whole receipts of the farmer, there must be an end of accumulation; for no capital can then yield any profit whatever, and no additional labour can be demanded, and consequently population will have reached its highest poin’. (PE p.120)

In the first half of this quotation, Ricardo refers to (1) and (2) as the measures for preventing the rise in wages. According to him, though profit decreases by rising wages, with the progress of society, this fall in profit is checked by improvements in machinery related to producing necessities in both agriculture and manufacture, and by ‘discoveries in the science of agriculture’ producing corn as ‘the prime necessary of the labourer’^{vii}. Falls in profit can be checked by these improvements. However, in the latter half of this quotation, Ricardo suddenly refers to the limit of accumulation. He mentions the situation where wages rise up to the whole products and the residual profit is zero. This is exactly the stationary state, where capital accumulation ceases.

Finally, according to Ricardo, agricultural improvements temporally prevent the rise in wages; however, the society eventually reaches the stationary state of zero profit. As mentioned in the first section, he regards agricultural improvements as having only small effects on capital accumulation, whereas the diminishing returns in agriculture as having large effects. Ricardo would have considered that the agricultural improvements have only temporary effects, and that they cannot overcome the restriction of nature. Now, we proceed to another measure to check the rise in wages.

Ricardo mentions in his *Funding System* (1820)

With every increased difficulty of producing additional supplies of raw produce from the land, corn, and the other necessaries of the labourer, would rise. Hence wages would rise. A real rise of wages is necessarily followed by a real fall of profits, and, therefore, when the land of a country is brought to the highest state of cultivation,— when more labour employed upon it will not yield in return more food than what is necessary to support the labourer so employed, that country is come to the limit of its increase both of capital and population. (Ricardo 1951c; henceforth FS p.179)

Here, Ricardo mentions the stationary state of zero profit, where the laborer's wages are the same as what he himself produces from the land. Ricardo calls this situation 'the highest state of cultivation', where capital and population have already ceased to grow. Moreover, in the same book, Ricardo persists

The richest country in Europe is yet far distant from that degree of improvement, but if any had arrived at it, by the aid of foreign commerce, even such a country could go on for an indefinite time increasing in wealth and population... Let these be supplied from abroad in exchange for manufactured goods, and it is difficult to say where the limit is at which you would cease to accumulate wealth and to derive profit from its employment. This is a question of the utmost importance in political economy. (FS p.179)

In this case, Ricardo insists that the stationary state of zero profit is endlessly postponed by the importation of food from abroad. Therefore, in that country, the accumulation of wealth does not cease and profit can be acquired in the accumulation process. For Ricardo, though the agricultural improvements and the import of cheaper food can both check the falling profit rate, only the importation of food can infinitely postpone the end of accumulation.

Comparing the agricultural improvements and the importation of cheaper food, the drastic solution to the check of increasing wages is supposed to be the former, and the latter is supposed to have only resulted from the fact that England, at that time, had the comparative advantage for manufactured goods. If the comparative advantage of England had been for agriculture, then domestic cultivation in England would have increased, which would have led to a decrease in agricultural productivity and a fall in profit. In the case of Ricardo, which product has the comparative advantage is directly

connected with the economic growth of the country. A country whose comparative advantage lies in manufactured goods grows rapidly, whereas a country whose advantage is in agricultural products grows slowly.

Ricardo says in the letter of 13 Jan. 1815 to Malthus

On the supposition which you have made of a great foreign demand for our raw produce, there can be no question that more capital would be employed on the land, and I think profits would fall. Such a demand cannot exist in the present situation of the world. Raw produce is always imported into the relatively rich country, and never exported from it, but on occasions of dearth or famine. I have no doubt that if the free importation of corn is allowed into this country, inasmuch as it will direct foreign capital to foreign land, it will tend to lower foreign profits, and if all the earth were cultivated, *with equal skill*, up to the same standard, the rate of profits would be every where the same. (Ricardo 1952 p.171)

Ricardo's statement intrigues me. Under Malthus's supposition that the demand for English raw produce from abroad is great, the cultivation in England would develop and the rate of profit would decrease. However, this could not occur in reality. Under free trade, a rich country such as England imports corn and the profit of a corn-exporting country decreases, reflecting the fall in agricultural productivity. He, at least, recognizes that profit would decrease and that capital accumulation would slow down in the corn-exporting country. This indicates an uneven development between the corn-exporting and corn-importing countries.

Ricardo considers that the advancing technology could not overcome the effect of diminishing returns in agriculture under the technical level in those days. Hence, he adopts not the agricultural improvements—the drastic solution—but the importation of corn by using the comparative advantage for manufactured goods.

Referring to the stationary state, Ricardo says, 'I have been desirous only to elucidate the principles', and 'my whole basis is assumed at random, and merely for the purpose of exemplification' (PE p.121). Finally, the stationary state of zero profit is the ultimate condition theoretically examined. Avoiding the stationary state by importing cheaper food is a theoretical assumption. This differs from the realities with which Ricardo was confronted. What were the realities in Ricardo's day?

4. Free trade and two-sector model of agriculture and manufacture

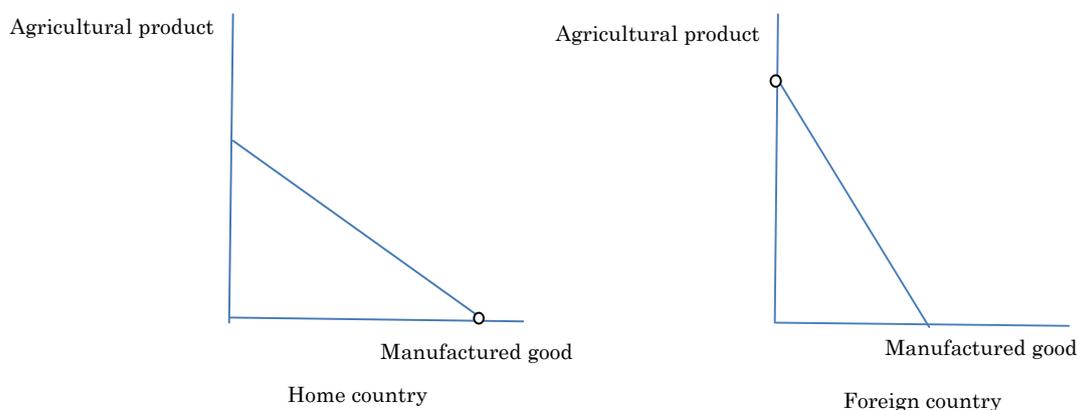
In the beginning of the 19th century, when Ricardo lived, the problem he thought

England had to solve was how to manage domestic agriculture. According to him, the smaller the agriculture is, the more rapidly the economy grows. The importation of corn was the ultimate solution for him. Hence, it was necessary for Ricardo to consider the general theory of foreign trade, which facilitates the importation of corn (Chapter VII ‘On Foreign Trade’ in *Principles*). Moreover, this chapter examines how foreign trade affects the profits that fund capital accumulation.

However, in this chapter, he does not treat corn as the key product. The famous four magic numbers are the wine and cloth exported and imported between England and Portugal. Ricardo investigates the general theory of foreign trade here, keeping corn in mind. Hence we examine a model including agriculture based on his comparative advantage theory.

The comparative advantage theory has the following assumptions: the production factor is only labour, there is no movement of factors between countries, and labour productivity in each industry is fixed. Under these assumptions, comparing the ratio of labour input between the manufacture and agriculture in the home country (M/A , where M or A is the quantity of labour required to produce a unit of manufactured product or that of agricultural product, respectively) with the ratio of labour input between those industries in a foreign country (M^*/A^*), if M/A is smaller than M^*/A^* , the home country has the comparative advantage in manufacture and the foreign country has the comparative advantage in agriculture. This is a ‘textbook example’ of the comparative advantage theory. When the home country and the foreign country each allocate a fixed quantity of labour between agriculture and manufacture, the production possibility frontier of two products is linear as shown in Figure 1.

Figure1



Each country produces at the end-point of the white circle. England, as the home

country, specializes in manufacture and the foreign country specializes in agriculture.

During Ricardo's time, Britain was the world's leading industrialized country, and hence, had the comparative advantage in manufactured goods. M/A was equivalent to the relative price between both because Ricardo assumes that the labour theory of value holds. He says, 'manufactured commodities [are] always falling, and raw produce [is] always rising, with the progress of society' (PE p.97). As industrialization proceeds, the price of manufactured goods decreases on account of improvements in machinery, whereas the prices for agricultural products increase through the diminishing returns in agriculture. The relative price (equal to M/A) decreases, and accordingly, manufactured goods gain the comparative advantage.

In those days, however, Britain still enjoyed a high ratio of agriculture at home. In the middle of the 18th century, Britain was a corn-exporting country, which accounted for 10% of its total exports. Moreover, the ratios of Britain's primary and secondary industries in 1811 were 35.7% and 20.8%, respectively, and that of agriculture never fell below 20% till the 1850s. During this period, however, the Corn Laws were introduced in Britain to protect domestic farmers. Ricardo lived during the time of the Corn Laws. Did Ricardo assume that rapid industrialization and removal of agriculture would take place in Britain under free trade if the Corn Laws had been repealed?

According to Ricardo, Britain would not have become highly industrialized, even if the Corn Laws had been repealed. Ricardo did not assume perfect specialization in manufacture. In *On Protection to Agriculture* (1822), he objected to the protectionists supposing that England would have become an importer of immense corn under free trade:

In the first place, I differ with those who think that the quantity which we should import would be immense

In proportion as the quantity required came from the interior of Poland and Germany, the cost would be greatly increased by the expenses of land carriage. To raise a larger supply, too, those countries would be obliged to have recourse to an inferior quality of land, and as it is the cost of raising corn on the worst soils in cultivation requiring the heaviest charges, which regulates the price of all the corn of a country, there could not be a great additional quantity produced, without a rise in the price necessary to remunerate the foreign grower. In proportion as the price rose abroad, it would become advantageous to cultivate poorer lands at home; and, therefore, there is every possibility that, under the freest state of demand, we should not be importers of any very large quantity. (Ricardo 1951b;

henceforth PA, p.265)

Here, Ricardo refers to the possibilities of declining productivity due to diminishing returns of agriculture in the corn-exporting countries (Poland and Germany), and even to those of additional cultivation in inferior lands in the corn-importing country (Britain). He supposed that agricultural cultivation would persist in Britain because M/A would be equal to M^*/A^* before perfect specialization could be achieved. Ricardo admitted that Britain 'should not be importers of any very large quantity'. Ricardo himself did not assume such a perfect specialization as in the text-type Ricardian trade theory in Figure 1.

The Ricardian international trade theory makes three assumptions: there is no movement of production factor among countries, the only production factor is labour, and labour productivities are fixed. Among these assumptions, Ricardo himself admits only the first. The best way to express Ricardo's intention is the two-sector model of agriculture and manufacture, as examined by Findlay (1974) and Maneschi (1998). In contrast to Findlay's and Maneschi's studies, we adopt the labour theory of value as assumed by Ricardo.

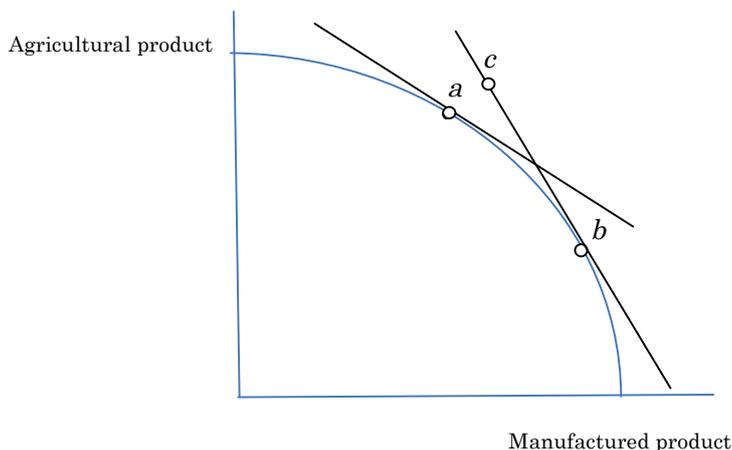
In that model, the agricultural industry has the two factors of labor and land, whereas manufacture has one factor: labour. Moreover, the productivity of agriculture is decreasing by the law of diminishing returns because additional labour is inputted in the fixed land, whereas the productivity of manufacture using only labour is constant. Those suppositions are the minimum requisites in Ricardo's theory. Because the diminishing returns in agriculture are indispensable to the inverse relationship between wages and profit. Moreover, he always assumes manufacture as the leading new industry in the age of Industrial Revolution.

We will depict Ricardo's economy under these assumptions. First, supposing to allocate the fixed quantity of labour between two industries, M/A increases, as the ratio of manufacture in total products increases. The labour productivity in agriculture increases owing to the decrease in domestic cultivation, and a unit of agricultural product can be made by less labour, while labour productivity in manufacture remains constant.

Therefore, the marginal rate of transformation ($-\Delta X_A/\Delta X_M$), which is the decreasing number of unit of agricultural product X_A with every increase of one unit of manufactured product X_M , grows gradually. Because the agricultural products produced by labour moved from agriculture to produce a manufactured product become large as the agricultural productivity increases^{viii}. The fact that the marginal rate of

transformation increases indicates that the production possibility frontier is not linear but concave against the origin as shown in Figure 2. The marginal rate of transformation or M/A is the slope on each point of the production possibility frontier.

Figure 2



Actual production of agriculture and manufacture is made somewhere on this frontier. In the self-sufficient economy, when two products are produced at point a , the same amount of products are consumed. The production point a is also the consumption point. The relative price of two products in the home country is denoted by p (price of manufactured product / price of agricultural product) and that of the same two products in the foreign country is denoted by p^* . Each of them, p and p^* , is equivalent to the labour ratio of two products, M/A and M^*/A^* , respectively, because Ricardo relies on the labour theory of value. Under autarky, M/A in England as the home country is smaller than M^*/A^* in the foreign country; thus, the relative prices in both countries are $p < p^*$.

When free trade begins, the international relative price (terms of trade) lies between p and p^* . If the price is above p^* , then both the home country and foreign country export the manufactured product and import the agricultural product. Hence, the manufactured product is overproduced. If the international price is below p^* , then the overproduction of the agricultural product occurs. The home country having comparative advantage for manufactured product decreases its agricultural product and increases its manufactured product for the home and foreign countries. The production point moves to point b of the Figure 2. The relative price p under free trade becomes larger than that under autarky, and then becomes the international price as well as the domestic price. Therefore, M/A is also larger than before because p is equivalent to M/A based on the labour theory of value.

Ricardo considers the labour theory of value to hold true within the country, but

not abroad. In ‘On Foreign Trade’, he says, ‘the same rule which regulates the relative value of commodities in one country, does not regulate the relative value of the commodities exchanged between two or more countries’ (PE p.133). This sentence denies the fact that the home and foreign products are exchanged in proportion to the absolute quantity of labour bestowed in each. M/A is the labour ratio between two products. It does not matter that the domestic relative price becomes equal to the foreign one through the international relative price.

The home country, therefore, exports the manufactured product and imports the agricultural one at the international price, while the foreign country exports the agricultural product and imports the manufactured one at this price. The point of domestic consumption lies somewhere on the line tangent to the production possibility frontier at the production point b , that is, point c . Point c lies outside of the production possibility frontier, where two products are consumed under an autarky economy. This means that more consumption of the two products is possible at point c .

The point of production b is not always the end point of the frontier. This means that complete specialization occurs neither in manufacture nor in agriculture. As the above quotation from *On Protection to Agriculture* (1822) clarifies, Ricardo assumed an industrial structure wherein agriculture remained at home, though Britain was highly industrialized. As per Ricardo’s understanding, perfect specialization could not occur in Britain. It did not surprise him that Britain practiced agriculture at a certain scale.

5. Brief examination of Ricardo’s model

We briefly examine Ricardo’s two-sector model here. This model comprises two sectors: agriculture and manufacture, each of which takes one year to produce corn and a manufactured commodity, respectively, and the capital consists entirely of circulating capital (labour).

Agriculture is a sector where the law of diminishing returns holds. Taking the quantity of land in existence as given, the production of corn can be expressed by the following production function:

$$X_A = f(L_A) \quad f'(L_A) > 0 \quad f''(L_A) < 0 \quad (1)$$

where X_A is the physical quantity of corn produced in one year and L_A is the number of labourers employed in agriculture.

The production function of manufacture is

$$pX_M = paL_M \quad (2)$$

where p is the relative price of manufactured commodity in terms of corn, X_M is the

physical quantity of the manufactured commodity produced in one year, L_M is the number of labourers employed in the production of the manufactured commodity and a is the physical productivity of labourer in the manufacture sector (a fixed number $a > 0$). Moreover, we can formulate the following equation:

$$L = L_A + L_M \quad (3)$$

where L is the total number of labourers.

The marginal product of labour in agriculture $f'(L_A)$ is declining because labour is employed on a fixed area of land. The marginal product of labour in the other sector, manufacture, is constant, because the labour productivity there is a fixed number a . Hence, the production possibility frontier of two products is not linear but concave, as already mentioned in Figure 2. The marginal rate of transformation is the slope on each point of the production possibility frontier. Moreover, taking the labor theory of value into account, we can derive the following equation:

$$-(1/a) / (1/f'(L_A)) = p \quad (4)$$

because the reciprocal of labour productivity is the labour input per unit of that commodity. The relative price p is equivalent to the ratio of each labour input, according to the labour theory of value. Moreover, we derive the following equation from (4):

$$-f'(L_A) / a = p$$

The left side of this equation denotes the marginal rate of transformation; thus, the marginal rate of transformation is equivalent to the relative price^{ix}.

Between England, as a home country, and a foreign country, $p < p^*$ or $M/A < M^*/A^*$ under the self-sufficient economy. When the free trade begins, England increases the production of manufactured goods and decreases that of agricultural product. Therefore the domestic relative price p increases up to the international relative price. The point of consumption lies somewhere on the line tangent to the production possibility frontier at the point of production where the possibility of consumption increases. However, in any case, the point of production does not always lie on the end point of the production possibility frontier.

Though Ricardo rarely mentions agriculture as a sector of production of necessities in the Chapter 'On Foreign Trade' of *Principles*, he refers to it in the footnote of a famous illustration about the exchange of wine and cloth between England and Portugal.

It will appear then, that a country possessing very considerable advantage in machinery and skill, and which may therefore be enabled to manufacture commodities with much less labour than her neighbours, may, in return for such

commodities, import a portion of the corn required for its consumption, even if its land were more fertile, and corn could be grown with less labour than in the country from which it was imported. (PE p.136)

After the above remarks, Ricardo mentions an illustration of the comparative advantage theory: even a person who has the absolute advantage for both shoes and hats specializes in making shoes which have a comparative advantage, and the other person specializes in making hats. He concludes that these specializations are an advantage for both. In the above footnote preceding this illustration of comparative advantage, when the country having absolute advantage for both manufactured goods and corn specializes in manufacture having comparative advantage and imports corn in exchange for the manufactured goods, the imported corn is supposed to be only 'a portion of the corn' consumed in the country.^x Finally, when Ricardo takes corn into account, he argues incomplete specialization because corn reminds him of the diminishing returns.

According to Ricardo, the development of domestic cultivation in England causes agricultural productivity to decline, and it leads to importing cheaper food from abroad. However, the agricultural productivity in the food-exporting country begins to decline owing to the law of diminishing returns. This causes profit in that country to decline and the growth rate to slow down. Then the uneven development between corn-exporting and corn-importing countries occurs. Finally, declining productivity in agriculture is bound to occur somewhere in the world. The corn-exporting country forces the profit rate, as well as the growth rate, to decline. The ultimate solution to the problem lies only in the technical advance in agriculture.

6. Ricardo's theory of foreign trade

Ricardo devised two measures to prevent the decline in profit: agricultural improvements and importation of cheaper food. The latter was understood to be the driving force keeping the profit rate high and putting off the stationary state. Though Chapter VII 'On Foreign Trade' deals with free trade, which was originally the measure against declining profit, it is argued from the viewpoint of the general theory. The objective of the chapter was to examine the general theory of free trade; therefore, he does not refer to corn with the law of diminishing returns.

Now we examine the general theory of foreign trade. The following quotation is an accurate expression of what free trade means:

Foreign trade, then, though highly beneficial to a country, as it increases the amount and variety of the objects on which revenue may be expended, and affords, by the abundance and cheapness of commodities, incentives to saving, and to the accumulation of capital, has no tendency to raise the profits of stock, unless the commodities imported be of that description on which the wages of labour are expended. (PE p.133)

According to Ricardo, foreign trade 'increases the amount and variety of the objects on which revenue may be expended', namely 'increase[s] the mass of commodities, and therefore the sum of enjoyments' (PE p.128), compared with the self-sufficient economy. When the amount of products for consumption increases, 'the happiness of mankind' (PE p.132) increases. This is the first and fundamental meaning of foreign trade. In addition, he recognizes that foreign trade 'affords, by the abundance and cheapness of commodities, incentives to saving, and to the accumulation of capital'. Savings and capital accumulation increase as much as the expenses from revenue decrease by buying imported cheaper commodities. This is the second meaning. Finally, he says, foreign trade 'has no tendency to raise the profits of stock, unless the commodities imported be of that description on which the wages of labour are expended' (PE p.133). The above remarks include the entire meaning of his foreign trade theory.

Foreign trade increases the amount of domestic consumption by exchanging with other countries. This is the fundamental meaning of free trade:

It is quite as important to the happiness of mankind, that our enjoyments should be increased by the better distribution of labour, by each country producing those commodities for which by its situation, its climate, and its other natural or artificial advantages, it is adapted, and by their exchanging them for the commodities of other countries, as that they should be augmented by a rise in the rate of profits. (PE p.132)

He says that 'our enjoyments' are increased by the foreign trade. Each country produces more products 'by the better distribution of labour' suited to the climate or situation of that country and exchanges them with other countries. Each country increases the domestic consumption by exchanging more commodities produced. Foreign trade increases 'our enjoyments', namely 'the happiness of mankind'. The following quotation indicates the same meaning:

Under a system of perfectly free commerce, each country naturally devotes its capital and labour to such employments as are most beneficial to each. This pursuit of individual advantage is admirably connected with the universal good of the whole. By stimulating industry, by rewarding ingenuity, and by using most efficaciously the peculiar powers bestowed by nature, it distributes labour most effectively and most economically: while, by increasing the general mass of productions, it diffuses general benefit, and binds together by one common tie of interest and intercourse, the universal society of nations throughout the civilized world. (PE p.133-134)

Each country increases the amount of products by optimum production under the given conditions, and the possibility of consumption by exchanging the increased products with each other. The famous example of the ‘four magic numbers’ between England and Portugal shows this fundamental meaning of free trade.

The example assumes an actual exchange ratio: a units of Portuguese wine are exchanged for b units of English cloth as indicated by Sraffa (1930), Ikusawa (1974), Ruffin (2002) and Maneschi (2004) ^{xi}. Table 1 presents the example.

Table 1
Labour Required to Produce Units a and b

	a units of wine	b units of cloth
England	120	100
Portugal	80	90

In England, 20 labourers (120 - 100) move from the wine to the cloth industry and in Portugal, 10 labourers (90 - 80) move from the cloth to the wine industry to attain a ‘better distribution of labour’. Each country completely specializes in the cloth or wine industry by employing excess of 20 or 10 labourers, respectively. Each country ‘distributes labour most effectively and most economically’. These reallocations of labour based on the 18th century rule (Viner 1937, p.440) increase the amount of products. Each country exchanges these increased products and enjoys more consumption. Ricardo investigates the reallocation of given fixed labour. His theory of foreign trade is not related to capital accumulation which causes the increase in labour. Ricardo, moreover, mentions international capital movements and the regulation of profit rates.

He refers to domestic profit rates as following: when the profit rate in Yorkshire

exceeds that in London, the profit rates become equal through capital movement from Yorkshire to London. However, the profit rates do not become equal among countries: 'if in consequence of the diminished rate of production in the lands of England, from the increase of capital and population, wages should rise, and profits fall, it would not follow that capital and population would necessarily move from England to Holland, or Spain, or Russia, where profits might be higher' (PE p.134). According to these remarks, the rates of profit in a country become equal, whereas those among countries do not, since international capital movements do not occur.

In that famous example, Portugal has the absolute advantage for both wine and cloth. In order for international capital and labour movements to occur, both production factors need to move to Portugal. All production factors would disappear in England. He mentions here

It would undoubtedly be advantageous to the capitalists of England, and to the consumers in both countries, that under such circumstances, the wine and the cloth should both be made in Portugal, and therefore that the capital and labour of England employed in making cloth, should be removed to Portugal for that purpose... if capital freely flowed towards those countries where it could be most profitably employed, there could be no difference in the rate of profit, and no other difference in the real or labour price of commodities, than the additional quantity of labour required to convey them to the various markets where they were to be sold. (PE p.136)

Here Ricardo supposes the international movements of capital and labour. If both factors move to Portugal, where labour productivities of both commodities exceed those in England, then the profit rates would become equal in both countries and both commodities would be exchanged in proportion to their bestowed labour. The equalization of profit rate and the labour theory of value become valid in this world. However, such a story would not arise in reality.

Experience, however, shews, that the fancied or real insecurity of capital, when not under the immediate control of its owner, together with the natural disinclination which every man has to quit the country of his birth and connexions, and intrust himself with all his habits fixed, to a strange government and new laws, check the emigration of capital. (PE p.136)

In actuality, capital cannot be moved from its own country since it is impossible to control the capital invested in foreign countries, and labourers are disinclined to leave their country. Therefore, both the international equalization of profit rate and the international labor theory of value, cannot hold in the actual world. Ricardo postulated such conditions.

However, it is a necessary condition for the comparative advantage theory that international capital and labour movements do not occur. If these movements were admitted, then all production factors would move to Portugal, and both products would be made only in Portugal. Ricardo never admits that the production factors move from country to country and that each factor price is equal among countries.

What determines factor prices: wages and profit? In the case of Ricardo, it is attributed to the diminishing returns in agriculture or restriction of nature. Let us recall the previous quotation.

if in consequence of the diminished rate of production in the lands of England, from the increase of capital and population, wages should rise, and profits fall, it would not follow that capital and population would necessarily move from England to Holland, or Spain, or Russia, where profits might be higher. (PE p.134).

This remark indicates the diminishing returns in agriculture and uneven profit rates among countries. With the increase in capital and labor, agricultural productivity decreases, which leads to rising wages and falling profits. However, capital and labour do not move out of the country. Finally, factor prices, such as wages and profits, are determined in that country. Moreover, both depend on domestic agricultural productivity, namely the diminishing returns restricted by nature.

The possibility that foreign trade affects the profit rate arises only in the case that the imported commodities are wage goods, especially corn. He refers to this in the Chapter 'On Foreign Trade'.

It has been my endeavor 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. If, instead of growing our

own corn, or manufacturing the clothing and other necessities 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. (PE p.132)

The meaning of Ricardo's remarks is clear. Foreign trade does not affect the profit rate. However, it affects it in the case where wage goods are imported at a cheaper price. If imported corn on which wages are expended are cheaper, then the profit rate will rise as a consequence of falling wages. As a result, a corn-exporting country decreases its profit, and slows down the growth rate, while a corn-importing country, such as England, can get rid of the stationary state. The country having comparative advantage for manufacture can force stagnation on the corn-exporting country. This is the conclusion of Ricardo's theory. The Chapter 'On Foreign Trade' argues the general theory of foreign trade except corn.

References

- Ikusawa, K. (1974) 'Ricardo Hikakuseisanhisetu no Genkei Rikai to Henkei Rikai', *Shogaku ronsan* 15-6.
- Maneschi, A. (1998) *Comparative Advantage in International Trade: A Historical Perspective*, Edward Elgar.
- Maneschi, A. (2004) 'The true meaning of Ricardo's four magic numbers' *Journal of International Economics*, vol.62, 433-443.
- Findlay, R. (1974) 'Relative Prices, Growth and Trade in a Simple Ricardian System' *Economica*, 41(161) 1-13.
- Psinetti, L.L. (1974) *Growth and Income Distribution; Essays in Economic Theory*, Cambridge U.P.
- Ricardo, D. (1951a) *On the Principles of Political Economy and Taxation*, in P. Sraffa, (ed.), *The Works and Correspondence of David Ricardo*, vol.1, Cambridge U.P. (abbreviated to PE)
- Ricardo, D. (1951b) *On Protection to Agriculture*, in P. Sraffa, (ed.), *The Works and Correspondence of David Ricardo*, vol.4, Cambridge U.P. (abbreviated to PA)
- Ricardo, D. (1951c) *Funding System*, in P. Sraffa, (ed.), *The Works and Correspondence of David Ricardo*, vol.4, Cambridge U.P. (abbreviated to FS)
- Ricardo, D. (1952) *Letters 1810-1815*, in P. Sraffa, (ed.), *The Works and Correspondence of David Ricardo*, vol.6, Cambridge U.P.
- Ruffin, R. (2002) 'David Ricardo's Discovery of Comparative Advantage' *History of Political Economy*, vol. 34(4), 727-748.

- Schultz, T. W. (1953) *The Economic Organization of Agriculture*, McGraw-Hill.
- Sraffa, P. ed. (1951-73) *The Works and Correspondence of David Ricardo*, 11vols. Cambridge U.P.
- Sraffa, P. (1930) 'An Alleged Correction of Ricardo' *The Quarterly Journal of Economics*, vol. 44(3), 539-545.
- Viner, J. (1937) *Studies in the Theory of International Trade*, reprinted by Augustus M. Kelly Publishers in 1975.
- Wrigley, E. A. (1988) *Continuity, Chance and Change: The Character of the Industrial Revolution in England*, Cambridge U.P.
- Saito, O. (2008) *Comparative Economic Development*, Iwanami Shoten (in Japanese).
- Hattori, M. (1995) *Corn Laws Controversy*, Showado (in Japanese).
- Hayami, Y. (2000) *Development Economics*, Sobunsha Publishing Company (in Japanese).
- Hayami, Y. & Godo, Y. (2002) *Agricultural Economics*, Iwanami Shoten (in Japanese).
- Mouri, K. (2008) *Horizon of Classical Economics*, Minerva Shobo (in Japanese).
- Mizuta, K. (2015) Ricardo's Theory of Capital Accumulation: Population, Free Trade, Agricultural Improvement and Introduction of Machinery, *The Annual Bulletin of The Malthus Society*, 24: 1-24 (in Japanese) .
- Mizuta, K. (2004) Economic Policy and Economic Liberalism: Ricardo's Case of International Economics, *Annual Report of the Economic Society, Tohoku University*, 65(3): 489-502 (in Japanese).
- Mizuta, K. (2002) Adam Smith's 'System of Natural Liberty' and Mercantilism. In Takemoto, Hiroshi and Ikuo Omori (ed.) *Reconsider of Mercantilism*, Tokyo: Nihon Keizai Hyoronsha: 127-153 (in Japanese).

ⁱ The agricultural technology of those days in England stayed in the Norfolk system of farming, till the high farming after the middle of 19th century. Though the latter system produced the golden age of English farming, the technology in Ricardo's age was not so high to be able to defeat the decrease in agricultural productivity. cf. Mouri (2008).

ⁱⁱ Saito (2008) divides the increasing returns of Smith from the diminishing returns with the principle of population of Malthus, Ricardo and other classical economists. He evaluates Smith as a precursor of increasing-returns economy of Allyn Young and Alfred Marshall.

ⁱⁱⁱ According to Wrigley (1988), classical economists, including Smith, supposed that land as a restricting factor decreases the marginal productivity of economy, and that the growing economy eventually reaches the stationary state. Wrigley names this economy restricted by land as a organic economy. However, according to him, Industrial Revolution actually produced a mineral-based energy economy which caused the high rate of economic growth. This differed from classical economists' suppositions. Hence,

the supposition of classical economists was supposed to be betrayed by the reality. We assume the following: Smith supposed not diminishing returns but increasing returns. Though productivity of manufacture is indeed high, the agricultural sector was still restricted by nature.

iv [] within a quotation is made up by the writer.

v According to Wrigley (1988), it may be shortsighted that land is one of the three factors of production; however, most raw materials of manufacture and food were produced from land in the days of organic economy he named. Therefore, land was significant in those days.

vi Schultz (1953) poses two problems: the food problem and the farm problem. The food problem is caused by investing too many resources in agriculture, whereas the farm problem is caused by the opposite investing too few resources in agriculture. Hayami & Godo (2002) applies the farm problem to low-income countries, the food problem to middle-income country and the problem of agricultural adjustment to high-income countries.

vii Ricardo mentions, in *Principles*, 'but improvements in agriculture are of two kinds: those which increase the productive powers of the land, and those which enable us, by improving our machinery, to obtain its produce with less labour'. The former is the case of 'the more skillful rotation of crops, or the better choice of manure', for example 'a course of turnips' (PE p.80), which was typical of Norfolk farming in those days. The latter is the same improvements in machinery as in manufacture.

viii If an increment of labor ΔL moves from agriculture to manufacture, an increment in manufactured product ΔX_M and that in agricultural product ΔX_A are denoted by the following equations:

$$\Delta X_M = (\Delta X_M / \Delta L) \Delta L$$

$$\Delta X_A = (\Delta X_A / \Delta L) \Delta L$$

The marginal product of labour in manufacture or agriculture is denoted within the parentheses of the right side of the above equations. Then, the marginal rate of transformation (the decreasing number of agricultural product to increase a unite of manufactured product) is denoted by the following as an absolute value:

$$- \Delta X_A / \Delta X_M = (\Delta X_A / \Delta L) / (\Delta X_M / \Delta L)$$

The right side of the above equation is the ratio of marginal product of labour in agriculture and manufacture. A reciprocal of marginal product of labour is a quantity of labour per unit of product, denoted by A or M thus far. Considering these conditions, the above equation is transformed to the following:

$$- \Delta X_A / \Delta X_M = (\Delta X_A / \Delta L) / (\Delta X_M / \Delta L) = (\Delta L / \Delta X_M) / (\Delta L / \Delta X_A) = M/A$$

As the marginal rate of transformation becomes larger, so does M/A .

ix In these equations, $f'(L_A)$ is the marginal product of labor, which was denoted by $\Delta X_A / \Delta L$ in footnote viii. Moreover, a corresponds to the marginal product of labour $\Delta X_M / \Delta L$. Therefore, $1/a$ or $1/f'(L_A)$, which is the reciprocal of a or $f'(L_A)$, corresponds to $\Delta L / \Delta X_M$ or $\Delta L / \Delta X_A$, or M or A , respectively. Hence, the following equation is concluded:

$$-(1/a) / (1/f'(L_A)) = f'(L_A) / a = p$$

x Viner (1937) points out that this quotation is a example of incomplete specialization (p.452).