Econ. J. of Hokkaido Univ.,
Vol. 27 (1998), pp. 1～9

International Division of Labour and Capital Export in a Ricardian Model[1]

Takao SASAKI

In a Ricardian model consisting of two pure labour economies with the same two sectors, a difference in profit rates emerges both between sectors in each country and between countries as soon as economies become open to each other because of the formation of prices in the world market. This difference in profit rates generates an international capital transfer based on both world market prices and the difference of wage rates between countries if three conditions, Kindleberger's, Lenin's and Classical conditions are satisfied. This means that advanced country exports capital to the sector having comparative advantage in less developed country within the range provided by the three conditions, and furthermore that the equalization of profit rates between countries does not necessarily emerge as a result of international capital movement.

Key words: international division of labor, comparative cost advantage, world market prices, foreign direct investment, capital export, international capital movement, international equalization of profit rates, monopolistic advantage for foreign direct investment, possibility of capital export, pure labor economy, Ricardian model.

1. Introduction

Political restrictions and regulations imposed on international capital movements have been eliminated in the world economy since the end of the Golden Age. The origin of the liberalization of international capital movements is not simple. The collapse of the fixed exchange rate system based on the Bretton-Woods Agreements had an effect on the deregulation on capital movements. The re-evaluation of the role capital movements play in economic development, through the experiences of export-oriented industrialization in both East and Southeast Asian economies supported by foreign direct investment, has also encouraged deregulation. The structural change of the world economy, specifically the emergence of an imbalance in the current accounts of industrialized countries has also effected the liberalization of international capital movements. An explo-

1) I have already expressed the same argument of the present work in my papers and book written in Japanese. For example, see Chapter 7 in my book (Sasaki 1994).

sive increase in international capital flows followed. International economics, however, is unable to account for this historical change. A long period of closed economies after World War I and the theorem of factor-price equalization in the neo-classical international economics caused economists to turn their eyes away from the study of international capital movements.

One of the most important fields of study in international capital movements is the analysis of foreign direct investment. It has caused tremendous change, leading to a structural change in the world economy from the 1970's. It is well known that foreign direct investment is closely related to the changing patterns of the international division of labor. This fact implies the need to incorporate international capital movements into models of international trade. Moreover, the analysis of real economies should be investigated in order to widen the analysis to include the whole market economy with both financial and money markets.

In this paper, I study foreign direct investment in a Ricardian model of international trade. The first reason why I use a Ricardian model is that Ricardo (1951) laid the foundation for international economics. His idea of comparative cost persuaded his successors, including Heckscher (1949), Ohlin (1933), Samuelson (1948) and Dornbusch-Fischer-Samuelson (1977), to develop models of international economics. Secondly, Ricardo excluded the possibility of capital exports not endogenously for simplicity of his model, but exogenously for the simple reason of insecurity.[2] This means that a Ricardian model must be examined on the assumption of the existence of capital exports. The third reason concerns the fact that the role of labor, which embodies technology, has become more important in recent years. On one hand, qualitative improvement of labor has emerged as one of the most important factors in high-technological industries compared with the economy up to the 1970's. On the other hand, this situation has led Ricardian analytical models based on a pure labor economy to take center stage. The above-mentioned Dornbusch-Fischer-Samuelson model in international economics and Pasinetti's elaboration (1993) on structural economic dynamics seems to be a reflection of this historical situation.

This paper consists of 4 sections. First, I set up a typical Ricardian model. In section 2, I show that, given world market prices, differences between profit rates emerge. In the next section, I consider the characteristics of international capital movements in reference to the three conditions which are separately pointed out concerning capital exports in the economic literature. I give some concluding remarks in section 4.

2) Ricardo (1951), pp. 136-137.

2. The Model

I assume a world economy comprising two countries, home and the rest. Each country produces two goods. In both countries, capitalists advance their capital to workers, and engage in not only setting a process of production but also directing it with their knowledge. Technology is embodied in both labor and capital, and it is equalized respectively within a country. Returns to scale are constant. Wage rates are equalized in each country, and determined exogenously. Profit is the economic surplus after deducting wages. If the price of the second commodity is taken as numéraire, the prices of each commodity in each country when the economy is closed is given by

$$\begin{aligned} p_{1j} &= l_{1j}(\mu_j p_{1j} + \nu_j)(1+r_j) = \frac{l_{1j}}{l_{2j}}, \\ p_{2j} &= l_{2j}(\mu_j p_{1j} + \nu_j)(1+r_j) = 1, \end{aligned} \tag{2.1}$$

where p represents the price of the commodity, l is labor per produced unit, r denotes rate of profit, μ is the consumption coefficient of the first commodity per wage and ν is that of the second commodity per wage. The subscripts 1 and 2 denote the goods, and the subscript j, where, $j=h, f$, denotes the country.

Here, $1/(1+r_j)$ represents the share of wages in output in each country. When ω denotes the share of wages, I obtain[3]

$$\omega_j = l_{1j}\mu_j + l_{2j}\nu_j. \tag{2.2}$$

Therefore, if real wage rates in both countries are equal as Ricardo assumed[4], capitalists of a country having an advantage in labor productivity over the other country enjoy a higher rate of profit. But, if the wage rate in a country should increase in relation to the growth in productivity in order to maintain balance in the economy as Pasinetti (1974, 1981) insisted, and as empirical studies have showed, rates of profit in both countries should be equalized. Hereafter, I follow Pasinetti's analysis.

Let's suppose the home country's productivity is higher in both industries than the rest because of higher quality of both labor and capital, and that the home country has the comparative advantage in the production of the first commodity, as follows,

$$l_{1h} < l_{1f},\ l_{2h} < l_{2f},\ l_{1h} < l_{2h},\ l_{1f} > l_{2f}. \tag{2.3}$$

Under the existence of international trade, if each country is small, the price of the first commodity in the world market is written as

$$p_{1h} < p_{1w} < p_{1f}, \tag{2.4}$$

3) This formulation is from Negishi (1985).

4) See Ricardo (1951), p. 93.

where the subscript w denotes the world market in which only one price exists for each commodity.

The emergence of world market prices fundamentally influences price systems based on labor coefficients, and, therefore, seriously affects profit rates in various industries.

3. Differences between Profit Rates

The formation of world market prices causes a divergence in the profit rates between industries in both countries, because prices become independent variables in the profit rate in each industry for each country. The profit rates relating to a change in world market prices are given by

$$r_{1j}=\frac{p_{1w}}{l_{1j}(\mu_j p_{1w}+\nu_j)}-1,$$
$$r_{2j}=\frac{1}{l_{2j}(\mu_j p_{1w}+\nu_j)}-1. \tag{3.1}$$

According to (2.1), I can draw profit rate curves for each industry in each country, as shown in Figure 1. It is clearly shown that the world market price of the first commodity should be between A and B, and the profit rates of industries having a comparative advantage should become higher than those in other industries.

Supposing that capital would be transferred according to profit rates,[5] but labor movements between countries according to wage rates are restricted because of political restrictions, and that there are no costs in the transfer of capital itself, then these differences in profit rates could result in capital exports.

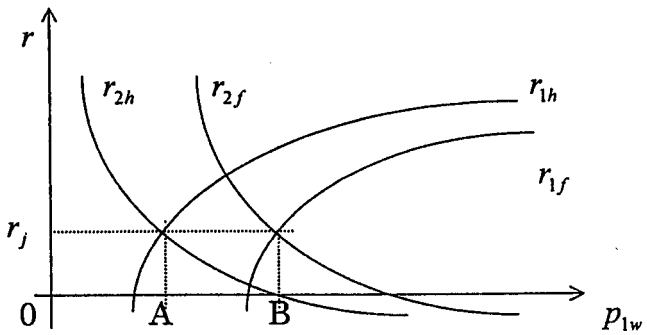

Figure 1.

4. Conditions for Capital Exports

Differences in profit rates between economies should cause capital exports,

5) See Ricardo (1952-1), p. 38. For Ricardo "no proposition in Euclid was clearer than" capital transfers depending on profit rates. This reference means that Ricardo did not endogenously exclude the possibility of international capital movements.

and international capital movements should cause both the equalization of the profit rates and the maximization of world production. These simple results are from the works of Kempf (1966) and MacDougal (1960). These models, however, are based on the assumption that the production functions of the two economies are the same. Our Ricardian model, assumed differences in the production functions of the two economies. On this assumption, I should consider three conditions drawn from the research of Kindleberger (1969), Lenin (1960), and the classical economists.

First, Kindleberger pointed out that every enterprise investing their capital in foreign countries should have a monopolistic advantage against enterprises located in capital importing countries.[6] This suggests that foreign capital could not profit through capital exports without having an advantage in competition over capital of the capital importing country. This advantage in competition is provided by productivity in the model. Therefore, Kindleberger's condition means that the amount of labor per produced unit of a commodity under the direction of foreign capital should be lower than that of the capital importing country.

This means that international capital movement emerges non-symmetrically between countries, i. e. capital flows only from the more industrialized countries to the less industrialized countries. Returning to our model, according to (2. 3), it is clear that only the capital of the home country can be exported to the foreign country. And it is also clear that the capital of the foreign country cannot be transferred to the home country because of the shortage of technological knowledge possessed by capitalists compared with the technological level for both setting production processes and directing labor.

The second condition is from Lenin's *Imperialism*. He pointed out that capital could be exported when possibilities of capital exports were available in capital importing countries.[7] This condition means that exported capital could not be operated unless the capital could employ labor and other conditions for production based on a higher technology compared with the one of the capital importing country. Therefore, our model suggests that exporting capital from the

6) See Kindleberger (1969), p. 14. As is well known, Kindleberger considered the monopolistic advantage held by multinational enterprises in the framework of oligopolistic competition. But, the core of his argument can be applied to abstract models, if any exclusiveness is assumed in those models.

7) See Lenin (1960), p. 245, where Lenin pointed out some examples in his perspective concerning historically particular characteristics of capitalism. It is quite clear that his argument for the possibilities of capital export have general implications within various economic analyses. This point has never been mentioned in both international economics and theoretical studies concerning foreign direct investment, even though actual investors see the possibility of capital export as a critically important factor in a decision on foreign direct investment.

home country causes a flow to the production of the second commodity in the foreign country, since the technical gap in the production of the first commodity between countries is wider than it is in the production of the second commodity. The assumption (1. 3) reflects that the production of the first commodity in the home country enjoys a higher quality both of labor and capital compared with the production of the second commodity. If the production of the second commodity under the direction of the capital of the home country does not need a higher quality of labor than that of the foreign country, the capital of the home country exported to the foreign country can employ labor of the foreign country in the production of the second commodity.

It is important to pay attention to the implications of this condition. It is quite clear that sectors attracting exported capital are limited under this condition, even though wage rates in the capital importing country are generally lower than wage rates in the exporting country. This condition implies that the capital importing country must offer both quantity and quality in labor, developed infrastructure, and other attracting factors as incentives to transfer capital, not just wage rates and world market prices.

Both Kindleberger's condition and Lenin's condition are given by

$$l_{2h} \leq l_{2x} < l_{2f}, \tag{4. 1}$$

where x denotes exported capital.

Thirdly, the capital will not be exported unless the profit rate is higher than the profit rate of the first industry of the home country. This condition is drawn from the classical thesis established by Ricardo (1952).[8] Classical economists argue that any capital of unprofitable sectors will move to profitable sectors. This condition in our model is given by

$$r_{2x} > r_{1h}. \tag{4. 2}$$

The profit rate of the exported capital from the home country to the second industry of the foreign country is given by

$$r_{2x} = \frac{1}{l_{2x}(\mu_f p_{1w} + \nu_f)} - 1. \tag{4. 3}$$

Figure 2 shows that the difference in profit rates causes capital to be exported between A and C, and is related to changes in the world market price of the

8) See, the letter to McCulloch on the 23rd of March, 1821, (Ricardo, 1952-2, pp. 357-358), where Ricardo insisted that profits might be higher in England than abroad because of high productivity of manufacturing industry in England. This argument could be drawn from two propositions, i. e. first the manufacturing industry in England enjoyed higher profits, and secondly both capital and labor could move from low profits sectors to manufacturing industries. As well seen here, Ricardo tried to exclude capital export endogenously.

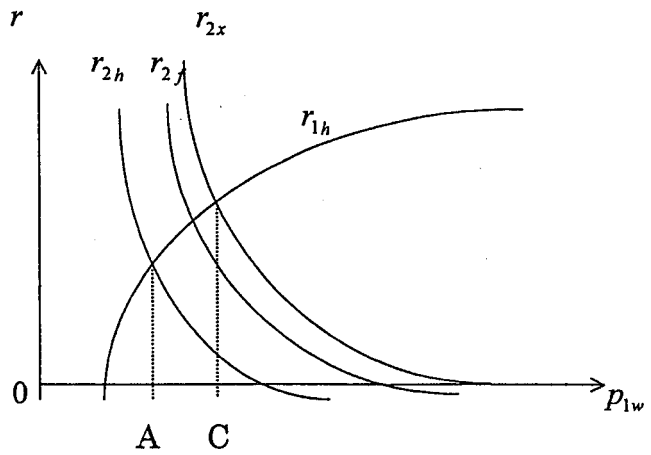

Figure 2.

first commodity.

It seems that the classical argument implies the actual world market price exists beyond C, but does not exceed B in Figure 1.[9] But this implication has not been proved, and has to be proved within a theoretical framework including capital movements between countries.

5. Conclusion

The analysis indicates that capital exports in the form of foreign direct investment could exist in a Ricardian model. The emergence of world market prices generates differences in the profit rates between industries having a comparative advantage and disadvantage, which causes a transfer of capital between countries in an international economy.

The difference in profit rates does not immediately cause international capital movements. Of the three possible cases, only one case will occur, i. e. the capital of the advanced countries will flow to the industries having a comparative advantage in the less advanced countries unless the world market price is in favor of profit rates of the industries having a comparative advantage of advanced countries.

Capital exports depend on the differences in the labor coefficients and wage rates, and the change in world market prices.[10] International capital movements could accelerate the formation of the international division of labor, and also have a tendency to equalize the profit rates of exported capital and the industries of advanced countries having a comparative advantage. However, the international capital movement would not cause the equalization of the profit rates of

9) This classical argument is not formulated. Its formulation requires elaboration concerning the world market price equilibrating supply with demand.

the world, because production functions and wages are not the same between countries.

Although the present analysis is simple, it can explain the rapid growth of capital exports from Japan to Southeast Asian countries after the Plaza Accord of 1985. The appreciation of Japanese yen which brings changes in world market prices for Japanese industries causes foreign direct investment to seek lower wage rates.[11] The Southeast Asian countries can offer the required quality of labor and infrastructure as well as lower wage rates compared with Japan. Moreover, the exported capital from Japan has a tendency to move from the capital importing country to yet another country depending on the changes in wage rates, if the other country offers the identical quality of labor and infrastructure. As a result, structural changes in the international division of labor has been accelerated.

Despite its simplicity, the analysis can be extended to include many other cases, such as a case with the existence of entrance barriers, that with tariffs, and that with fertility. This model, therefore, provides the basic analysis to study multinational corporations, mutual foreign direct investment between advanced countries, and traditional direct investment in less advanced countries.

The analysis also shows that the case of classical economics in which capital movement occurs only from an industry to another industry within a country requires extremely strict conditions. At the same time, the classical prediction concerning full-employment of both labor and capital would be undermined when capital exports occur, because the exportation of capital could cause unemployment both of labor in the capital exporting countries and of local capital in the capital importing countries. Research into the relationship between capital exports and macro economic conditions is needed. It may require extremely severe conditions, because full employment, equalization of the profit rates within a country, capital movements limited in a country, and one world market price

10) I pointed out in Chapter 7 of my book (see Sasaki 1994) that the same conclusion could be drawn from an analysis on a model including capital goods with a Walrasian type of income distribution. For example, if the first commodity is a capital good, the second commodity is a consumption good, and income distribution is a Walrasian type, the closed price system of the home country is obtained by

$$p_{1h}=l_{1h}\mu_h+k_{1h}p_{1h}(1+r_h),$$
$$1=l_{2h}\mu_h+k_{2h}p_{1h}(1+r_h),$$

where k represents the input coefficient of capital goods, and μ represents consumption coefficients. Capital export could emerge from the following condition of r_{2x}:

$$r_{1h}=\frac{1}{k_1}-\frac{\mu_h l_{1h}}{p_{1w}k_{1h}}-1<r_{2x}=\frac{1-\mu_f l_{2x}}{p_{1w}k_{2x}}-1.$$

11) Exchange rates are included implicitly as a factor of capital exports as world market prices in the present model. I have already examined this factor in a Ricardian model with continuum goods (see Sasaki 1995).

for each commodity are simultaneously taking place. However, it is not possible in a Ricardian model to answer these problems, because it normally deals with the price problem without demand and also excludes the equilibrium problem concerning physical quantities. I would examine these problems in further research.

Professor of World Economy, Hokkaido University

References

1. Heckscher, E. F. (1949, first published in 1919), "The Effect of Foreign Trade on the Distribution of National Income," in Readings in *the Theory of International Trade*, edited by Ellis, H. S. and L. A. Metzler, Philadelphia, Blakiston.
2. Kempf, M. C. (1966), "The Gain from International Trade and Investment: A Neo-Hecscher-Ohlin Approach," *American Economic Review*, 56, pp. 788-809.
3. Kindleberger, C. P. (1969), *American Business Abroad,* New Haven, Yale University Press.
4. Lenin, V. I. (1960, original in 1917), Der Imperialismus als hoechstes Stadium des Kapitalismus, in W. I. Lenin Werke, Band 22, Berlin, Dietz Verlag.
5. MacDougal, G. D. H. (1960), "The Benefit and Cost of Private Investment from Abroad: A Theoretical Approach," *Economic Record*, 36, pp. 395-409.
6. Negishi, T. (1985), *Economic Theories in a non-Walrasian Tradition*, Cambridge, Cambridge University Press.
7. Ohlin, B. (1933), *Interregional and International Trade*, Cambridge, Harvard University Press.
8. Pasinetti, L. L. (1974), *Growth and Income Distribution: Essays in Economic Theory*, Cambridge, Cambridge University Press.
9. _____. (1977), *Essays on the Theory of Joint Production*, New York, Columbia University Press.
10. _____. (1981), *Structural Change and Economic Growth: A Theoretical Essay on the Dynamics of the Wealth of Nations*, Cambridge, Cambridge University Press.
11. _____. (1993), *Structural Economic Dynamics; A Theory of the Economic Consequences of Human Learning*, Cambridge, Cambridge University Press.
12. Ricardo, D. (1951, original in 1817), *On the Political Economy and Taxation, in The Works and Correspondence of David Ricardo*, Vol. I, edited by Sraffa, P., Cambridge, Cambridge University Press.
13. _____. (1952-1), *The Works and Correspondence*, Vol. V. Speeches and Evidence.
14. _____. (1952-2), *The Works and Correspondence*, Vol. VIII. Letters 1819-1821.
15. Samuelson, P. A. (1948), "International Trade and Equalization of Factor Prices," *Economic Journal*, 59, pp. 163-184.
16. _____. (1977 with Dornbusch, R. and S. Fischer), "Comparative Advantage, Trade, and Payments in a Ricardian Model with a Continuum of Goods," *American Economic Review*, 67, pp. 823-839.
17. Sasaki, T. (1994), *Kokusai Shihon Idou no Seikeizaigaku* (published in Japanese, the title means Political Economy of International Capital Movement), Tokyo, Fujiwara-Shoten.
18. _____. (1995), "International Investment in a Ricardian Model with a Continuum of Goods," *Economic Studies* (published in Japanese), Vol. 45, No. 1, Hokkaido University.