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ANALYSIS OF THE HECKSHER-OHLIN MODEL

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The Hecksher-Ohlin theory is a theory of a long-term general balance where the two factors of production taken into account, namely work and capital, are interchangeable among the fields of activity. This theory considers that the relative advantage of each country depends on the combination of the production factors (capital, work, nature) which ensure a proportion which is comparatively or relatively higher than the more abundant factor and, therefore which may allow a production cost, which is relatively or comparatively low of the merchandise to be exported.

Keywords*: Hecksher-Ohlin theory, relative advantage, comparative advantage, work, capital*

Introduction

The Hecksher-Ohlin theory is a theory of a long-term general balance where the two factors of production taken into account, namely work and capital, are interchangeable among the fields of activity. This theory tackles the theory of the work value and succeeds in making the best of the great contributions of the second half of the 18th century, among which Alfred Marshal's contribution is worth mentioning.

Ohlin insists on the reasons that made him reject the theory of work value and chose the neoclassic theory of prices as a starting point in the analysis of the international trade. He expresses his intention to formulate a theory of the international trade which will comply with the theory of mutual interdependence among prices and thus independent of the classical theory of the value based on work.

Hecksher and Ohlin mainly show that the essential elements of the international trade are the following:

- production factors of the national economy are different from those of the world economy;
- the different way in which the production factors are involved in the production of goods which constitute the object of the international trade.

Starting from these essential elements, the theory designed by Hecksher and Ohlin suggests that nations should specialize in the manufacturing of those goods that make use intensively of the factors that they own abundantly. Thus, Ohlin concludes that every region is better endowed to produce goods that require a better proportion of its relatively abundant factors. On the other hand, it is unsuited to produce goods that require a greater proportion of the existing factors in smaller quantities or factors that are not available at all.

Hecksher and Ohlin's theory does not give up the principle of the comparative advantage, formulated by the classical theory of the international trade. Starting from the marginal principle of the end-using whose size is inversely proportional to the abundance of the intermediary goods used or directly proportional to the their scarcity, Hecksher and Ohlin's theory considers that the relative advantage of each country depends on the combination of the production factors (capital, work, nature) which ensure a proportion which is comparatively or relatively higher than the more abundant factor and, therefore which may allow a production cost, which is relatively or comparatively low of the merchandise to be exported.

In order to exemplify this idea, Ohlin mentions that Australia owns more agricultural land but less work force, less capital and less mines than Great Britain. Consequently, Australia is better adapted to the manufacturing of goods which require a greater quantity of agricultural land while Great Britain has the advantage of producing goods which require a considerable quantity of other factors. If both countries would produce the total amount of commodities which are required, without any external interference, then the agricultural products would be cheaper than in Australia. However, the manufactured goods would be relatively expensive while in Great Britain it would be the opposite, where, due to the limited production of the land, every acre should be cultivated intensively, requiring hard work and a lot of capital to produce the necessary quantity of food. To the example provided by Ohlin we might add some other examples which are specific nowadays. Thus, this theory provides an explanation regarding the fact that on one hand, countries like United States, Japan, the European Union export automobiles, planes and other goods requiring a large amount of capital. On the other hand, countries like India, China, Taiwan export fabrics, shoes and other merchandise which require the work force intensively.

As a result the Hecksher-Ohlin theory provides an explanation regarding the way in which the comparative advantage is constituted. Thus, from the two authors' point of view, the comparative advantages are due to the endowment differences regarding the production factors of the national economies involved in the international trade.

The hypotheses, on which the Hecksher and Ohlin's theory relies on, are the following:

- there are no transport expenses or any other barriers or hindrances in the international trade;
- there is a perfect competition on the commodity market as well as on the production factors market;
- all production functions yield a constant output on the scale;
- work and capital are perfectly interchangeable among the industrial sectors within the same country but perfectly unchangeable among other countries.

Description of the model

We are going to analyze the Hecksher and Ohlin model of a world economy made up of two national economies: country α and country β, which produce two products: B_1 and B_2. The production factors used to manufacture these products are work (L) and capital (K). We assume that the B_1 product is intensive in the work factor. Likewise we assume that country α is abundant in the work production factor and the country β is abundant regarding the capital production factor. If we use L_1 and K_1 to refer to the work and capital supplies existing on the economic level of country α and with L_2 and K_2 the work and capital supplies existing on the economic level of country β, the following inequality results:

$$L_1/K_1 > L_2/K_2$$

The above inequality shows that the abundance regarding the production factors is defined in relative terms but not in absolute ones. Thus, if we define the abundance in relative terms, neither of the two economies can be abundant in both factors, although in absolute terms one of them might be.

The consumers of the two economies have identical preferences and as a result, the relative demand curves are identical to those of the two products provided that we have the same relative prices for B_1 and B_2. To simplify the analysis we assume that the two economies own the same manufacturing technology of the two products.

We shall make the following notations:

$a_{1,1}$ = the number of working hours from the work factor required to produce a unit of the B1 product

$a_{1,2}$ = the number of working hours from the work factor required to produce a unit of B2 product

$a_{2,1}$ = number of units from the capital factor required to produce a unit of the B1 product

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$a_{2,2}$ = number of units from the capital factor required to produce a unit of the B2 product

The hypothesis according to which the production of the B_1 product is intensive in the capital factor and the production of the B_2 product is intensive in the land factor can be expressed by the following inequality:

$$a_{2,1}/a_{1,1} > a_{2,2}/a_{1,2}$$

which is equivalent to the following:

$$a_{2,1}/a_{2,2} > a_{1,1}/a_{1,2}$$

The two economies from the world economy cannot use more resources than those available. If the economy of country α produces $Q_{1,1}$ units of the B_1 product and $Q_{1,2}$ units of the B_2 product, then it should use $a_{1,1}*Q_{1,1}+a_{1,2}*Q_{1,2}$ working hours and $a_{2,1}*Q_{1,1}+a_{2,2}*Q_{1,1}$ units of the capital production factor. However, the amount of work used should not exceed the available offer L_1, which is equivalent with the following inequality:

$$a_{1,1}*Q_{1,1} + a_{1,2}*Q_{1,2} = L_1$$

Secondly, the total amount of the capital production factor cannot exceed the available offer K_1:

$$a_{2,1}*Q_{1,1} + a_{2,2}*Q_{1,2} = K_1$$

For the economy of country β, under the circumstances in which $Q_{2,1}$ units of the product are manufactured, the following inequalities result:

$$a_{1,1}*Q_{2,1} + a_{1,2}*Q_{2,2} \leq L_2$$
$$a_{2,1}*Q_{2,1} + a_{2,2}*Q_{2,2} \leq K_2$$

The inequalities can be rewritten as follows:

$$Q_{1,2} \leq L_1/a_{1,2} - (a_{1,1}/a_{1,2})*Q_{1,1}$$
$$Q_{1,2} \leq K_1/a_{2,2} - (a_{2,1}/a_{2,2})*Q_{1,1}$$
$$Q_{2,2} \leq L_2/a_{1,2} - (a_{1,1}/a_{1,2})*Q_{2,1}$$
$$Q_{2,2} \leq K_2/a_{2,2} - (a_{2,1}/a_{2,2})*Q_{2,1}$$

The functions of the production possibilities for the economies of the two countries, α and β are presented in figure 1.

Figure 1 shows that the limited work and capital supply constrain the production possibilities of the two countries. Since the B_1 product is more intensive in the capital factor than B_2 product, the line which characterizes the capital constraint is more inclined than the line that characterizes the work factor constraint.

The thickened lines from figure 1 describe the production possibilities of the two economies. If the two economies produce a quantity, which is bigger than the B_1 product, aspect described by M_1 and N_1, then the frontier of the production possibility is identical with the constraint of the work factor. If, on the other hand, the M_2 and N_2 economies produce a larger quantity of B_1 product as compared to the B_2 product (see M_2 and N_2) then the frontier of the production possibilities is determined by the constraint of the capital production factor. The type of constraint, which determines the frontier of production possibilities, depends on the combination between B_1 and B_2 products accomplished by every economy.

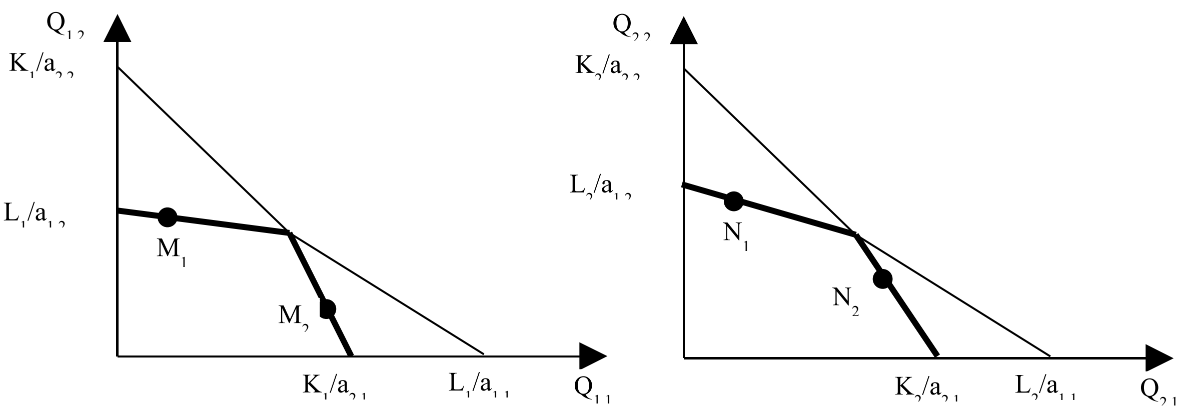

Figure 1: The functions of the production possibilities for the economies of country α and country β

Analysis of the effects of the international trade

To analyze the effects of the international trade on the economies of country α and country β we shall make the following notations:

$p_{1,1}$ = the unit price of the B_1 product on the economic level of country α

$p_{1,2}$ = the unit price of the B_2 product on the economic level of country β

w_1 = the wage for the working hour on the economic level of country α

pr_1 = the profit due to the use of a unit from the capital factor on the economic level of country α

$p_{2,1}$ = the unit price of the B_1 product on the economic level of country α

$p_{2,2}$ = the unit price of the B_2 product on the economic level of country β

w_2 = the wage for the working hour on the economic level of country β

pr_2 = the profit due to the use of a unit from the capital factor on the economic level of country β

The perfect competition existing in the industry of B_1 and B_2 products determines the complete elimination of the monopoly profit, which means that the price of any good or product is equal to its production cost. Thus on the level of the country α economy we have the following inequalities:

$$p_{1,1} = a_{1,1}*w_1 + a_{2,1}*pr_1$$
$$p_{1,2} = a_{1,2}*w_1 + a_{2,2}*pr_1$$

and for country β:

$$p_{2,1} = a_{1,1}*w_2 + a_{2,1}*pr_2$$
$$p_{2,2} = a_{1,2}*w_2 + a_{2,2}*pr_2$$

In figure 2 there are described the four equations presented above. Since the B_1 product is more intensive in the production capital factor than the B_2 product, the following relation results: $a_{2,1}/a_{1,1} > a_{2,2}/a_{1,2}$ which implies the fact that right line corresponding to the B_1 product is more inclined than the one corresponding to the B_2 product.

The economies of the two countries will produce two products: B_1 and B_2 providing that the price is equal to the cost in both industrial branches. This equality is achieved for the two products in E_1 where $w_1=w^*_1$ şi $pr_1=pr^*_1$ and E_2 where $w_2=w^*_2$ şi $pr_2=pr^*_2$. Figure 2 shows that we can determine the price of the production factors when we know the price of the products. Likewise, when the price of products changes, the price of the production factors will change as well.

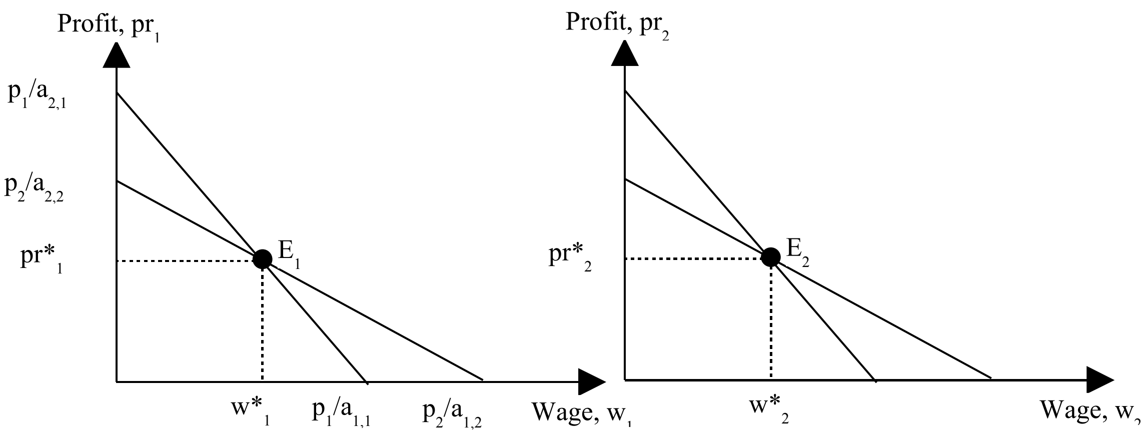

Figure 2: The determining of the production prices

When the international trade will be conducted within the world economy, then the phenomenon of convergence of the relative prices will be recorded. This means that the relative price of the B_1 product becomes equal in the two economies. Under the circumstances in which the economy of country α is relatively abundant in capital factor and the economy of country β is relatively abundant in the work factor, the B_1 product is more intensive in the capital factor and the B_2 product is more intensive in the work factor then, on the one hand the economy of country α will have a better production of the B_1 product as compared with the B_2 product. On the other hand,

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the economy of country β will produce less of B_1 as compared with the B_2 product. The curve of the relative supply for the B_1 product of country α economy will be situated on the right side of the curve of the economy of country β.

The curve of the O_1 relative supply of the country α economy and the curve of the O_1 relative supply of the country β are presented in figure 3. The curve of the C relative supply is the same for both economies. Under the circumstances of autarchy the balance of the country α economy will be in D_1 point and the balance of the country β economy will be in D_2. In the absence of the international trade, the relative price of the B1 product is lower in the country α economy than in country β.

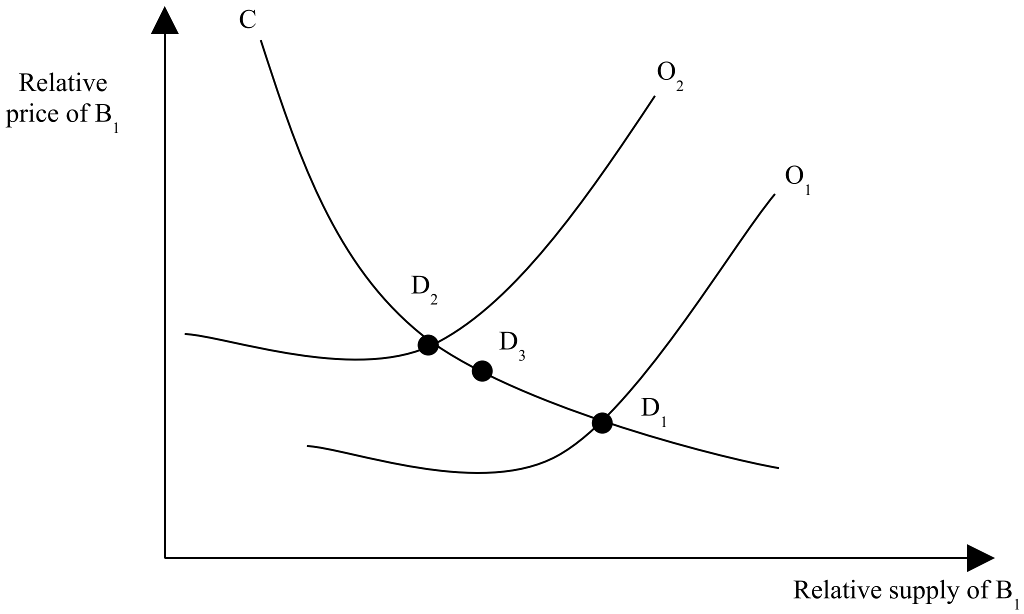

Figure 3: The balance before and after the conducting of the international trade

When the economies of the two countries are involved in commercial relations, the relative prices become convergent. The relative price of the B_1 product will increase on the economic level of country α while the same price will decrease on the economic level of country β. The new relative price of the B_1 product will stabilize somewhere between the relative prices existing before the international trade. The new point of balance will be D_3 as shown in figure 3. Within the economy of country α, the increase of the relative price of the B_1 product determines an increase of the relative production of this product, which is simultaneous with a relative decrease of its consumption. Thus, the economy of country α becomes the exporter of B_1 products and an importer of B_2 products. On the other hand, the decreasing of the relative price of the B_1 product in the country β economy has as a consequence the changing of this economy into one that imports B_1 products and exports B_2 products. In conclusion, the national economies have the tendency of exporting products whose production is intensive in the abundant production factors.

Conclusions

The changing of the relative prices has a great impact on the income corresponding to the work and capital production factors. On the economic level of the country α, an increase of the relative price of the B_1 product determines an increase of the purchasing power for the capital factor in terms of the two products. At the same time it determines a decrease of the purchasing power for the work factor in terms of the two products.

On the economic level of the country β, a decrease of the relative price of the B_1 product generates a decrease of the purchasing power for the capital factor in terms of the two products, which is simultaneous with an increase of the purchasing power for the work factor in terms of the two products.

The resource in which the economy is relatively abundant (which in our case is capital for the country α economy and work for country β economy) – represents the abundant production factor which cannot be found in a relative abundance. Work is the rare factor for the economy of country α whereas capital is the rare factor for the economy of country β.

The general conclusion that can be drawn regarding the effect of the international trade concerning the income distribution might be couched in the following terms: the owners of the abundant production factors of the national economy will benefit from the international trade while the owners of the rare factors will lose.

References:

1. Heckcher, E.F., *Readings in the Theory of International Trade*, Ellis H.S., Metzler L.A. (eds.), Irwin, Homewood, 1950
2. Ohlin, B., *Interregional and International Trade*, Harvard University Press, Cambridge, 1933
3. Puşcaciu V., Puşcaciu Fl., *Comerț internațional*, Editura Didactică şi Pedagogică R.A., Bucureşti, 2004
4. Sută N., *Comerț internațional şi politici comerciale contemporane*, Editura Eficient, Bucureşti, 2000.
5. Bhagwati J., *Lectures on International Trade*, Second Edition, MIT Press, Cambridge, M.A., 1998.
6. Kenen P.B., *The International Economy*, Ed. Prentice Hall Inc., 1985.
7. Krugman P., Obstfeld M., *International Economic – Theory and Policy,* Ed. Harper-Rollins, 2000.

This paper was recommended for publication by Prof. Florin Dan PUŞCACIU, PhD.