

INTERNATIONAL TRADE

Edited by
Bharat Hazari and Yin-Wong Cheung

CRITICAL CONCEPTS IN
ECONOMICS



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Critical Concepts in Economics

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Part 3

GAINS FROM TRADE

THE GAINS FROM INTERNATIONAL TRADE

Paul A. Samuelson

Source: *Canadian Journal of Economics and Political Science*, 5 (1939), 195–205.

[1] In a recent paper¹ the thesis was advanced that while it is not possible to demonstrate rigorously that *free* trade is better (in some sense) for a country than *all* other kinds of trade, it nevertheless can be shown conclusively that (in a sense to be defined later) free trade or some trade is to be preferred to *no* trade at all. I should like here to amplify these remarks with respect to the last point, that some trade is better than no trade.

This is by no means a novel proposition. Indeed, it can be traced back to the beginnings of the Classical theory of international trade. It has become associated, however, quite unnecessarily in my opinion, with a labour theory of value, or a "real cost" theory of value, or more recently, with an opportunity cost theory of value. All of these have come in for considerable criticism in recent years as restrictive special cases of the so-called theory of general equilibrium. Those writers who have insisted on the need for a modern theory of value for a positive description of behaviour in international trade have in general ignored the normative aspects of international trade, presumably in the belief that as soon as one gives up the inadmissible special theories indicated above, nothing can be said concerning this problem.² It will be argued here that this is a mistake, that from the most general theories of equilibrium all valid normative propositions can be derived.

[2] It is well to indicate clearly the assumptions under which our analysis is to take place. We shall consider a single economy consisting of one or more individuals enjoying a certain unchanging amount of technological knowledge, so that we may take as data the production functions relating the output of each commodity to the amounts of inputs devoted to its production. Any number of commodities is assumed; there may also be any number of inputs or productive services. These are not necessarily fixed in amount, but may have supply functions in terms of various economic prices.

Moreover, for our purposes the differentiation of the factors of production can proceed to any degree; thus, labour services of the same man in different occupations are not regarded as the same factor of production unless the provider of these services is indifferent as between these two uses. Similarly, in order that the productive services rendered by different individuals may be considered the same service, it is necessary that in every use they be infinitely substitutable.

In order to ensure that perfect competition is possible, we rule out increasing returns, and assume that all production functions show constant returns with respect to proportional changes of *all* factors. Each individual acts as if he were a small part of the markets which he faces and takes prices as given parameters which he cannot influence by changes in his own supplies or demands. It is assumed that for each individual there exists an *ordinal* preference scale in which enter all commodities and productive services, and that subject to the restraints of fixed prices he always selects optimal amounts of each and every commodity and every productive service (some zero in amount). Each individual is better off if he receives more of every commodity while rendering less of every productive service. No attempt is made to render the "utilities" and "disutilities" of different persons comparable.

[3] Under these conditions, for any assumed set of prices there will correspond definite demand and supply reactions on the part of every individual. Moreover, the total outputs of each commodity will be determined, and the total amounts of productive factors necessary to produce these outputs will be determined. If the economy is isolated, it will be necessary as conditions of equilibrium that prices of commodities and factors of production be such as to equalize the amounts produced and consumed of each and every commodity, and to equalize the amounts supplied and demanded of every productive factor.

Under assumed conditions of ownership of the factors of production and assumed scales of preference for commodities and productive services on the part of every individual, there will result in general (waiving possible multiplicities of equilibrium raising problems not peculiar to international trade) unique equilibrium quantities of consumption goods and productive services for each and every individual. It is unnecessary to write down mathematically these equations to deduce the familiar fact that not enough has been assumed to be able to deduce the absolute level of commodity and factor prices, but that these are determined except for a factor of proportionality; i.e., relative commodity and factor prices are determined. Let us write as follows the equilibrium set of prices, determined to within a factor of proportionality, which will be established for our economy when isolated,

$$p_1^0, p_2^0, \dots, p_n^0, w_1^0, w_2^0, \dots, w_s^0,$$

with corresponding equilibrium total quantities of the respective commodities and productive services,

$$x_1^0, x_2^0, \dots, x_n^0, a_1^0, a_2^0, \dots, a_s^0.$$

The total amounts produced of the respective commodities will be indicated by the barred letters,

$$\bar{x}_1^0, \bar{x}_2^0, \dots, \bar{x}_n^0,$$

equal respectively in the isolated state to the quantities (unbarred) consumed.

[4] Before introducing possibilities for trade into our system, it will be useful in view of the later discussion first to develop certain relations which must hold in the field of *production*. Confronted with given factor prices, firms will combine factors of production in such proportions as to produce any selected quantity of consumers' goods at the lowest total money cost. In consequence of this, certain marginal conditions of equality will be attained (or at least certain inequalities with respect to finite movements). Although the proof is not given here,³ it can be shown that this places restrictions on the possible combinations of factors of production and commodities which can occur. Indeed, it will be found that the totals of commodities produced and the totals of productive services must obey an implicit equation of the following form:

$$\phi[\bar{x}_1, \bar{x}_2, \dots, \bar{x}_n, a_1, a_2, \dots, a_s] = 0. \quad [1]$$

This is capable of the following interpretation: for preassigned values of all productive services and all but one commodity, this equation gives the *maximum* amount of the remaining commodity which can be produced with the given state of technology. Moreover, with preassigned amounts of all commodities and all but one productive service, this shows the *minimum* amount of this one productive service which is necessary.

Utilizing the well-known law of variable proportions, the following remarkable theorem can be established. Consider any set of commodity and factor prices,

$$p_1', p_2', \dots, p_n', w_1', w_2', \dots, w_s'.$$

Since each entrepreneur is trying to maximize his profits, there will result an optimal set (not unique) of commodities produced and productive services used, indicated by

$$\bar{x}_1', \bar{x}_2', \dots, \bar{x}_n', a_1', a_2', \dots, a_s',$$

satisfying, of course, equation [1]. Our theorem says that *for such preassigned prices the resulting optimal quantities of commodities and productive services maximize for the economy as a whole the algebraic difference between total value of output and total factor cost, as compared to any other commodity and factor combinations satisfying equation [1].* This is equivalent to the following inequality:

$$\begin{aligned} [p_1' \bar{x}_1' + p_2' \bar{x}_2' + \dots + p_n' \bar{x}_n'] - [w_1' a_1' + w_2' a_2' + \dots + w_s' a_s'] &\geq \\ [p_1' \bar{x}_1 + p_2' \bar{x}_2 + \dots + p_n' \bar{x}_n] - [w_1' a_1 + w_2' a_2 + \dots + w_s' a_s], \end{aligned} \quad [2]$$

where the unprimed x 's and a 's represent *any* point satisfying equation [1]. This inequality merely places certain curvature restrictions on the surface represented by equation [1], for the various ratios between respective prices correspond in a well-known manner to the respective slopes (when they exist) of this surface.⁴ In figure I are presented typical shapes for various cross-sections of this surface. In the first diagram is shown the amount that must be given up of one commodity, x_j , in order to get more of another, x_i , with all other variables held constant. This substitution curve must be concave to the origin. The next diagram shows the amount of one input, a_k , which must be added to compensate for withdrawals of a_r , all other variables being held constant. The last diagram shows the amount of commodity, x_j , that can be secured with additional amounts of a_k , with constant levels for the remaining outputs and inputs.

The above inequality can be written symbolically

$$\sum p' \bar{x}' - \sum w' a' \geq \sum p' \bar{x} - \sum w' a, \quad [2]$$

where it is always understood that the summations are over the respective n commodities and s productive services. Of course, a similar inequality holds for any other preassigned set of prices.

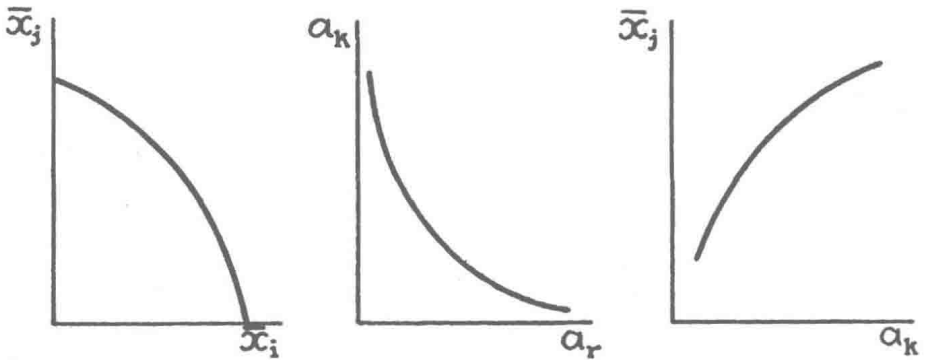


Figure I

[5] Trade can be introduced very simply into our system without explicitly dealing with any new country or countries. This is done by the useful device of supposing that there exists an outside market in which there prevail certain arbitrarily established (relative) prices at which this country can buy or sell various commodities in unlimited amounts without changing those quoted prices. It does not matter for the present purposes how, in fact, such prices would be established in this outside market or source, but rather we are interested in the effects upon this country of the existence of such quoted prices.

The fact that this outside market will both buy and sell at the new quoted prices will compel the prices of respective goods in the domestic economy to assume equivalent ratios, or else corrective arbitrage movements would take place. Obviously, therefore, we have introduced new forces to determine some of the prices. It is necessary, then, to drop some of our previous conditions. In particular, we must dispense with the condition that the amounts of commodities produced domestically and consumed domestically must be equal. Instead we have the single condition that the total value of imports must equal the total value of exports, or

$$\sum p x = \sum p \bar{x}. \quad [3]$$

It is clear that for any preassigned prices of internationally tradable goods there will result certain equilibrium values for all the other variables, quantities produced and consumed, productive services supplied, and prices of non-tradable commodities and services.

For one set of prices, namely those proportional to the set $[p_1^0, p_2^0, \dots, p_n^0]$ which would prevail if the economy were isolated, no trade will result.⁵ For these particular prices are such as to equalize the domestic production and consumption of each and every good. For any other set of prices, some trade will result, and there will emerge new equilibrium values for all of our unknowns. By assigning appropriate values to our outside prices, we can obviously reproduce all possible conditions of trade which could conceivably arise. This is the justification for introducing a simplifying device which enables us to ignore the existence of outside economies. Of course, if we were trying to explain the *actual* prices with which our economy will be confronted, it would be necessary to consider outside conditions.

[6] I first apply our analysis of the effect of introducing relative prices, different from those which would be established if our system were isolated, to a simplified case in which all members of our economy are identical in every respect. That is, the same ordinal preference schedule relating commodities and productive services is assumed for every individual, and also the same ownership in the means of production. This does not mean that the utilities of different individuals are comparable. Indeed, since all individuals are identical, if one is bettered (in an ordinal sense) by the introduction of