Scale Economies, Product Differentiation, and the Pattern of Trade

By PAUL KRUGMAN*

For some time now there has been considerable skepticism about the ability of comparative cost theory to explain the actual pattern of international trade. Neither the extensive trade among the industrial countries, nor the prevalence in this trade of two-way exchanges of differentiated products, make much sense in terms of standard theory. As a result, many people have concluded that a new framework for analyzing trade is needed.[1] The main elements of such a framework—economies of scale, the possibility of product differentiation, and imperfect competition—have been discussed by such authors as Bela Balassa, Herbert Grubel (1967, 1970), and Irving Kravis, and have been "in the air" for many years. In this paper I present a simple formal analysis which incorporates these elements, and show how it can be used to shed some light on some issues which cannot be handled in more conventional models. These include, in particular, the causes of trade between economies with similar factor endowments, and the role of a large domestic market in encouraging exports.

The basic model of this paper is one in which there are economies of scale in production and firms can costlessly differentiate their products. In this model, which is derived from recent work by Avinash Dixit and Joseph Stiglitz, equilibrium takes the form of Chamberlinian monopolistic competition: each firm has some monopoly power, but entry drives monopoly profits to zero. When two imperfectly competitive economies of this kind are allowed to trade, increasing returns produce trade and gains from trade even if the economies have identical tastes, technology, and factor endowments. This basic model of trade is presented in Section I. It is closely related to a model I have developed elsewhere; in this paper a somewhat more restrictive formulation of demand is used to make the analysis in later sections easier.

The rest of the paper is concerned with two extensions of the basic model. In Section II, I examine the effect of transportation costs, and show that countries with larger domestic markets will, other things equal, have higher wage rates. Section III then deals with "home market" effects on trade patterns. It provides a formal justification for the commonly made argument that countries will tend to export those goods for which they have relatively large domestic markets.

This paper makes no pretense of generality. The models presented rely on extremely restrictive assumptions about cost and utility. Nonetheless, it is to be hoped that the paper provides some useful insights into those aspects of international trade which simply cannot be treated in our usual models.

I. The Basic Model

A. *Assumptions of the Model*

There are assumed to be a large number of potential goods, all of which enter symmetrically into demand. Specifically, we assume that all individuals in the economy have the same utility function,

$$U = \sum_i c_i^\theta \qquad 0 < \theta < 1 \tag{1}$$

where c_i is consumption of the ith good. The number of goods actually produced, n,

*Yale University and Massachusetts Institute of Technology.

[1]A paper which points out the difficulties in explaining the actual pattern of world trade in a comparative cost framework is the study of Gary Hufbauer and John Chilas.

will be assumed to be large, although smaller than the potential range of products.[2]

There will be assumed to be only one factor of production, labor. All goods will be produced with the same cost function:

$$l_i = \alpha + \beta x_i \qquad \alpha, \beta > 0 \qquad i = 1, \ldots, n \tag{2}$$

where l_i is labor used in producing the ith good and x_i is output of that good. In other words, I assume a fixed cost and constant marginal cost. Average cost declines at all levels of output, although at a diminishing rate.

Output of each good must equal the sum of individual consumptions. If we can identify individuals with workers, output must equal consumption of a representative individual times the labor force:

$$x_i = Lc_i \qquad i = 1, \ldots, n \tag{3}$$

We also assume full employment, so that the total labor force must just be exhausted by labor used in production:

$$L = \sum_{i=1}^{n} (\alpha + \beta x_i) \tag{4}$$

Finally, we assume that firms maximize profits, but that there is free entry and exit of firms, so that in equilibrium profits will always be zero.

B. *Equilibrium in a Closed Economy*

We can now proceed to analyze equilibrium in a closed economy described by the assumptions just laid out. The analysis proceeds in three stages. First I analyze consumer behavior to derive demand functions. Then profit-maximizing behavior by firms is derived, treating the number of firms as given. Finally, the assumption of free entry is used to determine the equilibrium number of firms.

[2]To be fully rigorous, we would have to use the concept of a continuum of potential products.

The reason that a Chamberlinian approach is useful here is that, in spite of imperfect competition, the equilibrium of the model is determinate in all essential respects because the special nature of demand rules out strategic interdependence among firms. Because firms can costlessly differentiate their products, and all products enter symmetrically into demand, two firms will never want to produce the same product; each good will be produced by only one firm. At the same time, if the number of goods produced is large, the effect of the price of any one good on the demand for any other will be negligible. The result is that each firm can ignore the effect of its actions on other firms' behavior, eliminating the indeterminacies of oligopoly.

Consider, then, an individual maximizing (1) subject to a budget constraint. The first-order conditions from that maximum problem have the form

$$\theta c_i^{\theta-1} = \lambda p_i \qquad i = 1, \ldots, n \tag{5}$$

where p_i is the price of the ith good and λ is the shadow price on the budget constraint, that is, the marginal utility of income. Since all individuals are alike, (5) can be rearranged to show the demand curve for the ith good, which we have already argued is the demand curve facing the single firm producing that good:

$$p_i = \theta \lambda^{-1} (x_i / L)^{\theta-1} \qquad i = 1, \ldots, n \tag{6}$$

Provided that there are a large number of goods being produced, the pricing decision of any one firm will have a negligible effect on the marginal utility of income. In that case, (6) implies that each firm faces a demand curve with an elasticity of $1/(1-\theta)$, and the profit-maximizing price is therefore

$$p_i = \theta^{-1} \beta w \qquad i = 1, \ldots, n \tag{7}$$

where w is the wage rate, and prices and wages can be defined in terms of any (common!) unit. Note that since θ, β, and w are the same for all firms, prices are the same for all goods and we can adopt the shorthand $p=p_i$ for all i.

The price p is independent of output given the special assumptions about cost and utility (which is the reason for making these particular assumptions). To determine profitability, however, we need to look at output. Profits of the firm producing good i are

$$\pi_i = px_i - \{\alpha + \beta x_i\} w \qquad i=1,\ldots,n \tag{8}$$

If profits are positive, new firms will enter, causing the marginal utility of income to rise and profits to fall until profits are driven to zero. In equilibrium, then $\pi=0$, implying for the output of a representative firm:

$$x_i = \alpha/(p/w-\beta) = \alpha\theta/\beta(1-\theta) \qquad i=1,\ldots,n \tag{9}$$

Thus output per firm is determined by the zero-profit condition. Again, since α, β, and θ are the same for all firms we can use the shorthand $x=x_i$ for all i.

Finally, we can determine the number of goods produced by using the condition of full employment. From (4) and (9), we have

$$n = \frac{L}{\alpha+\beta x} = \frac{L(1-\theta)}{\alpha} \tag{10}$$

C. *Effects of Trade*

Now suppose that two countries of the kind just analyzed open trade with one another at zero transportation cost. To make the point most clearly, suppose that the countries have the same tastes and technologies; since we are in a one-factor world there cannot be any differences in factor endowments. What will happen?

In this model there are none of the conventional reasons for trade; but there will nevertheless be both trade and gains from trade. Trade will occur because, in the presence of increasing returns, each good (i.e., each differentiated product) will be produced in only one country—for the same reasons that each good is produced by only one firm. Gains from trade will occur because the world economy will produce a greater diversity of goods than would either country alone, offering each individual a wider range of choice.

We can easily characterize the world economy's equilibrium. The symmetry of the situation ensures that the two countries will have the same wage rate, and that the price of any good produced in either country will be the same. The number of goods produced in each country can be determined from the full-employment condition

$$n = L(1-\theta)/\alpha; \qquad n^* = L^*(1-\theta)/\alpha \tag{11}$$

where L^* is the labor force of the second country and n^* the number of goods produced there.

Individuals will still maximize the utility function (1), but they will now distribute their expenditure over both the n goods produced in the home country and the n^* goods produced in the foreign country. Because of the extended range of choice, welfare will increase even though the "real wage" w/p (i.e., the wage rate in terms of a representative good) remains unchanged. Also, the symmetry of the problem allows us to determine trade flows. It is apparent that individuals in the home country will spend a fraction $n^*/(n+n^*)$ of their income on foreign goods, while foreigners spend $n/(n+n^*)$ of their income on home country products. Thus the value of home country imports measured in wage units is $Ln^*/(n+n^*) = LL^*/(L+L^*)$. This equals the value of foreign country imports, confirming that with equal wage rates in the two countries we will have balance-of-payments equilibrium.

Notice, however, that while the *volume* of trade is determinate, the *direction* of trade—which country produces which goods—is not. This indeterminacy seems to be a general characteristic of models in which trade is a consequence of economies of scale. One of the convenient features of the models considered in this paper is that nothing important hinges on who produces what within a group of differentiated products. There is an indeterminacy, but it doesn't matter. This result might not hold up in less special models.

Finally, I should note a peculiar feature of the effects of trade in this model. Both before and after trade, equation (9) holds; that is, there is no effect of trade on the scale of production, and the gains from trade come solely through increased product diversity. This is an unsatisfactory result. In another paper I have developed a slightly different model in which trade leads to an increase in scale of production as well as an increase in diversity.[3] That model is, however, more difficult to work with, so that it seems worth sacrificing some realism to gain tractability here.

II. Transport Costs

In this section I extend the model to allow for some transportation costs. This is not in itself an especially interesting extension although the main result—that the larger country will, other things equal, have the higher wage rate—is somewhat surprising. The main purpose of the extension is, however, to lay the groundwork for the analysis of home market effects in the next section. (These effects can obviously occur only if there are transportation costs.) I begin by describing the behavior of individual agents, then analyze the equilibrium.

A. *Individual Behavior*

Consider a world consisting of two countries of the type analyzed in Section I, able to trade but only at a cost. Transportation costs will be assumed to be of the "iceberg" type, that is, only a fraction g of any good shipped arrives, with $1-g$ lost in transit. This is a major simplifying assumption, as will be seen below.

[3]To get an increase in scale, we must assume that the demand facing each individual firm becomes more elastic as the number of firms increases, whereas in this model the elasticity of demand remains unchanged. Increasing elasticity of demand when the variety of products grows seems plausible, since the more finely differentiated are the products, the better substitutes they are likely to be for one another. Thus an increase in scale as well as diversity is probably the "normal" case. The constant elasticity case, however, is much easier to work with, which is my reason for using it in this paper.

An individual in the home country will have a choice over n products produced at home and n^* products produced abroad. The price of a domestic product will be the same as that received by the producer p. Foreign products, however, will cost more than the producer's price; if foreign firms charge p^*, home country consumers will have to pay the c.i.f. price $\hat{p}^*=p^*/g$. Similarly, foreign buyers of domestic products will pay $\hat{p}=p/g$.

Since the prices to consumers of goods of different countries will in general not be the same, consumption of each imported good will differ from consumption of each domestic good. Home country residents, for example, in maximizing utility will consume $(p/\hat{p}^*)^{1/(1-\theta)}$ units of a representative imported good for each unit of a representative domestic good they consume.

To determine world equilibrium, however, it is not enough to look at consumption; we must also take into account the quantities of goods used up in transit. If a domestic resident consumes one unit of a foreign good, his combined direct and indirect demand is for $1/g$ units. For determining total demand, then, we need to know the ratio of total demand by domestic residents for each foreign product to demand for each domestic product. Letting σ denote this ratio, and σ^* the corresponding ratio for the other country, we can show that

$$\text{(12)} \qquad \sigma=(p/p^*)^{1/(1-\theta)}g^{\theta/(1-\theta)}$$

$$\sigma^*=(p/p^*)^{-1/(1-\theta)}g^{\theta/(1-\theta)}$$

The overall demand pattern of each individual can then be derived from the requirement that his spending just equal his wage; that is, in the home country we must have $(np+\sigma n^*p^*)d=w$, where d is the consumption of a representative domestic good; and similarly in the foreign country.

This behavior of individuals can now be used to analyze the behavior of firms. The important point to notice is that the elasticity of *export* demand facing any given firm is $1/(1-\theta)$, which is the same as the elasticity of *domestic* demand. Thus transportation costs have no effect on firms' pricing policy; and the analysis of Section I can be carried out as before, showing that transportation costs also have no effect on the number of firms or output per firm in either country.

Writing out these conditions again, we have

$$(13)\quad p=w\beta/\theta;\ p^*=w^*\beta/\theta$$

$$n=L(1-\theta)/\alpha;\ n^*=L^*(1-\theta)/\alpha$$

The only way in which introducing transportation costs modifies the results of Section I is in allowing the possibility that wages may not be equal in the two countries; the number and size of firms are not affected. This strong result depends on the assumed form of the transport costs, which shows at the same time how useful and how special the assumed form is.

B. *Determination of Equilibrium*

The model we have been working with has a very strong structure—so strong that transport costs have no effect on either the numbers of goods produced in the countries, n and n^*, or on the prices relative to wages, p/w and p^*/w^*. The only variable which can be affected is the relative wage rate $w/w^*=\omega$, which no longer need be equal to one.

We can determine ω by looking at any one of three equivalent market-clearing conditions: (i) equality of demand and supply for home country labor; (ii) equality of demand and supply for foreign country labor; (iii) balance-of-payments equilibrium. It will be easiest to work in terms of the balance of payments. If we combine (12) with the other equations of the model, it can be shown that the home country's balance of payments, measured in *wage units* of the *other* country, is

$$(14)\quad B=\frac{\sigma^*n\omega}{\sigma^*n+n^*}L^*-\frac{\sigma n^*}{n+\sigma n^*}\omega L$$

$$=\omega LL^*\left[\frac{\sigma^*}{\sigma^*L+L^*}-\frac{\sigma}{L+\sigma L^*}\right]$$

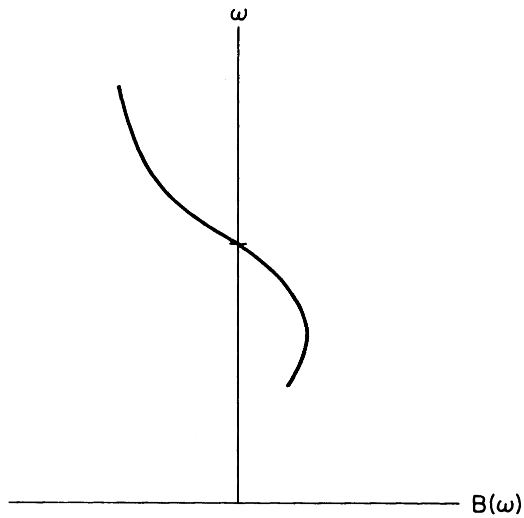

FIGURE 1

Since σ and σ^* are both functions of $p/p^*=\omega$, the condition $B=0$ can be used to determine the relative wage. The function $B(\omega)$ is illustrated in Figure 1. The relative wage $\bar{\omega}$ is that relative wage at which the expression in brackets in (4) is zero, and at which trade is therefore balanced. Since σ is an increasing function of ω and σ^* a decreasing function of ω, $B(\omega)$ will be negative (positive) if and only if ω is greater (less) than $\bar{\omega}$, which shows that $\bar{\omega}$ is the unique equilibrium relative wage.

We can use this result to establish a simple proposition: *that the larger country, other things equal, will have the higher wage.* To see this, suppose that we were to compute $B(\omega)$ for $\omega=1$. In that case we have $\sigma=\sigma^*<1$. The expression for the balance of payments reduces to

$$(14')\quad B=LL^*\left[\frac{1}{\sigma L+L^*}-\frac{1}{L+\sigma L^*}\right]$$

But (14′) will be positive if $L>L^*$, negative if $L<L^*$. This means that the equilibrium relative wage ω must be greater than one if $L>L^*$, less than one if $L<L^*$.

This is an interesting result. In a world characterized by economies of scale, one would expect workers to be better off in larger economies, because of the larger size of the local market. In this model, however, there is a secondary benefit in the form of better terms of trade with workers in the rest of the world. This does, on reflection, make intuitive sense. If production costs were the same in both countries, it would always be more profitable to produce near the larger market, thus minimizing transportation costs. To keep labor employed in both countries, this advantage must be offset by a wage differential.

III. "Home Market" Effects on the Pattern of Trade

In a world characterized both by increasing returns and by transportation costs, there will obviously be an incentive to concentrate production of a good near its largest market, even if there is some demand for the good elsewhere. The reason is simply that by concentrating production in one place, one can realize the scale economies, while by locating near the larger market, one minimizes transportation costs. This point—which is more often emphasized in location theory than in trade theory—is the basis for the common argument that countries will tend to export those kinds of products for which they have relatively large domestic demand. Notice that this argument is wholly dependent on increasing returns; in a world of diminishing returns strong domestic demand for a good will tend to make it an import rather than an export. But the point does not come through clearly in models where increasing returns take the form of external economies (see W. M. Corden). One of the main contributions of the approach developed in this paper is that by using this approach the home market can be given a simple formal justification.

I will begin by extending the basic closed economy model to one in which there are two industries (with many differentiated products within each industry). It will then be shown for a simple case that when two countries of this kind trade, each will be a net exporter in the industry for whose products it has the relatively larger demand. Finally, some extensions and generalizations will be discussed.

A. *A Two-Industry Economy*

As in Section I, we begin by analyzing a closed economy. Assume that there are two classes of products, *alpha* and *beta*, with many potential products within each class. A tilde will distinguish *beta* products from *alpha* products; for example, consumption of products in the first class will be represented as $c_1,\ldots,c_n$ while consumption of products in second are $\tilde{c}_1,\ldots,\tilde{c}_n$.

Demand for the two classes of products will be assumed to arise from the presence of two groups in the population.[4] There will be one group with L members, which derives utility only from consumption of *alpha* products; and another group with $\tilde{L}$ members, deriving utility only from *beta* products. The utility functions of representative members of the two classes may by written

$$(15)\quad U=\sum_i c_i^{\theta};\ \tilde{U}=\sum_j \tilde{c}_j^{\theta} \qquad 0<\theta<1$$

For simplicity assume that not only the form of the utility function but the parameter θ is the same for both groups.

On the cost side, the two kinds of products will be assumed to have identical cost functions:

$$(16)\quad l_i=\alpha+\beta x_i \qquad i=1,\ldots,n$$

$$\tilde{l}_j=\alpha+\beta\tilde{x}_j \qquad j=1,\ldots,\tilde{n}$$

where, l_i, $\tilde{l}_j$ are labor used in production on typical goods in each class, and x_i, $\tilde{x}_j$ are total outputs of the goods.

The demand conditions now depend on the population shares. By analogy with (3),

[4]An alternative would be to have all people alike, with a taste for both kinds of goods. The results are similar. In fact, if each industry receives a fixed share of expenditure, they will be identical.

we have

$$(17) \quad x_i = Lc_i \qquad i=1,\ldots,n$$
$$\tilde{x}_j = \tilde{L}\tilde{c}_j \qquad j=1,\ldots,\tilde{n}$$

The full-employment condition, however, applies to the economy as a whole:

$$(18) \qquad \sum_{i=1}^{n} l_i + \sum_{j=1}^{\tilde{n}} \tilde{l}_j = L + \tilde{L}$$

Finally, we continue to assume free entry, driving profits to zero. Now it is immediately apparent that the economy described by equations (15)–(18) is very similar to the economy described in equations (1)–(4). The price and output of a representative good—of either class—and the total number of products $n+\tilde{n}$ are determined just as if all goods belonged to a single industry. The only modification we must make to the results of Section I is that we must divide the total production into two industries. A simple way of doing this is to note that the sales of each industry must equal the income of the appropriate group in the population:

$$(19) \qquad npx = wL; \quad \tilde{n}\tilde{p}\tilde{x} = \tilde{w}\tilde{L}$$

But wages of the two groups must be equal, as must the prices and outputs of any products of either industry. So this reduces to the result $n/\tilde{n} = L/\tilde{L}$: the shares of the industries in the value of output equal the shares of the two demographic groups in the population.

This extended model clearly differs only trivially from the model developed in Section I when the economy is taken to be closed. When two such economies are allowed to trade, however, the extension allows some interesting results.

B. *Demand and the Trade Pattern: A Simple Case*

We can begin by considering a particular case of trade between a pair of two-industry countries in which the role of the domestic market appears particularly clearly. Suppose that there are two countries of the type just described, and that they can trade with transport costs of the type analyzed in Section II.

In the home country, some fraction f of the population will be consumers of *alpha* products. The crucial simplification I will make is to assume that the other country is a *mirror image* of the home country. The labor forces will be assumed to be equal, so that

$$(20) \qquad L + \tilde{L} = L^* + \tilde{L}^* = \bar{L}$$

But in the foreign country the population shares will be reversed, so that we have

$$(21) \qquad L = f\bar{L}; \quad L^* = (1-f)\bar{L}$$

If f is greater than one-half, then the home country has the larger domestic market for the *alpha* industry's products; and conversely. In this case there is a very simple home market proposition: *that the home country will be a net exporter of the first industry's products if $f > 0.5$.* This proposition turns out to be true.

The first step in showing this is to notice that this is a wholly symmetrical world, so that wage rates will be equal, as will the output and prices of all goods. (The case was constructed for that purpose.) It follows that the ratio of demand for each imported product to the demand for each domestic product is the same in both countries.

$$(22) \qquad \sigma = \sigma^* = g^{\theta/(1-\theta)} < 1$$

Next we want to determine the pattern of production. The expenditure on goods in an industry is the sum of domestic residents' and foreigners' expenditures on the goods, so we can write the expressions

$$(23) \quad npx = \frac{n}{n+\sigma n^*} wL + \frac{\sigma n}{\sigma n + n^*} wL^*$$

$$n^*px = \frac{\sigma n^*}{n+\sigma n^*} wL + \frac{n^*}{\sigma n + n^*} wL^*$$

where the price p of each product and the

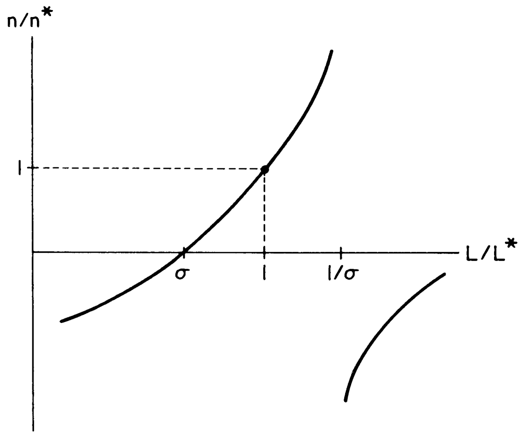

FIGURE 2

output x are the same in the two countries. We can use (23) to determine the relative number of products produced in each country, n/n^*.

To see this, suppose *provisionally* that some products in the *alpha* industry are produced in both countries; i.e., $n>0$, $n^*>0$. We can then divide the equations (23) through by n and n^*, respectively, and rearrange to get

$$(24) \qquad L/L^*=(n+\sigma n^*)/(\sigma n+n^*)$$

which can be rearranged to give

$$(25) \qquad n/n^*=\frac{L/L^*-\sigma}{1-\sigma L/L^*}.$$

Figure 2 shows the relationship (25). If $L/L^*=1$, so does n/n^*; that is, if the demand patterns of the two countries are the same, their production patterns will also be the same, as we would expect. And as the relative size of either country's home market rises for *alpha* goods, so does its domestic production, as long as L/L^* lies in the range $\sigma<L/L^*>1/\sigma$.

Outside that range, (25) appears to give absurd results. Recall, however, that the derivation of (24) was made on the provisional assumption that n and n^* were both nonzero. Clearly, if L/L^* lies outside the range from σ to $1/\sigma$, this assumption is not valid. What the figure suggests is that if L/L^* is less than σ, $n=0$; the home country specialized entirely in *beta* products, producing no *alpha* products (while the foreign country produces only *alpha* products). Conversely, if L/L^* is greater than $1/\sigma$, $n^*=0$, and we have the opposite pattern of specialization.

We can easily demonstrate that this solution is in fact an equilibrium. Suppose that the home country produced no *alpha* products, and that a firm attempted to start production of a single product. This firm's profit-maximizing f.o.b. price would be the same as that of the foreign firm's. But its sales would be less, in the ratio

$$\frac{\sigma^{-1}L+\sigma L^*}{L+L^*}<1$$

Thus such a firm could not compete.

This gives us our first result on the effect of the home market. It says that if the two countries have sufficiently dissimilar tastes each will specialize in the industry for which it has the larger home market. Obviously, also, each will be a net exporter of the class of goods in which it specializes. Thus the idea that the pattern of exports is determined by the home market is quite nicely confirmed.

We also get some illuminating results on the conditions under which specialization will be incomplete. Incomplete specialization and two-way trade within the two classes of products will occur if the relative size of the domestic markets for *alpha* goods lies in the range from σ to $1/\sigma$, where $\sigma=g^{\theta/(1-\theta)}$. But g measures transportation costs, while $\theta/(1-\theta)$ is, in equilibrium, the ratio of variable to fixed costs;[5] that is, it is an index of the importance of scale economies. So we have shown that the possibility of incomplete specialization is greater, the greater are transport costs and the less important are economies of scale.

A final result we can take from this special case concerns the pattern of trade when

[5]One can see this by rearranging equation (9) to get $\beta x/\alpha=\theta/(1-\theta)$.

specialization is incomplete. In this case each country will both import and export products in *both* classes (though not the same products). But it remains true that, if one country has the larger home market for *alpha* producers, it will be a *net* exporter in the *alpha* class and a net importer in the other. To see this, note that we can write the home country's trade balance in *alpha* products as

$$(26)\quad B_\alpha = \frac{\sigma n}{\sigma n + n^*} wL^* - \frac{\sigma n^*}{n + \sigma n^*} wL$$
$$= wL^* \left[\frac{\sigma n}{\sigma n + n^*} - \frac{\sigma n^*}{n + \sigma n^*} \frac{L}{L^*} \right]$$
$$= \frac{\sigma w L^*}{\sigma n + n^*} [n - n^*]$$

where we used (24) to eliminate the relative labor supplies. This says that the sign of the trade balance depends on whether the number of *alpha* products produced in the home country is more or less than the number produced abroad. But we have already seen that n/n^* is an increasing function of L/L^* in the relevant range. So the country with the larger home market for the *alpha*-type products will be a net exporter of those goods, even if specialization is not complete.

C. *Generalizations and Extensions*

The analysis we have just gone through shows that there is some justification for the idea that countries export what they have home markets for. The results were arrived at, however, only for a special case designed to make matters as simple as possible. Our next question must be the extent to which these results generalize.

One way in which generalization might be pursued is by abandoning the "mirror image" assumption: we can let the countries have arbitrary populations and demand patterns, while retaining all the other assumptions of the model. It can be shown that in that case, although the derivations become more complicated, the basic home market result is unchanged. Each country will be a net exporter in the industry for whose goods it has a relatively larger demand. The difference is that wages will in general not be equal; in particular, smaller countries with absolutely smaller markets for both kinds of goods will have to compensate for this disadvantage with lower wages.

Another, perhaps more interesting, generalization would be to abandon the assumed symmetry between the industries. Again, we would like to be able to make sense of some arguments made by practical men. For example, is it true that large countries will have an advantage in the production and export of goods whose production is characterized by sizeable economies of scale? This is an explanation which is sometimes given for the United States' position as an exporter of aircraft.

A general analysis of the effects of asymmetry between industries would run to too great a length. We can learn something, however, by considering another special case. Suppose that the *alpha* production is the same as in our last analysis, but that the production of *beta* goods is characterized by *constant* returns to scale and perfect competition. For simplicity, also assume that *beta* goods can be transported costlessly.

It is immediately apparent that in this case the possibility of trade in *beta* products will ensure that wage rates are equal. But this in turn means that we can apply the analysis of Part B, above, to the *alpha* industry. Whichever country has the larger market for the products of that industry will be a net exporter of *alpha* products and a net importer of *beta* products. In particular: if two countries have the same composition of demand, the larger country will be a net exporter of the products whose production involves economies of scale.

The analysis in this section has obviously been suggestive rather than conclusive. It relies heavily on very special assumptions and on the analysis of special cases. Nonetheless, the analysis does seem to confirm the idea that, in the presence of increasing returns, countries will tend to export the goods for which they have large domestic markets. And the implications for the pattern of trade are similar to those suggested by Steffan Linder, Grubel (1970), and others.

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