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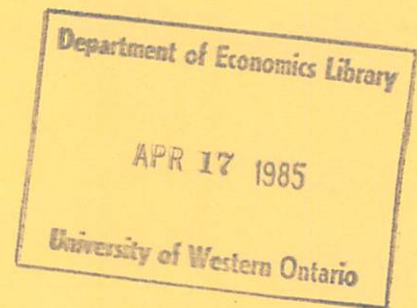
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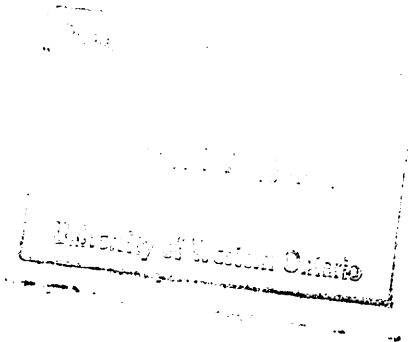
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FOREIGN DIRECT INVESTMENT AND THE MULTINATIONAL FIRM

W. J. Ethier

A PARTICULAR FRAMEWORK of thought about foreign direct investment is now dominant. This framework addresses the question of why multinational firms should exist at all in the face of presumed penalties for operating across national and cultural boundaries. It has three constituents. First, the firm should possess some ownership advantage, such as a patent or the ability to perform managerial or organizational tasks in some specific endeavor. The firm is in effect defined by its attempt to exploit this advantage across national markets. Second, locational considerations, such as tariffs and the pattern of comparative advantage, should mandate simultaneous activity in a number of markets, so that the firm does not exploit its ownership advantage by concentrating all operations in one country and exporting to others. Finally, the internalization of international transactions must be preferable to the arm's length use of markets. The firm, for example, should find it advantageous to conduct foreign manufacturing itself rather than to license a foreign firm to do it.

Internalization appears to be emerging as the Caesar of the OLI triumvirate. See, for example, McCulloch (1984, p 5), Buckley and Casson (1976), Casson (1979), and Rugman (1980), who has gone so far as to assert (p 370) that,

"the existing theories of FDI are really sub-cases of the theory of internalization."

I claim that, quite independently of how one reacts to these arguments, internalization should be the focal point of theories of direct investment. Internalization is the only one of the three key elements not already incorporated into trade theory. Locational considerations are basic to the pure theory of international trade, and ownership advantages figure prominently in our recent theories of trade and imperfect competition. Internalization, by contrast, is one of our critical 'black boxes', always appealed to but never explained. The central task of any general equilibrium theory of the multinational corporation must be to elucidate the role of the internalization issue.

The OLI framework, or 'eclectic theory', as John Dunning has dubbed it, has received an increasingly wide application.¹ Theoretical and empirical investigations of the multinational enterprise are very often conducted with reference to this framework,² and it is now standard stuff in undergraduate textbooks.³ The literature on direct investment is truly gargantuan, and it has a commonly accepted framework for thought. Nevertheless, there has thus far been, with one notable exception, no attempt to supply a general equilibrium theory. The notable exception is the work of James Markusen and Elhanan Helpman

¹This approach to the theory of the firm derives from Coase (1937) and many followers. Important contributions with respect to the multinational corporation include: Hymer (1960), Kindleberger (1969), Caves (1971, 1974), Buckley and Casson (1976), Dunning (1977, 1981), Casson (1979), and Rugman (1981), among others.

²The literature on direct investment is vast and has been surveyed many times. (A survey article of the surveys would not be out of order.) Useful guides and collections include: Kindleberger (1970), Dunning (1971, 1973, 1977), Stevens (1974), Hufbauer (1975), Vernon (1977), Lall and Streeten (1977), Hood and Young (1979), Agarwal (1980), Caves (1982), and Kindleberger and Audretsch (1983).

³See, for example, Ethier (1983, ch 7).

on multinational enterprises generated by multi-plant scale economies.⁴ These economies (or possession of the factors of production that enable the economies to be generated) are the basis for ownership advantages, and locational considerations are determined by relative factor endowments and technological parameters. That the exploitation of multiplant economies should be internalized is taken as a matter of course. Thus this work falls squarely within the OLI framework.⁵

A general equilibrium theory is essential if we are to connect systematically direct investment to its fundamental determinants and if we are to understand the relation between standard international trade theory and the multinational firm. Two central outstanding issues well illustrate the need for such an understanding.

The first is the relation of direct investment to the relative factor abundance of countries. Conventional trade theory teaches us that differences in factor endowments induce international factor flows, but the larger part of actual direct investment is between countries with relatively similar factor endowments. Furthermore, two-way direct investment within industries is becoming increasingly prominent. (One cannot help but be reminded of how the uneasy relation between conventional trade theory and the relatively large volumes of trade between similar economies and of intraindustry trade stimulated recent theoretical developments.) The usual response to this puzzle is that direct investment concerns ownership and need not coincide at all with physical

⁴See Markusen (1984), Horstmann and Markusen (1984), Helpman (1983a, 1983b, 1984) and Helpman and Krugman (1984). An interesting alternative is provided by Cherkes (1984), who analyzes how historically sunk fixed costs can generate multinational firm activity.

⁵Markusen and Helpman are both primarily concerned, however, to link their treatments of direct investment to the theory of international trade, not to the OLI framework.

capital movements. Indeed the OLI framework does not address real capital flows. But such an answer is no answer at all. My intuition would have been that the considerations emphasized by the OLI framework -- like the potential for physical factor movements -- become more significant with larger differences in factor endowments. The latter certainly cause locational considerations to become more pronounced, and by making countries less alike can be expected to increase disparities in ownership advantages.⁶ This intuition may be incorrect (and I shall in fact argue below that it is), but the OLI framework, when divorced from a general equilibrium theory, can take us no farther.

The second issue is the effect of direct investment on the incomes of the factors -- labor in particular -- employed at home by the multinational firm. This is in fact the preeminent source-country policy issue. But we completely lack the equipment to approach this question in the same way that international trade theory allows us to analyze the effects of commercial policy issues.

The present paper, like those of Markusen and Helpman, is concerned with general equilibrium theories. But whereas Markusen and Helpman each took internalization for granted and went on from there, I wish to endogenize the internalization decision. In the process I hope to shed some light on the two issues alluded to above. My conclusions differ dramatically from the implications of the Markusen-Helpman model. This establishes the potential importance of modelling internalization, regardless of how satisfactory my way of doing so might be.

⁶Indeed this is basically what happens in the Markusen-Helpman model.

I. INTERNALIZATION AND INFORMATION

The internalization issue is largely a matter of the international economics of information. That is, the critical consideration determining whether a particular international transaction should be internalized usually reduces to an analysis of the exchange of information between two agents. The argument is probably best advanced by explicit consideration of the more important examples.

Consider first the very large class of cases where the ownership advantage is itself the unique possession of some body of knowledge. This might be knowledge of new technology, acquired by the firm's research efforts, or perhaps knowledge of how to market certain products in a certain place, acquired by the firm's unique past experience. The firm wishes to exploit this knowledge in a second, foreign, market, by selling goods embodying the new technology in that market or by importing from that country goods to be marketed at home. In either case the transaction can be done at arm's length -- by selling the knowledge to a foreign collection of factors (or 'firm') -- or via internalization -- by itself employing the foreign factors. The basic consideration working against the arm's length alternative is the fact that in order to sell its information for its full value the firm must convincingly indicate what it has to sell, thereby losing, at least in part, its monopoly advantage. Note that the critical feature of this class of examples is not the market imperfection represented by the monopoly position of the firm. Rather it is the problem of transacting in information.

As a second class of examples consider multiplant economies, as in the Markusen-Helpman model. Separate plants in different countries draw upon a 'home office' utilizing a particular factor. In principle the relation between the

plants and the home office might be either arm's length or internalized. If the home office input is in effect knowledge (such as a research effort applicable to all the plants) this class of examples is a subset of the preceding one, so suppose that the input is something else, such as a coordinating function of some kind. This coordination could be done either at arm's length or internally: the home office and the plants would 'do' the same thing in either case, with this behavior dictated alternatively by a contract or by centralized directives. But a contract that makes arm's length behavior identical to internalized behavior becomes infeasible when the home office and plants must exchange a large volume of diverse information. This does not mean that internalization dominates; with much information to be processed decentralized decision making is likely to be attractive. The point is rather that the arm's length and internalized industrial structures will no longer be identical but will confront the various agents with different sets of incentives.⁷ Which structure is better will depend upon circumstances.

I do not claim that problems of information exchange are invariably central to direct investment, but only that this is sufficiently often the case to render it compelling that they occupy a central position in any general equilibrium theory. Further examples could be given, but those already cited include as special cases a good proportion of multinational activity and so suffice to make my point. What are the strategic implications for the construction of a general equilibrium theory of the multinational enterprise? The details of such a model must be colored, I should think, by the two aspects of information exchange that emerged in the above examples. That is, the public-good nature of

⁷This view of internalization is forcefully espoused by Grossman and Hart (1984).

information, discussed with respect to the first class of examples⁸ and the size and diversity of information flows, central to the second.

The rest of this paper is devoted to a rudimentary model of international trade motivated by the discussion thus far. The purpose is to illustrate how the above issues should be reflected in the crude details of simple model construction. In particular, I wish the model to have a pair of parameters that I can identify with the two critical aspects of information exchange I have just identified. This will enable me to isolate the role played by these basic considerations.

II. THE RUDIMENTARY MODEL

The model contains two countries, two factors, two goods and two services. Both goods are traded; the two factors and two services are nontraded. One of the goods, called wheat (W), is produced by the two factors, land (T) and labor (L). Land is specific to wheat production, so the second good, manufactures (M), and both services use only labor. Wheat production in the home country can be represented by $W = F(L_W, T)$ where F is a neoclassical production function and L_W denotes the amount of labor employed in the wheat sector.- Foreign-country variables will be distinguished by asterisks.

Manufactures are a collection of n differentiated goods, with n determined endogenously. Each variant can be produced at a choice of quality levels, indexed by Q , $0 \leq Q \leq Q_1$. Labor is the only input into manufacturing production; the variable cost of production of one unit of a manufacture (of any

⁸Magee (1977a, 1977b) gives a very useful treatment of what is called 'appropriability'. See also Casson (1979).

variety) of quality Q is aQw , where a is a technological parameter and w denotes the wage rate in terms of wheat (so that $w = F_L(L_W, T)$). Q is the variable that will be used below to discuss the role of the size and diversity of information flows.⁹

One of the services is a research activity whose results help determine the value of the parameter a . This latter can assume either of two values, $a_H > a_L$. The greater the volume R of resources devoted to research, the greater the probability $p(R)$ that $a = a_L$. I assume $p' > 0$ and $p'' < 0$. Labor is the only input into the research service, so R is assumed measured in units of labor. The public-good aspect of information will be associated with the variable R . Research furnishes the proprietary information which makes the firm's product unique (thereby providing the ownership advantage) and which helps to determine a (thereby linking this proprietary information to the uncertainty facing the firm).

Consumers in the two countries possess identical tastes. Furthermore, if a certain variety of manufactures is consumed at all it is consumed in a fixed amount, independently of quality. Define units of measurement so that exactly one unit is consumed, worldwide, of each variety that is produced in equilibrium. Let μ denote the fraction of this unit consumed at home and $1 - \mu$ the fraction consumed abroad. Assume μ is the same for each variety. Finally, I suppose that consumers regard a unit of any variety of manufactures of quality Q to be a perfect substitute for Q units of wheat. Thus domestic consumers will consume μ units of a variety of quality Q if its price, in terms of wheat, is no greater than Q , and they will consume none otherwise. I make this assumption

⁹In the terminology of Shaked and Sutton (1983, 1984), the manufacturing sector is characterized by both 'horizontal' and 'vertical' product differentiation.

simply to divorce the present paper from issues involving the division of labor or the benefits of increased product differentiation. These issues have been treated in depth in the recent literature.¹⁰

The final activity is a downstream service (or good) that must be combined with manufactures before they can be consumed, in either country. The basic assumption is that this activity is nontraded -- the easiest way to model locational advantages. This service uses only labor as an input, with q units of labor required, in each country, for the downstream activity associated with one unit of a manufacture (of any variety or quality).

I assume that labor must be committed to research and to downstream production before the resolution of uncertainty about the value of a (that is, about the success of the research effort). After such resolution the choice of what quality level to provide of each variety can be made. Ex-ante, all varieties of produced manufactures are symmetric, although ex-post they differ in the realized value of a and the chosen value of Q . In equilibrium the chosen research effort, R , will accordingly be the same for each chosen variety. If the number n of varieties is sufficiently large, the economy-wide average of a will be known ex-ante to (approximately) equal $p(R)a_L + [1 - p(R)]a_H$, even if the value of a pertaining to any particular variety is not yet known. Thus the equilibrium amount of labor devoted to research, manufacturing, and downstream production will be determined ex-ante, for any value of n . This value must then be such as to clear factor markets.

Let me briefly summarize the rationale of my model. I have identified two key aspects of information exchange -- its public-good nature and the size

¹⁰See, for example, Ethier (1979, 1982), Helpman (1981), Krugman (1979, 1981) and Lancaster (1980).

and diversity of information flows -- and have accordingly provided the model with two variables -- R and Q -- to serve as 'pegs' on which respectively to hang these issues. In order for informational problems to be present at all, the model must have some intrinsic source of uncertainty (at least from the viewpoints of individual agents). This is provided here by what I call the 'dispersion': $a_H - a_L$. In order to relate direct investment to standard trade theory, fundamental parameters of the latter must be included as well. This is represented here by relative factor endowments: $(L/T) - (L^*/T^*)$. The basic idea of the model, then, is that the fundamental determinants (the dispersion and relative factor endowments) should interact in the background while alternatives about industrial structure are related to the way the informational variables (R and Q) are treated.

I submit that this general structure is pretty much inevitable, given the goals of this paper, once my earlier arguments are accepted. In this sense my model is quite general. In two other ways it is not. The dimensionality is low, with each of the four basic elements represented by a single variable. But all our simple trade models have low dimensionality: this is what makes them simple. Less common is the linearity I have imposed on some basic functional forms, relating both to technology and to tastes. Thus the sensitivity of the following results to this linearity is a significant issue, but one beyond the scope of this paper.¹¹

¹¹However I do conjecture that relaxations of my assumptions about functional forms would either leave the main results of this paper unchanged or alter them in ways that are obvious [at least to readers of Markusen (1984) and Helpman (1984)]. A more significant question -- also beyond the scope of this paper -- is the sensitivity of my conclusions to the assumption about industrial structure that will be made in section IV below.

III. THE INTEGRATED EQUILIBRIUM

It will prove convenient to establish a point of reference by analyzing the model's solution when all stages for each variety are integrated within a single international firm. A single manufacturing firm, identified with a particular variety,¹² thus conducts the research service, the production of that variety, and downstream activity in both countries. Assume that research and production takes place only at home; this assumption will be dropped later.

a. The behavior of the individual firm

Suppose for now that all firms are risk neutral. Let Q_L and Q_H denote the quality of goods delivered to home and foreign markets when $a = a_L$ and when $a = a_H$ respectively. The firm cannot influence the wage w that it must pay, and the equilibrium value of w will turn out to be state independent. Thus the optimization problem confronted by the domestic manufacturer is to choose a combination (R, Q_L, Q_H) that maximizes expected profit:

$$(1) \quad p(R)Q_L(1 - a_L w) + [1 - p(R)]Q_H(1 - a_H w) - (wR + qw^0)$$

where $w^0 = \mu w + (1-\mu)w^*$ and w^* denotes the foreign wage. The firm is here cognizant of the fact that Q is the highest price it will be able to charge for a unit of final output of quality Q .

¹²This is for expositional convenience. Nothing changes if each firm produces an assortment of varieties, as long as there are many firms and potential firms.

The optimal strategy obviously depends upon the wages w and w^* faced by the firm. There are three distinct possibilities.

(i) $w > (1/a_L) > (1/a_H)$. In this case the firm must lose money if it operates, regardless of which state emerges. Consequently it will not enter the market at all, that is, the solution to its problem is: $R = Q_L = Q_H = 0$.

(ii) $(1/a_L) > (1/a_H) > w$. The firm knows ex ante that it will pay to provide the highest feasible quality level, Q_1 , regardless of which state is realized. The research effort R will be carried to the point where its marginal cost just equals the marginal expected cost reduction: $w = Q_1 p'(R)[1 - a_L w - (1 - a_H w)]$. Thus the solution to the firm's problem is: $Q_L = Q_H = Q_1$ and $R = R_1$, where R_1 is the solution to

$$(2) \quad p'(R_1) = 1/Q_1(a_H - a_L).$$

Note that the wage rate has no influence on R_1 . Since goods of the highest quality will be produced in both states, research affects only the chance of producing in the low cost state rather than the high cost one, and the difference in costs is strictly proportional to the wage, as is the cost of research.

(iii) $(1/a_L) > w > (1/a_H)$. In this case the firm may or may not choose to enter, depending upon whether expected profit is nonnegative. If it does enter it knows that, should $a = a_H$, it will not in fact produce anything (or, rather, that it will produce goods of lowest quality 0 at variable cost 0), so that resources devoted to research and to domestic downstream production will be lost. If $a = a_L$ the firm will wish to provide the highest feasible quality, Q_1 . If $w = 1/a_H$, the firm will be indifferent about what quality to provide whenever $a = a_H$. The research effort will be optimized when $w = Q_1 p'(R)(1 - a_L w)$. Thus

the optimal operating strategy is: $Q_H = 0$, $Q_L = Q_1$ and $R = R_2(w)$ where $R_2(w)$ is the solution to

$$(3) \quad p'(R_2) = w/Q_1(1 - a_L w).$$

(Note that $R_2(1/a_L) = 0$, $R_2(1/a_H) = R_1$ and $R_2' < 0$ when $w < 1/a_L$). This strategy will be the chosen one if it yields nonnegative expected profit:

$$(4) \quad p(R_2)Q_1(1 - a_L w) - (wR_2 + w^q) \geq 0.$$

Otherwise the firm will not enter: $Q_L = Q_H = R = 0$. The reason that R_2 depends upon w while R_1 did not is that in this case the research effort determines the chance that the firm will choose to produce at all and thus increase its earnings by $1 - a_H w$, which is not proportional to the wage. This difference between cases (ii) and (iii) will turn out to be at the very center of the role of multinationals in this model.

In addition to the above three possibilities there are two boundary cases. If $w = 1/a_L$ the firm has no chance to offset its fixed costs and so will not enter at all, just as in (i). If $w = 1/a_H$ the firm will be indifferent about what level of quality to provide whenever $a = a_H$. This is the only circumstance under which the firm could choose to do something other than provide the highest possible quality Q_1 or not produce at all. But it would be a mistake to dismiss this circumstance as a fluke simply because it requires a unique wage: that wage might be unusually 'likely' to occur (the simple Ricardian model of trade comes to mind).

b. Equilibrium in the manufacturing sector

There is free entry into the domestic manufacturing sector, and all firms compete on equal terms for labor. In equilibrium expected profits are driven to zero, or below if only wheat is produced in equilibrium. This means that, if $(1/a_L) > w > (1/a_H)$, expression (4) must hold with equality. When $w < (1/a_H)$ the zero profit condition is

$$(5) \quad Q_1[1-w[p(R_1)a_L + (1-p(R_1))a_H]] - [wR_1 + w^0q] = 0.$$

Thus (4) and (5) determine those combinations of w and w^* that are consistent with manufacturing equilibrium (recall that $w^0 = \mu w + (1-\mu)w^*$). In Figure 1 below, the Manufacturing Equilibrium schedule, labelled ME, shows for each value of w^* the corresponding equilibrium home wage w . The ME schedule is a straight line when $w < (1/a_H)$ -- reflecting the fact that (5) is a linear relation between w and w^* -- but becomes steeper¹³ as w exceeds $1/a_H$, since R_2 is a decreasing function of w in (4). Note that the nonlinear part of ME disappears if $p(R)$ is so responsive to increases in the research effort that $p(R_1)/p'(R_1) < R_1 + \mu q$.

¹³Implicit differentiation of (4) -- with equality -- confirms that it defines a relation between w and w^* that is strictly convex to the origin, when the optimality condition (3) is satisfied.

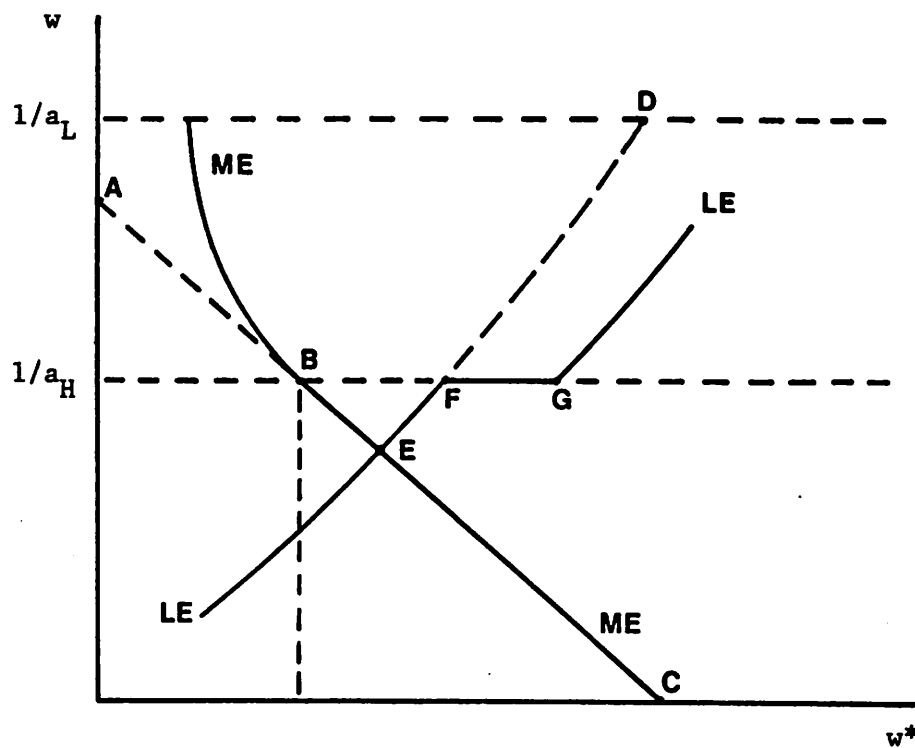


Figure 1

c. **General equilibrium**

In full equilibrium¹⁴ labor in each country must be paid the value of its marginal product in wheat, a traded good. This establishes a second relation between w and w^* and so closes the system. Labor market equilibrium in the two countries is given respectively by:

$$(6) \quad w = F_L(L_W, T) = F_L(L - n[a^0 Q_1 + R_1 + \mu q], T)$$

and

$$(7) \quad w^* = F_L^*(L_W^*, T^*) = F_L^*(L^* - n(1-\mu)q, T^*)$$

if $w < 1/a_H$. Here $a^0 = p(R_1)a_L + [1-p(R_1)]a_H$ so that $a^0 Q_1 n$ denotes the total employment of labor in manufacturing production and is known ex-ante, even though the employment of labor in the production of each variety is not so known. When $w > 1/a_H$ labor market equilibrium is instead given by

$$(6') \quad w = F_L(L - n[p(R_2(w))Q_1 a_L + R_2(w) + \mu q], T)$$

and

$$(7) \quad w^* = F_L^*(L^* - n(1-\mu)q, T^*).$$

¹⁴I assume the existence of a unique equilibrium in which each country consumes all (produced) goods in positive amounts.

Equations (6), or (6'), and (7) give two relations in the three variables w , w^* and n . Eliminating n gives the Labor Equilibrium schedule depicted as LE in Figure 1. This curve necessarily has a positive slope: a higher value of w^* requires a higher marginal product of labor in foreign wheat production and therefore less labor in that sector. This means that more labor is devoted to downstream production, which in turn means more manufactured goods, more domestic labor in the manufacturing sector, less labor in the wheat sector, and so a larger value of w . Note that the LE schedule is a step function, with a horizontal portion (depicted as FG in Figure 1) when $w = 1/a_H$. The line through E, F and D is the graph of (6) and (7), while the line through G and H graphs (6') and (7). The value of w^* that satisfies (6) and (7) when $w = 1/a_H$ is less than the value of w^* that then satisfies (6') and (7). This is because when $w = 1/a_H$ producers of manufactured goods for which $a = a_H$ are indifferent about which quality level to supply. Thus a given manufacturing labor force can alternatively provide a larger number n of goods with less quality for those goods with $a = a_H$, or a smaller number of goods of greater quality. As we move from F to G in the figure, the quality level of those goods for which $a = a_H$ falls with n rising just enough so that L_W remains constant. But with downstream production costs independent of quality, the rise in n increases the size of the foreign downstream sector, thereby lowering L_W^* and so raising w^* . Full international equilibrium is determined by the intersection of the ME and LE schedules. Thus in Figure 1 Point E depicts the equilibrium levels of w and w^* . The earlier analysis then shows how these wages determine n , R , Q_L , and Q_H . The fact that (2) holds with equality for each variety implies balanced trade, ex post as well as ex ante.

IV. INFORMATION AND INDUSTRIAL STRUCTURE

The previous section described equilibrium under a particular assumption about industrial structure. I now wish to examine how the informational considerations previously raised can be alternatively reflected in the structure of the model, and how these alternatives influence conclusions about the model's behavior and about the industrial structure to which it corresponds. The manufacturing sector contains four separate operations for each variety, so a substantial number of different types of integration could be considered. To limit the size of this paper, I consider only the possible integration of upstream production with both downstream activities, and leave to the reader consideration of other possibilities. In particular I assume throughout that research and upstream production are integrated within a firm, and that no integration across varieties is considered. As foreign downstream production is the only activity not performed at home, the integration decisions that I consider include whether to become a multinational enterprise. They also involve both horizontal and vertical integration.¹⁵

Consider the behavior of the internationally integrated firm as described in the previous section. In principle this behavior could be duplicated by an arm's length contract between the home research and production firm and two independent downstream firms, with the contract calling for exactly the same behavior as described above. That is, the contract would commit the upstream firm to the same (R, Q_L, Q_H) as above and would call for the downstream firms to

¹⁵These three decisions (horizontal integration, vertical integration, and going multinational) could be disentangled by allowing q to differ across countries and to be sensitive to whether the downstream activity occurred in the same country as the research and manufacturing. I resist the temptation to perform the exercise.

make some payment P per unit of output to the upstream firm. (Assuming free entry into the downstream activity in each country, P would simply equal that value which causes expected downstream profit to equal zero.) When is such a contract feasible?

a. The public-good nature of information

The first point to notice is that the contract is conditional upon the results of the research undertaken by the home firm. But these results are proprietary to that firm, which presumably has an interest in keeping them secret. Thus there is an inherent informational asymmetry. This need not render the contract infeasible: if the foreign distributor can be confident that the home firm will have no incentive to lie about the success, or the extent, of its research effort, then the two can agree that the home firm will declare, without outside verification, how successful its research has been.

Since the home firm is risk neutral, it would not care if the state-invariant payment of P were replaced by a state-contingent payment schedule with the same expected value, that is, if the foreign distributor agreed to the price P_L when the home firm claimed $a = a_L$ and to the price P_H otherwise, where:

$$(8) \quad P = p(R)P_L + [1-p(R)]P_H.$$

It is possible to find an arm's length contract between the two firms that is incentive-compatible and that relieves the foreign firm from all risk. Consider, for example, the case where the contract calls for $Q_L = Q_1$ and $Q_H = 0$. If the foreign distributor is to bear no risk, P_H and P_L must be set so that Q_1

- $P_L - qw^* = 0 - P_H - qn^*$, or so that $Q_1 = P_L - P_H$. Substituting this into (8) reveals that the contract must call for $P_H = P - p(R)Q_1$ and $P_L = P + [1-p(R)]Q_1$. This is easily seen to be incentive-compatible.¹⁶ Verifying that the contracted amount of research is actually done is subject to exactly the same informational problem that prevents direct verification of the home firm's claims about the results of that research. However, the contracted amount R of research will also be made incentive-compatible by the above state-contingent payment schedule. To see this, suppose that a contract (P_L, P_H, R, Q_L, Q_H) has been negotiated and consider what level of R it is now in the firm's interest actually to undertake. Suppose that $w > 1/a_H$, so that $Q_L = Q_1, Q_H = 0$, and the contracted $R = R_2$ in equation (3). Then it will be in the home firm's interest actually to undertake the volume R of research that maximizes

$$p(R)[\mu Q_1 + (1-\mu)P_L - a_L Q_1 w] + [1-p(R)](1-\mu)P_H - R w - \mu q w.$$

Setting the derivative of this expression equal to zero yields the formula for the profit maximizing level of research:

$$p'(R) = w/[Q_1(\mu - a_L w) + (1-\mu)(P_L - P_H)].$$

The R that solves this expression will equal the contracted amount R_2 (as given by equation (3)) if

$$P_L - P_H = Q_1.$$

¹⁶Suppose for example that $a = a_L$. If the home firm tells the truth it will earn $Q_1(1-a_L w) + (1-\mu)[P-p(R)Q_1] - [R+\mu q]w$. If instead the home firm claims that $a = a_H$ it will earn $(1-\mu)[P-p(R)Q_1] - [R+\mu q]w$, which is less by the amount $Q_1(1-a_L w)$.

This is just our state contingent payment schedule.

This escape from the problem works because the home firm is risk neutral. If instead both firms are risk averse it could well be that the requirement that an arm's length contract be incentive-compatible would prove costly, so that there would be a motive for integration. Analysis of this possibility would bring us to the issues treated in depth by the literature on labor contracts with asymmetric information.¹⁷ As this is beyond the scope of the present paper, return now to the assumption of home risk neutrality. How valid is this assumption? It can be justified if the owners of the firms can diversify away risk, and in the present model domestic capitalists can eliminate risk by buying shares of all home manufacturing firms. Note that purely national capital markets suffice. But the lack of such markets is sometimes associated with the formation of multinational firms. To summarize, the public-good nature of information produces an informational asymmetry between the home and foreign firms, preventing the latter from directly verifying either the actual research effort of the former or the results of that effort. It will nevertheless be possible for the two firms to design an optimal incentive-compatible contract if at least one of the firms is risk neutral and if it is feasible for the contract to call for the payment schedule of the foreign firm to vary across all conceivable states of nature. Both requirements are demanding, and in particular the latter would require in practice extremely detailed and complex contracts. This brings us to our second informational issue.

¹⁷See Hart (1983) for a recent survey.

b. The multivariate nature of quality

The contract calls for delivery of goods of a certain quality. The model assumes that quality can be indicated by a single number, but of course it is almost always much more than that. This suggests that we consider the possibility that it is very difficult, or impossible, to include quality specification in an enforceable contract.¹⁸ This problem is obviously minimized for simple standardized goods whose quality can be objectively measured. There is also reason to think that the problem could be minimized if the contract is of a simple enough form. For example, if the required quality is state invariant the partners to the contract might well allow the precise definition of quality to remain implicit and to rely on mutual goodwill to determine whether the goods in fact come up to snuff. (I'd find it difficult to describe precisely a McDonald's, but I know one when I see it because they're always supposed to be the same.) This will be especially true if the model's equilibrium is interpreted as one which will be repeated over time. By contrast the need for precision in defining quality becomes acute when the contract calls for quality to vary significantly across states. If there are countless aspects to quality, involving diverse facets of the good's preparation, design, delivery and use, an enforceable contract involving state dependent quality would necessarily be a very complex matter indeed. Perhaps so much so that its use would in truth constitute economic integration, de facto if not de jure.

¹⁸Or, to put it another way, that we use the variable Q to represent relevant considerations, of whatever sort, that can't be contracted.

c. Modelling internalization

These considerations strongly suggest, I think, the way the present model should be elaborated to include a distinction between arm's length transactions and internalization. I assume that if the home and downstream firms are to implement a state dependent contract of the sort allowed in the previous section they must first become one firm, so that the transaction is internalized, and act so as to maximize joint profit. If the firms remain at arm's length, the contract they negotiate is constrained to call for state invariant quality. Distinguishing the arm's length structure from the multinational by this constraint responds to both of the informational problems raised in this section. A contract featuring state invariant quality will necessarily be incentive-compatible, and, as just pointed out, it will minimize the difficulties due to the multivariate nature of quality.¹⁹

d. Equilibrium with national and multinational firms

Suppose first that the home upstream firm maintains an arm's length relation with the downstream firms so that their contracts are constrained to call for state invariant quality. Recall from the preceding section that the home firm would actually prefer such a contract if $w < 1/a_H$, and that it would decline to enter if $w > 1/a_L$. Thus the constraint will matter only

¹⁹Of course this is just one of the conceivable ways of characterizing the motive for internalization, and it would be interesting to contrast its implications with those of some of the alternatives. But in order to limit the length of this paper I consider only the case that I find most appealing.

when $1/a_L > w > 1/a_H$. In this case the home firm's optimization problem is to choose Q and R to maximize:

$$Q[1 - a^o(R)w] - [wR + w^oq]$$

where $a^o(R) = p(R)a_L + [1-p(R)]a_H$. Now in equilibrium w must be such as to make this profit zero, so that $1 > a^o(R)w$. But then the optimizing choice of Q is the largest one feasible: $Q = Q_1$. If the research effort is being carried to the point where an additional dollar offers a zero net benefit, it must be the case that $p'(R) = 1/Q_1(a_H - a_L)$. Thus the firm behaves the same when $1/a_L > w > 1/a_H$ as when $1/a_H > w$. The Manufacturing Equilibrium schedule is thus now the graph of (5) for all values of w , and so, in Figure 1, ME now becomes the straight line ABC.

It follows from this analysis that labor market equilibrium is always described by (6) and (7), with (6') no longer playing a role. Thus the LE schedule in Figure 1 is the same as before for $w < 1/a_H$, but is depicted by FD when $w > 1/a_H$.

The arm's length equilibrium is now given by the intersection of the amended ME and LE schedules. The multinational equilibrium is of course just that analyzed earlier for the case of the internationally integrated firm.

e. The emergence of multinationals

If the amended ME and LE schedules in Figure 1 intersect sufficiently low so that the equilibrium $w < 1/a_H$, as is the case the way the figure is drawn, the arm's length equilibrium will be identical to the one with multinational

firms. All firms will feel unconstrained by the need to deal in state invariant-contracts. Thus there will be no reason for individual firms to form multinational enterprises, and no social consequences if they are not allowed to do so.

If the arm's length equilibrium calls for $w > 1/a_H$, the two equilibria will clearly differ. In this case, with an initial arm's length arrangement, firms would perceive it to be in their interest to form multinationals. If they are allowed to do so, it is therefore the equilibrium given by the original ME and LE schedules that is relevant.²⁰

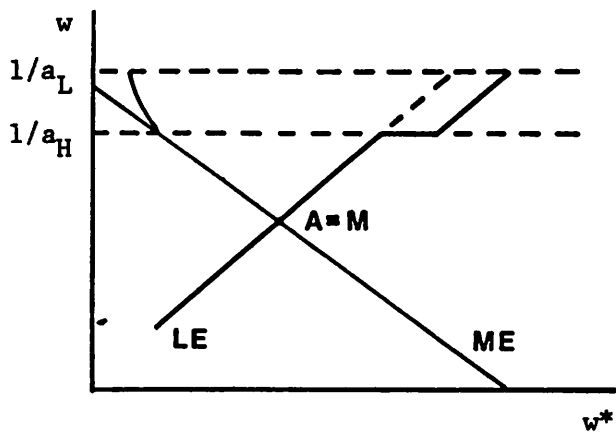
V. COMPARATIVE STATICS

This section compares the arm's length and multinational equilibria and inquires how that comparison responds to changes in the parameters of the model.

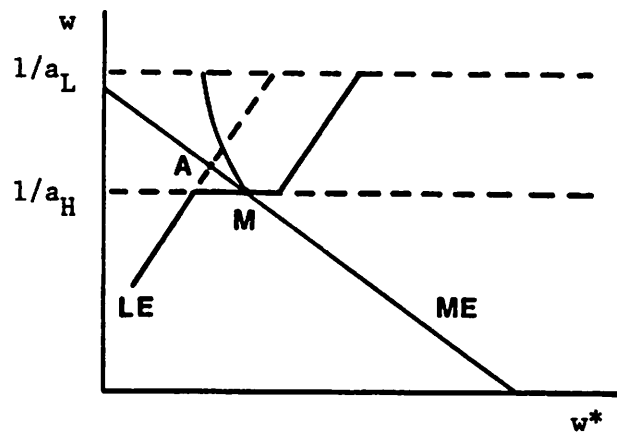
a. Alternative possibilities

The separate panels of Figure 2 show the alternative possible cases. In each panel the arm's length equilibrium is indicated by point A and the multinational equilibrium by point M. In case (a), point A features $w < 1/a_H$, so $A = M$

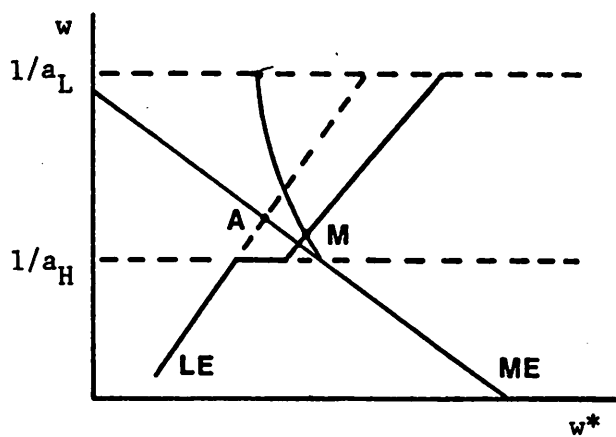
²⁰The firms may or may not find it to their advantage to shift from an arm's length to a multinational arrangement, but they will never perceive it to be actually disadvantageous to do so. Much of the less formal literature has assumed or asserted that multinational operation is inherently costly. The most natural way to introduce such considerations here would be to assume that the per unit downstream cost q is higher for an integrated firm. As the analysis is straightforward it is omitted. The principal consequence would be to add a range of cases where a change from an arm's length arrangement to an integrated one would be costly. If in addition internalization raises foreign q more than it would raise home q (as it would if integration is more costly when it involves operating across national and cultural barriers), there will be a range of cases where it would be advantageous for the upstream manufacturer to integrate with the home downstream firm but not with the foreign one.



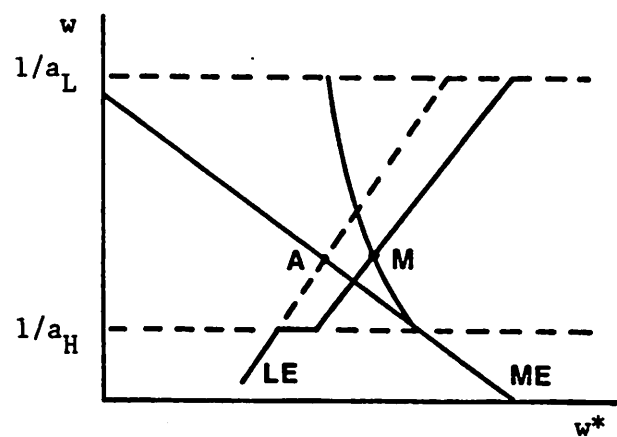
(a)



(b)



(c)



(d)

Figure 2

and there is no incentive to form multinationals. In the other three cases $w > 1/a_H$ at A, so $A \neq M$. Because of the step-like shape of the amended LE schedule, it is not unlikely that $w = 1/a_H$ at point M, as shown in panel (b). In this case, with an integrated equilibrium, firms are indifferent about the quality of goods that they provide when $a = a_H$. Thus they do not perceive that they derive any advantage from being multinational. However if they were to respond by dismembering themselves, the now-independent manufacturing firms would all have to offer Q_1 quality goods when $a = a_H$, which would cause w to rise. At the higher wage, the (now arm's length) firms wish to integrate.

In all cases where integration is beneficial, the multinational equilibrium features a higher foreign wage w^* than does the arm's length equilibrium. Therefore land's rent is lower: the formation of multinationals redistributes income in the host country to the factor employed intensively in the multinational sector and away from the other factor. This is just the reverse of what happens in the Markusen-Helpman model. Panels (b) and (c) imply the opposite redistribution in the source country, but, as panel (d) demonstrates, it is possible for the establishment of multinationals to benefit labor worldwide at the expense of land. These possibilities also are at odds with the Markusen-Helpman model (and the latter case is quite different from the implications of international factor mobility in a factor-endowments trade model). Also, from (9), multinationalization increases n : there is a greater variety of goods with multinationals than without. When $a = a_L$, goods are produced at quality Q_1 with either form of industrial organization, the difference being the greater potential variety offered by multinationals. When $a = a_H$, arm's length firms would still offer goods of quality Q_1 but multinationals would not produce, except possibly in the case of panel (b). Thus in equilibrium the

number of goods actually offered for sale by the multinationals, $[1-p(R)]n$, may be either greater or less than in an arm's length equilibrium.

Since the domestic wage may be either lower or higher with the multinational structure than with the arm's length one, it follows from (3) -- and also from the description of the properties of $R_2(w)$ immediately following (3) -- that the research effort may be either greater or less. Thus $p(R)$, which from a social point of view equals the fraction of varieties for which $a = a_L$, may be either greater or less.

b. Degree of technological dispersion

Consider now comparative statics changes in basic parameters. Since the role of multinationals is obviously intimately related to the fact that $a_L \neq a_H$, consider first the effect of changes in the degree of dispersion, $a_H - a_L$. Start with the case $a_H = a_L$ and ask what happens to the equilibria as a_H is gradually increased. Panels (a)-(d) of Figure 2 illustrate the result with snapshots taken along the way. Small deviations of a_H above a_L of course give no benefit to integration. A range of larger dispersions results in $w = 1/a_H$; within this range, the larger the dispersion the larger is the number n of varieties and the lower is the quality of those varieties for which $a = a_H$. Finally, very large dispersions introduce the possibility that the home wage is larger in an equilibrium with multinationals than in one with arm's length transactions.

c. Factor endowments

Consider next the effects of changes in factor endowments. An increase in the stock of wheat-specific land must, at given L_W , increase the marginal productivity of labor in wheat production. It then follows from (8), (8') and (9) that a rise in T^* , the foreign stock of land, and/or a fall in T will shift the LE schedule toward the right. A similar effect will be produced by a rise in L and/or reduction in L^* . Any combination of such changes will therefore raise w^* and lower w . They also reduce the chances of an equilibrium where $w > 1/a_H$, that is, they render it less likely that firms will have an incentive to go multinational.

VI. PATTERNS OF TRADE AND DIRECT INVESTMENT

Now that I have begun to address the role of relative factor endowments it is time to drop the assumption that all research and production takes place at home and to let the location of this activity become endogenous. However, in order to limit the length of this paper, I do suppose that each firm locates its research activity in the same country as its upstream production. In order to allow the role of factor endowments to stand out in clear relief, I assume that the efficiency of labor in research relative to upstream production and to downstream production is the same at home as abroad. But the absolute productivities of the two nations' workers need not be the same, so let w^* denote the wage of an efficiency unit of foreign labor, that is, of that quantity of foreign labor that can do the same research (or other activity) that one unit of domestic labor can. It follows that, if $w \neq w^*$, all production and research will

be conducted in the country with the lower wage. Thus the analysis in Sections IV and V remains unaltered, whenever the equilibria depicted in Figures 1 and 2 occur below the 45° line. If they occur above the 45° line the roles of the two countries are simply reversed. What is now necessary is to discover what determines which of these cases will in fact materialize, and to analyze the boundary case of international wage equalization.

a. The Manufacturing Equilibrium Envelope

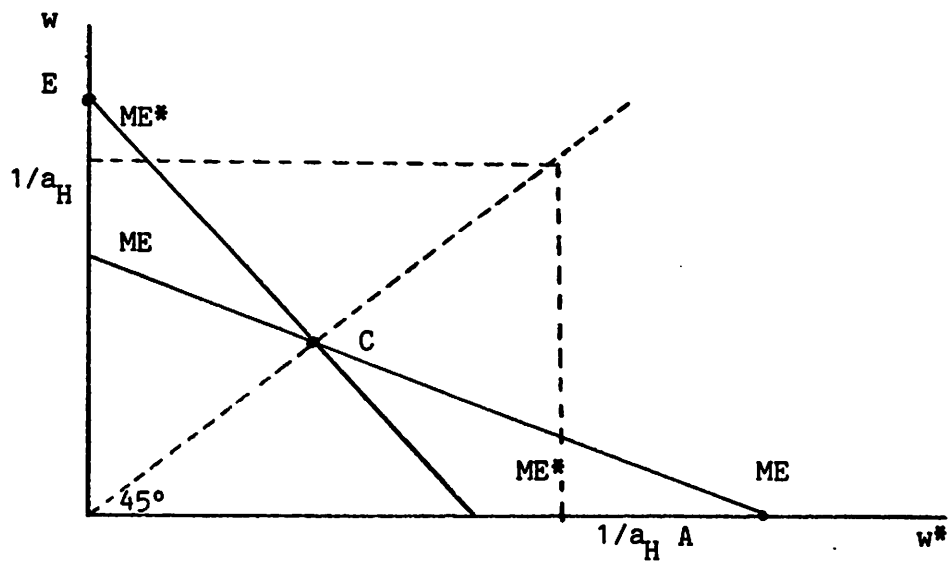
To this end, replicate for a foreign firm the discussion in Section III of the Manufacturing Equilibrium schedule. This results easily in the following analogs of (4) -- with equality -- and of (5).

$$(4^*) \quad p(R_2)Q_1(1 - a_L w^*) - (w^*R_2 + w^0q) = 0.$$

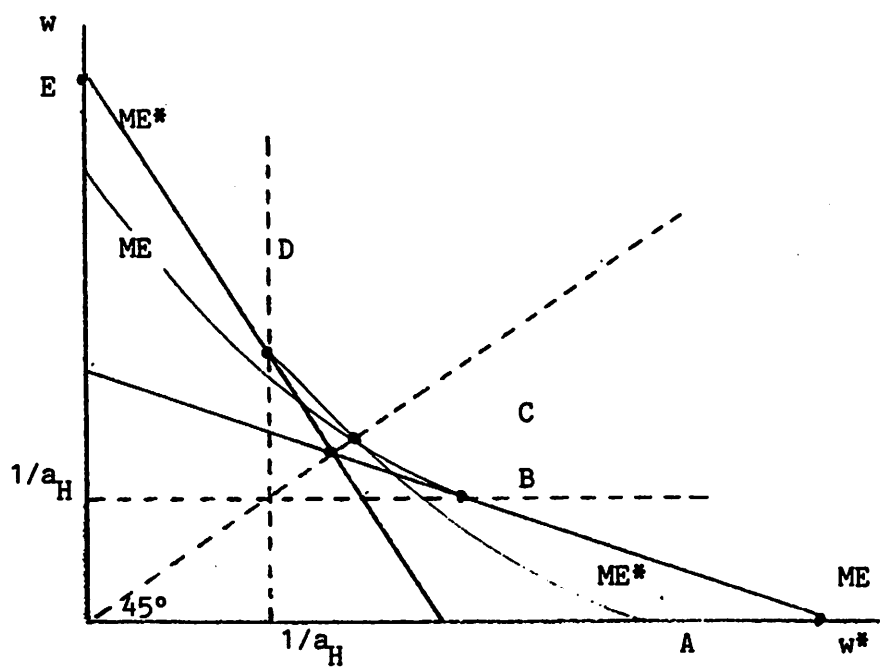
and

$$(5^*) \quad Q_1[1 - w^*(p(R_1)a_L + [1-p(R_1)]a_H)] - [w^*R_1 + w^0q] = 0.$$

Equations (4*) and (5*) determine a foreign Manufacturing Equilibrium schedule. Figure 3 shows the home and foreign curves, labelled ME and ME* respectively, in representative cases where (a) the dispersion $a_H - a_L$ is small, and where (b) the dispersion is large. It is easily shown, from (4), (4*), (5) and (5*), that ME must intersect ME* from below, so that multiple intersections are not possible. As Figure 3 makes clear, the single intersection will occur on the 45° line ($w = w^*$); this will be on the linear portions of ME



(a)



(b)

Figure 3

and ME^* (that is, $w = w^* < 1/a_H$) if the dispersion is small and on the nonlinear portions ($w = w^* > 1/a_H$) if the dispersion is large.

Along a country's ME curve profits in the manufacturing sector are zero; above the curve profits are negative, so that research and production are not sustainable; at points below the curve profits are positive so that such points are not compatible with equilibrium. Thus in Figure 3 international equilibrium must take place on the outer envelope of the ME and ME^* curves, that is, along ACE in panel (a) and along ABCDE in panel (b). Below point C all research and production takes place in the home country; above C it all takes place abroad. To see where equilibrium actually occurs, turn now to the Labor Equilibrium schedule.

b. The Labor Equilibrium curve and international equilibrium

Recall that, when all research and production takes place at home, the LE schedule is the solution of equations (6) and (7) for $w < 1/a_H$ and the solution of (6') and (7) when $w > 1/a_H$. More generally, if n denotes the number of varieties with research and production at home and n^* the number abroad, (6) and (7) become the following (I consider only cases when $w < 1/a_H$; the alternative is analogous).

$$(6'') \quad w = F_L(L - n[a^0Q_1 + R_1 + \mu q] - n^*\mu q, T)$$

and

$$(7'') \quad w^* = F_L^*(L^* - n(1-\mu)q - n^*[a^0Q_1 + R_1 + (1-\mu)q], T^*)$$

if $w < 1/a_H$. In addition, $n = 0$ whenever $w > w^*$ and $n^* = 0$ whenever $w < w^*$.

These relations determine a unique LE curve. Suppose, for example, that for some value of w^* there is a corresponding $w > w^*$ that allows (6'') and (7'') to hold for $n = 0$ and for some $n^* > 0$. There cannot be another value of w , with $w < w^*$, that also satisfies (6'') and (7'') for some $n > 0$, $n^* = 0$, and the same w^* . For if (7'') is to continue to hold for the same w^* , L_W^* must be unchanged so that the new value of n must be larger than the old value of n^* . But this will cause L_W to fall in equation (6''), so that w will rise rather than fall, that is, $w < w^*$ is not possible. Similar arguments applied to the other possible cases establish that the LE curve is uniquely defined. Note that the curve will coincide with the 45° line for a range of values of $w = w^*$ allowing (6'') and (7'') to hold for nonnegative n and n^* .

International equilibrium is of course determined by the intersection of the Labor Equilibrium curve with the Manufacturing Equilibrium envelope. If that intersection is below the 45° line, all research and production takes place at home and the discussion in Sections IV and V applies. It also applies, with the roles of the countries reversed, for intersections above the 45° line. But the fact that the LE curve will in general coincide with the 45° line for part of its length implies that an intersection exactly on that line (that is, at point C in the panels of Figure 3) cannot be dismissed as a fluke. Let me therefore examine this possibility in more detail.

c. International wage equalization

As Figure 3 makes clear, point C will be the intersection of the linear parts of ME and ME* if the dispersion is small enough and of the nonlinear parts for a sufficiently large dispersion. I discuss only the former case; the latter leads to similar conclusions. It follows from equation (5) or (5*) that, at such a point C, the common value of w and w^* is given by

$$(9) \quad w_C = Q_1/[Q_1a^0 + R_1 + q].$$

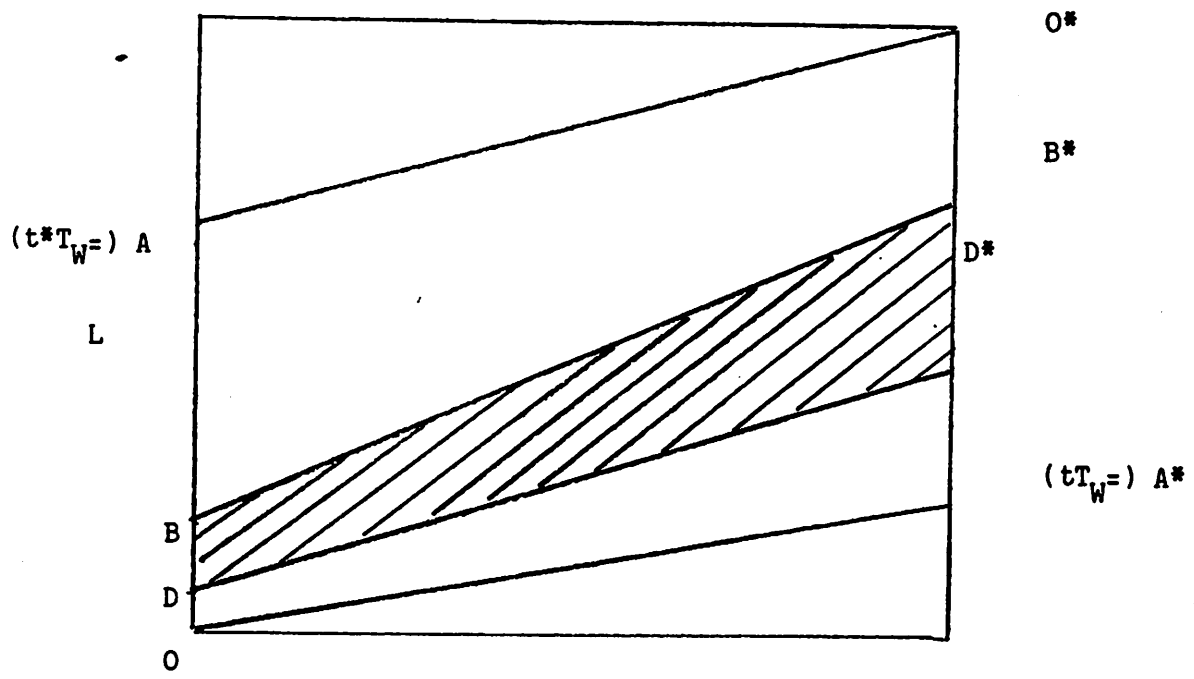
Setting the right hand sides of (6'') and (7'') equal to this value enables one to solve those equations for n and n^* as functions of the factor endowments of the two countries. In order to study the role of these endowments, I shall hold fixed the world stocks of the two factors ($L_W = L + L^*$ and $T_W = T + T^*$) and see how international equilibrium responds to redistributions of these stocks between the two countries. Now equations (6'') and (7'') determine equilibrium wheat labor-land ratios in the two countries ($t = L_W/T$ and $t^* = L_W^*/T^*$):

$$w_C = F_L(t, 1) = F_L^*(t^*, 1).$$

Note that

$$(10) \quad L_M = L - tT \text{ and } L_M^* = L^* - t^*T^*.$$

The world endowment ratio L_W/T_W consequently must exceed at least one of t and t^* for both countries to undertake research and production. Otherwise at most



T
 Figure 4

one country will do so (endowments could be such that both countries produce only wheat in equilibrium). Figure 4 depicts the case where the world endowment ratio exceeds both t and t^* . The dimensions of the box equal L_W and T_W respectively, with labor measured on the vertical axis and land on the horizontal, so that each point within the box represents one possible allocation of the world's factors. The home endowment is measured relative to the southwest corner of the box and the foreign endowment relative to the northeast corner. The slopes of the rays OA^* and O^*A respectively reflect t and t^* . Thus the area between these two rays contains all allocations that are consistent with both $L_M > 0$ and $L_M^* > 0$. But this is only a necessary condition for n and n^* to be both positive, not a sufficient condition. The reason is that a country will provide downstream services even if it conducts no research or production. For both countries to do the latter it is necessary for L_M and L_M^* to be such that equations (11) and (12) are solved for positive values of n and n^* .

$$(11) \quad n[a^0 Q_1 + R_1 + \mu q] + n^* \mu q = L_M$$

and

$$(12) \quad n(1-\mu)q + n^*[a^0 Q_1 + R_1 + (1-\mu)] = L_M^*$$

This will be the case when $b > (L_M/L_M^*) > d$, where

$$b = (a^0 Q_1 + R_1 + \mu q)/(1-\mu)q$$

and

$$d = \mu q / [a^0 Q_1 + R_1 + (1-\mu)q].$$

In Figure 4 the BB^* line shows endowment allocations for which $L_M/L_M^* = b$ and DD^* shows allocations where $L_M/L_M^* = d$. The 'wage equalization region' is therefore DBB^*D^* . Allocations within this region result in an international equilibrium at point C in Figure 3. Both countries have firms conducting research and production, and they have a common wage w_C .²¹ Allocations above the region imply an international equilibrium in which all research and production takes place at home, and all such activity takes place abroad with an allocation below the region. The present analysis bears a superficial similarity to that of factor price equalization in the familiar Heckscher-Ohlin-Samuelson model. It's worth pointing out, therefore, that wage equalization does not require identical production functions across countries, and that it does not imply equalization of the returns to land.

d. The influence of endowments and the dispersion

It's now possible to indicate how relative factor endowments and the size of the dispersion interact to determine the industrial structure, the volume and type (interindustry, intraindustry or intrafirm) of international trade, the volume and type of direct investment (unidirectional or two-way), and the international pattern of factor prices. In the following discussion I call the relatively labor abundant country the home one.

²¹More precisely, the international wage differential just equals the productivity differential of labor in the manufacturing sector (recall that foreign labor is measured in efficiency units).

Suppose first that relative factor endowments differ greatly between the two countries. Then international equilibrium will take place on the linear part of the Manufacturing Equilibrium envelope below point C in Figure 3. Then home wages are less than foreign wages, all research and production takes place at home, there is no direct investment,²² and all trade is interindustry (and interfirm), with the home country exporting unfinished manufactures in exchange for wheat. As relative factor endowments become more nearly equal, home wages rise (and home rents fall), foreign wages fall, and the volume of (interindustry) trade declines. If the dispersion is large enough so that $w_C > (1/a_H)$, sufficiently similar relative factor endowments will cause the home manufacturing firms to undertake direct investment. Trade and direct investment now appear to be substitutes, as the former contracts while the latter expands. But there is no causal relation between the two developments: they are both due to the assumed convergence of relative endowments across countries. International trade will consist of the interindustry exchange of wheat for unfinished manufactures, but the export of the latter will now be intrafirm trade.

If relative endowments become still more similar, equilibrium will take place at point C in panel (b) of Figure 3. The foreign economy will now undertake some research and production, with these foreign activities conducted by multinational firms. Direct investment is now two-way, and international trade consists of both interindustry trade and intraindustry trade, with each country exporting unfinished manufactures. The latter constitutes two-way intrafirm trade. Wages will also be equalized across countries. If endowments become still more similar, factor prices will not change further, but intraindustry

²²More precisely, there is no reason why any direct investment should take place.

(and intrafirm) trade will continue to displace interindustry trade. Note that now direct investment and trade (intraindustry) appear to be complements.

If the dispersion is instead small enough so that $w_C < (1/a_H)$, direct investment will never take place and there will therefore never be any intrafirm trade. But the above description of the effects of changes in relative factor endowments still applies to factor prices and to the respective roles of interindustry and intraindustry trade.

All this differs dramatically from the implications of the Markusen-Helpman model. There the formation of multinationals is associated with differences in relative factor endowments rather than similarities: multinationals can not emerge at all if trade in goods would itself equalize factor prices (in that model both sectors use both factors and technology is identical across countries), though the presence of multinationals can produce factor price equalization in some cases where trade alone cannot do so. Furthermore two-way direct investment cannot take place at all without impediments to international exchange.²³

²³All this is quite clear in Helpman (1984), but Markusen (1984) appears to have reached different conclusions. However this disparity simply reflects the one significant respect in which Markusen's model differs from Helpman's: the former assumes there is only one variety of manufacture, so that with a multinational equilibrium that sector contains but a single monopolistic firm. If the two countries have identical endowments, so that manufacturing activity occurs in both, that monopolist must ipso facto be a multinational. If in addition it pays to concentrate the public activity (analogous to my R) in one country, factor prices and resource allocation must differ in the two countries. But if there were instead many varieties they could be divided among the two countries, allowing each variety to be produced entirely in one country and eliminating the need for multinationals. Thus this model produces the same conclusions as Helpman's once additional varieties are introduced, which is necessary to compare its implications with those of the present paper.

VII. CONCLUDING REMARKS

This paper has developed a simple general equilibrium model of international trade offering an explanation for the emergence of multinational enterprises, within the general spirit of what Dunning calls the 'eclectic theory', or the OLI framework. The paper first argues that the question critical for understanding direct investment in the context of trade theory is the nature of internalization, and that the essential aspect of the latter usually involves the exchange of information between agents. The central informational issues are the public-good nature of information and the size and diversity of the information flows with which agents must contend.

A model was constructed to examine and reflect these concerns. The model contained two variables, research effort and product quality, respectively associated with the two central informational issues. The basic parameters of the model were relative factor endowments and the dispersion (or degree of intrinsic uncertainty facing agents).

The role of multinational activity was discussed and related to the basic parameters. The presence of multinational firms is positively related to the size of the dispersion. Also, similarity in relative factor endowments makes direct investment more likely, and also provides a basis for intraindustry trade and causes wages to be more nearly equal internationally. Sufficient endowment similarity (and the presence of a large enough dispersion) cause international wage equalization and two-way direct investment, making intraindustry trade and intrafirm trade large relative to interindustry trade.

These implications are dramatically different from those of the Markusen-Helpman model, which took internalization for granted. It would be prema-

ture, I believe, to interpret this difference in results as a picture of the significance of internalization, since it is unclear how robust either set of results is. For example, my conclusions could be sensitive to the exact way in which multinationalization alters contract possibilities, and a comparison of the Markusen (1984) and Helpman (1984) papers shows how sensitive the implications of that model are to assumptions about industrial structure and the number of varieties. What has been established is the inherent importance of explicitly modelling the internalization decision.

REFERENCES

- Agarwal, J. P., "Determinants of Foreign Direct Investment: A Survey," **Weltwirtschaftliches Archiv** 116 (1980), pp 739-73.
- Buckley, P. J. and M. Casson, **The Future of the Multinational Enterprise**. London: Macmillan (1976).
- Casson, M., **Alternatives to the Multinational Enterprise**. London: Macmillan (1979).
- Caves, R. E., "International Corporations: The Industrial Economics of Foreign Investment," **Economica** 38 (1971), pp 1-27.
- Caves, R. E., "International Trade, International Investment, and Imperfect Markets," **Special Papers in International Economics** No. 10. Princeton: International Finance Section, Princeton University (1974).
- Caves, R. E., **Multinational Enterprise and Economic Analysis**. Cambridge: Cambridge University Press (1982).
- Cherkes, M., **The Theory of the Multinational Enterprise in Manufacturing Industries**. University of Pennsylvania Ph. D. dissertation (1984).
- Coase, R. H., "The Theory of the Firm," **Economica** 4 (1937), pp 386-405.
- Dunning, J. H. (ed), **The Multinational Corporation**. London: George Allen and Unwin (1971).
- Dunning, J. H., "The Determinants of International Production," **Oxford Economic Papers** 25 (1973), pp 289-336.
- Dunning, J. H., "Trade, Location of Economic Activity and MNE: A Search for an Eclectic Approach." In: Ohlin, B., P. - O. Hesselborn, and P. M. Wijkman (eds), **The International Allocation of Economic Activity**. London: Macmillan (1977).
- Dunning, J. H., "Explaining the International Direct Investment Position of Countries: Towards a Dynamic or Developmental Approach," **Weltwirtschaftliches Archiv** 117 (1981), pp 30-64.
- Ethier, W. J., "Internationally Decreasing Costs and World Trade," **Journal of International Economics** 9 (1979), pp 1-24.
- Ethier, W. J., **Modern International Economics**. New York: Norton (1983).
- Ethier, W. J., "National and International Returns to Scale in the Modern Theory of International Trade," **American Economic Review** 72 (1982), pp 389-405.
- Grossman, S. J. and O. Hart, "The Costs and Benefits of Ownership: A Theory of Vertical Integration," processed (1984).

- Hart, O. D., "Optimal Labour Contracts under Asymmetric Information: An Introduction," **Review of Economic Studies** 50 (1983), pp 3-35.
- Helpman, E., "A Theory of Multinational Corporations and the Structure of Foreign Trade," processed (1983a).
- Helpman, E., "A Theory of Multinational Corporations and the Structure of Foreign Trade - Part II: Vertical Integration," processed (1983b).
- Helpman, E., "A Simple Theory of International Trade with Multinational Corporations," **Journal of Political Economy** 92 (1984), pp 451-71.
- Helpman, E., "International Trade in the Presence of Product Differentiation, Economies of Scale and Monopolistic Competition," **Journal of International Economics** 11 (1981), pp 305-40.
- Helpman, E. and P. R. Krugman, **Market Structure and Foreign Trade**. Cambridge: MIT Press, forthcoming (1984).
- Hood, N. and S. Young, **The Economics of Multinational Enterprise**. London: Longman (1979).
- Horstmann, I. and J. Markusen, "Strategic Investments and the Development of Multinationals," processed (1984).
- Hufbauer, G. C., "The Multinational Corporation and Direct Investment." In: Kenen, P. B. (ed), **International Trade and Finance**. Cambridge: Cambridge University Press (1975).
- Hymer, S., **The International Operations of National Firms**. Massachusetts Institute of Technology Ph. D. dissertation (1960).
- Kindleberger, C. P., **American Business Abroad: Six Lectures on Direct Investment**. New Haven: Yale University Press (1969).
- Kindleberger, C. P. (ed), **The International Corporation**. Cambridge: MIT Press (1970).
- Kindleberger, C. P. and D. B. Audretsch (eds), **The Multinational Corporation in the 1980s**. Cambridge: MIT Press (1983).
- Krugman, P., "Increasing Returns, Monopolistic Competition, and International Trade," **Journal of International Economics** 9 (1979), pp 469-80.
- Krugman, P., "Intraindustry Specialization and the Gains from Trade," **Journal of Political Economy** 89 (1981), pp 959-73.
- Lall, S. and P. Streeten, **Foreign Investment, Transnationals and Developing Countries**. London: Macmillan (1977).

- Lancaster, K., "Intra-Industry Trade under Perfect Monopolistic Competition," **Journal of International Economics** 10 (1980), pp 151-76.
- Magee, S. P., "Information and the Multinational Corporation: An Appropriability Theory of Direct Foreign Investment." In: Bhagwati, J. N. (ed), **The New International Economic Order: The North-South Debate**. Cambridge: MIT Press (1977a).
- Magee, S. P., "Multinational Corporations, the Industry Technology Cycle and Development," **Journal of World Trade Law** 11 (1977b), pp 297-321.
- Markusen, J. P., "Multinationals, Multi-Plant Economies, and the Gains from Trade," **Journal of International Economics** 16 (1984), pp 205-26.
- McCulloch, R., "U. S. Direct Foreign Investment and Trade: Theories, Trends, and Public Policy Issues." In: Erdilek, A. (ed), **Multinationals as Mutual Invaders: Intraindustry Direct Foreign Investment**. Beckenham: Croom Helm, forthcoming (1984).
- Rugman, A. M., "Internalization as a General Theory of Foreign Direct Investment: A Re-Appraisal of the Literature," **Weltwirtschaftliches Archiv** 116 (1980), pp 365-79.
- Shaked, A. and J. Sutton, "Natural Oligopolies," **Econometrica** 51 (1983), pp 1469-84.
- Shaked, A. and J. Sutton, "Natural Oligopolies and International Trade." In: Kierzkowski, H. (ed), **Monopolistic Competition and International Trade**. Oxford: Oxford University Press (1984).
- Stevens, G. V. G., "The Determinants of Investment." In: Dunning, J. H. (ed), **Economic Analysis and the Multinational Enterprise**. London: George Allen and Unwin (1974).
- Vernon, R., **Storm over the Multinationals: The Real Issues**. London: Macmillan (1977).

1981

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