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AGREED SPECIALISATION AND CROSS DIRECT INVESTMENT

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I. *Introduction*

Since the end of World War II, the importance of vertical trade, the exchange of foodstuffs and raw materials for manufactured goods, has declined. On the other hand, horizontal trade, the exchange of similar commodities, has become an increasingly large portion of trade. Intra-industry trade in similar but differentiated manufactured products among the European Economic Community (EEC), North America (Canada and the United States), and Japan has expanded especially rapidly. These products are often produced with similar factor proportions and similar technologies with firms facing similar factor prices. Traditional theories which describe international trade as a result of differences in technology (Ricardo) or factor endowments (Heckscher-Ohlin) cannot be used to analyse this type of trade in a meaningful manner. Rather, a new theory of the international division of labour [e.g., Helpman and Krugman (1985)] is required.

With the aim of providing the basis for a new theory, I have previously proposed "a theory of agreed specialisation" (Kojima, 1970). This approach emphasises the crucial role of scale economies and the benefits of agreeing on the direction of specialisation in the presence of such scale economies. Compared to a state of unfettered competition, agreed specialisation can lead to greater efficiency in production because it allows firms, industries, or countries (the unit depending on the nature of the scale economies involved) to reap the benefits of lower unit costs resulting from larger markets and output.

Furthermore, the benefits of agreed specialisation in international trade can be increased if direct foreign investment (DFI) consisting of both capital transfer and technological cooperation is undertaken in a host country's sector of specialisation. DFI can assist in market development when the product is to be imported by the investing country (i.e., offshore sourcing) and can also facilitate product development specific to the needs of the investing (and importing) country market. Moreover, technical cooperation can help improve productivity and quality control in host country production. Thus, the role of complementary cross direct investment can be substantial.

This paper first reviews the basis for agreed specialisation in the presence of economies of scale in Section II. In section III, the role of DFI in furthering the international division of labour and expanding the benefits of agreed specialisation is examined. Section IV then presents some empirical analyses of intra-industry cross investment and international trade between Japan and the United States.

II. *A Model of Agreed Specialisation*

The Determinants of Comparative Costs

Two major approaches to modeling the determinants of comparative costs and comparative advantage positions have dominated the international trade literature for over a century and a half. The Ricardian theory stresses the importance of differences in technology among countries as the basis for differences in comparative costs. Product cycle theories of international trade [Akamatsu (1962a, 1962b); Vernon (1966)] are similar in that differences in technology explain the evolution of comparative advantage positions over time. The Heckscher-Ohlin (H-O) or factor endowments theory holds that comparative costs are determined by differences in the factor endowments of trading nations. For example, if a country is relatively abundant in capital compared to its trading partners, the ratio of rental price of capital to the wage rate for labour will be relatively low, and the country will then be able to produce capital-intensive goods at a relatively low cost. In general terms, a country will have a comparative advantage in the production of goods requiring relatively large inputs of the factors which are relatively abundant in that country.

Analysis based on the H-O theory has dominated the literature for much of this century but, as indicated above, neither the H-O theory nor the Ricardian theory can adequately explain the large amount of the trade among industrialised nations with similar factor endowments and similar technologies. According to these theories there is no difference in comparative costs and consequently no incentive to engage in international trade among these countries. Yet, this type of trade thrives in reality.

What is the cause of this trade? In static models, a number of possibilities exist; differences in consumer tastes, differences in market structure (i.e., the existence of imperfect competition), the existence of substantial transportation costs, factor specificity or heterogeneity, and the existence of economies of scale (often related to market structure considerations). There are also a number of expressedly dynamic determinants such as product cycle considerations and the role of accumulating productive assets, both tangible (e.g., capital) and intangible (e.g., technology and marketing information). Although all of these alternatives deserve close consideration, the existence of economies of scale is the focus of attention here.[1] The reason for this focus is apparent discrepancy between the common assumption of constant returns to scale and the results of empirical analyses and casual observation which suggest that economies of scale are quite common in many manufacturing industries.

Analytical Consequences of Scale Economies

Two types of economies of scale, internal and external, have been used in previous analyses and should be defined before proceeding. First, define the production function for firm k ($k=1, 2, \ldots, n$) in industry j ($j=x, y$) of country i ($i=1, 2$):

[1] In addition to economies of scale, diversification of tastes is another important element leading to trade and enlarging the scope for increased benefits from agreed specialisation. See Helpman and Krugman (1985); Dixit and Stiglitz (1977); and Krugman (1979).

$$V_{ijk}=f_{ijk}(K_{ijk}, L_{ijk}) \tag{1}$$

where V=production, K=capital input, L=labour input and (1) is a homogeneous production function which is the same for all firms in the industry (i.e., $f_{ij1}=f_{ij2}= , \ldots , = f_{ijn}$). Second, define V_{ij} as the product of industry j (i.e., $V_{ij}=V_{ij1}+V_{ij2}+ \ldots +V_{ijn}$), K_{ij} as the capital input of industry j (i.e., $K_{ij}=K_{ij1}+K_{ij2}+ \ldots +K_{ijn}$), and L_{ij} as the labour input of industry j (i.e., $L_{ij}=L_{ij1}+L_{ij2}+ \ldots +L_{ijn}$). The production function for industry j in country i is then defined as:

$$V_{ij}=f_{ij1}(K_{ij1}, L_{ij1})+f_{ij2}(K_{ij2}, L_{ij2})+ \ldots +f_{ijn}(K_{ijn}, L_{ijn})=f_{ij}(K_{ij}, L_{ij}) \tag{2}$$

where (2) is also a homogeneous function.

Internal economies are defined as those which occur at the firm level; i.e., the firm production function (1) and consequently the industry production function (2) are all homogeneous of a degree greater than one. There are many reasons for these types of scale economies; perhaps the most classic example is Adam Smith's description of how output expansion facilitates the further division of labour and results in greater productivity. There is a major analytical difficulty with the assumption of internal economies of scale, however, in that average cost exceeds marginal cost and, consequently, price must be greater than marginal cost. In other words, some form of imperfect competition must result. The conditions for Pareto Optimality are therefore violated and unregulated market equilibrium no longer generates a first best solution.

External economies are those which are not firm specific; in other words, they result because expanded group output reduces costs for each producer in that group. The most common example of this type of scale economies which is consistent with perfect competition throughout the economy, is the assertion that output expansion leads to technological spillovers among firms.[2] When assuming such technological external economies, it is common to write the firm production function as follows:

$$V_{ijk}=f_{ijk}(K_{ijk}, L_{ijk})\, g_{ijk}(V_{ijk}) \tag{3}$$

where f_{ijk} is a homogeneous function of degree one (again assumed the same for all firms in industry j). In this formulation the external economy is represented by a multiplicative scale factor depending on output; note, however, the relationship to output does not have to be multiplicative. Given this formulation the industry production function (4) is as follows:

$$\begin{aligned} V_{ij}&=f_{ij1}(K_{ij1}, L_{ij1})g_{ij1}(V_{ij1})+f_{ij2}(K_{ij2}, L_{ij2})g_{ij2}(V_{ij2})+ \ldots \\ &\quad +f_{ijn}(K_{ijn}, L_{ijn})g_{ijn}(V_{ijn}) \\ &=f_{ij}(K_{ij}, L_{ij}) \end{aligned} \tag{4}$$

[2] The other common example of external economies is sometimes called pecuniary external economies and refers to the ability of firms to procure inputs at lower prices. Given the assumptions of fixed primary factor supplies and perfectly competitive factor markets, this is impossible in the case of primary factors; in the case of intermediate inputs, postulating pecuniary economies also implies that the markets for those inputs are imperfect [Chacholiades (1978, p. 185)]. Thus, the postulate of pecuniary economies is also incompatible with the assumption of perfect competition throughout the economy; this inconsistency is important because it indicates that a Pareto Optimal solution does not result from the unregulated working of free markets.

the function f_{ij} will then exhibit economies of scale (i.e., it will be homogeneous of a degree greater than one).[3]

One advantage of assuming external economies results from the fact that price and marginal cost can still be equalised by firms; in this sense external economies are consistent with analysis based on the assumption of perfect competition. Yet, the production externality can create a divergence between marginal cost as perceived by firms and social marginal cost and may also result in an economy's operating inside its transformation or production possibilities curve. In the absence of some highly restrictive assumptions, the conditions for Pareto Optimality are again violated in the absence of policy intervention.

Thus, in general, evaluating the welfare gains from increasing international trade under the assumption of scale economies becomes an exercise in comparing equilibria which are not necessarily Pareto Optimal. Recently there have been several studies which do show that international trade does lead to welfare gains in the presence of scale economies [e.g., Markusen (1984); Helpman and Krugman (1985)] although these studies all use a number of specific assumptions about pricing and market structure to generate their results. Nonetheless, it has been shown that the existence of scale economies alone is sufficient to generate trade among countries with identical endowments, technologies, and tastes [e.g., Krugman (1979)]. Furthermore, despite the difficulties involved, the empirical significance of scale economies makes it important to pursue modeling international trade under the assumption that production functions are subject to economies of scale.

Increasing Returns, Specialisation, and the Gains from Trade

Although general equilibrium welfare analysis is complicated by the problems described above, the increase in production efficiency facilitated by agreed specialisation in the presence of economies of scale can be easily illustrated with Figure 1. Assume the two countries have: 1) identical and fixed factor endowments, $K_1=K_{1x}+K_{1y}=K_2=K_{2x}+K_{2y}$, $L_1=L_{1x}+L_{1y}=L_2=L_{2x}+L_{2y}$, which are immobile between countries; 2) identical technologies, $f_{1x}=f_{2x}$ and $f_{1y}=f_{2y}$; and 3) identical tastes and industry demand functions in both countries. Further assume that the countries are of equal size; then, in autarky, each country will produce equal amounts of each good, $V_{1x}=V_{2x}$, $V_{1y}=V_{2y}$. Assume these quantities are all positive in autarky. Finally, assume that all industry production functions display increasing returns to scale as postulated in (2).[4]

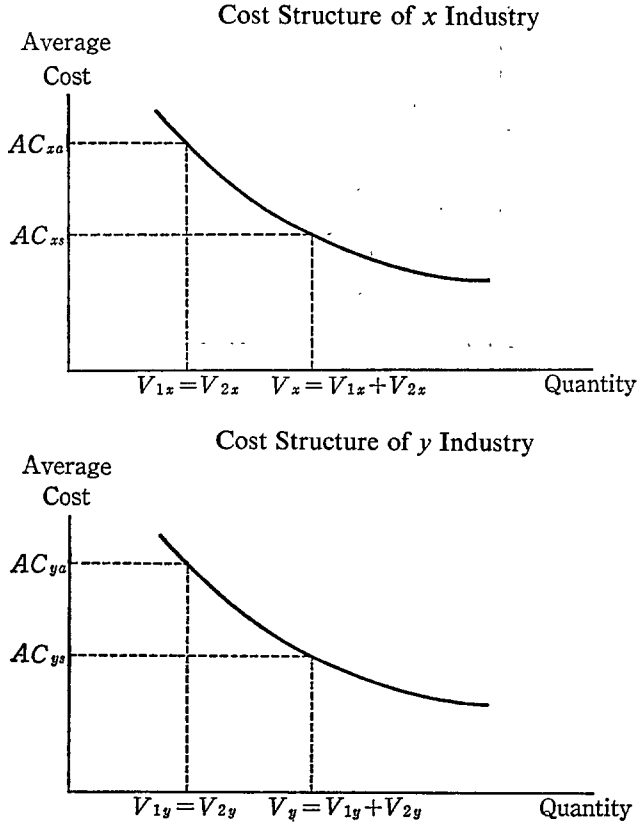
In Figure 1 average costs of production in autarky are given by AC_{xa} and AC_{ya}, respectively. Now suppose trade opens up and specialisation occurs. The x industry in

[3] Note that (4) is a somewhat strange production function. Normally movement along production functions result only from increases in inputs, in this case K and L; in contrast, technical progress causes a shift in the entire function upward (i.e., a downward shift of cost curves). However, in this interpretation of economies of scale, endogenous technical progress (i.e., technical progress resulting from the external economy) results in a movement along the production and cost functions, not shifts in the functions themselves.

[4] It is also possible to generate the same basic results with somewhat more general assumptions about factor endowments and country size; i.e. it is only necessary to assume that relative factor endowments are equal, $K_1/L_1=K_2/L_2$. Then $K_1>K_2$ implies $L_1>L_2$, i.e., 1 is the larger country, and vice versa. If 1 is the larger country, then $V_{1x}>V_{2x}$ and $V_{1y}>V_{2y}$, but $V_{1x}/V_{1y}=V_{2x}/V_{2y}$.

The assumptions about economies of scale do not depend on the nature of the scale economies at this point; they may be either internal or external. Also, it is only necessary to assume economies of scale in one industry for there to be potential gains in production efficiency from world's point of view.

FIGURE 1. SPECIALSATION AND COST REDUCTIONS

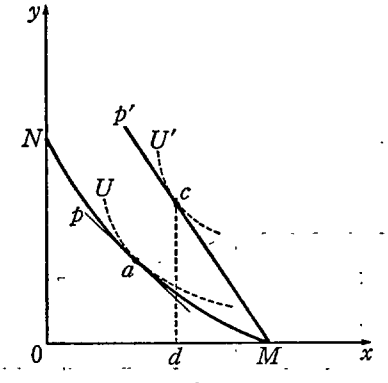


the country specialising in x will see its average cost of production fall to AC_{xs} and the y producing industry in country specialising in that good will have its unit costs fall to AC_{ys}. This results because each of these industries experiences a two-fold increase in demand for its product and can expand output accordingly. In the presence of the pronounced scale economies depicted in Figure 1, these output increases result in lower unit costs and create the opportunity for large gains in welfare in both countries.[5]

Although the above is a partial equilibrium analysis, it points to an important source of gains from trade. The adoption of some additional assumptions can also facilitate a general equilibrium analysis which underscores this analysis (Figure 2). Here it is necessary to assume that: 1) increasing returns to scale are due to technological external economies

[5] On the other hand, specialisation of this sort may eliminate one industry in each country thereby reducing the number of producers in each industry worldwide. This can lead to an increase in the degree of market power exercised by the remaining firms. If this market power is used and output prices increase, consumer surplus could shrink. These reductions are likely to be minimal, however, because firms are often motivated to hold profits down so as to deter the entry of competitors. Furthermore, if there are anti-trust laws, firms with market power also try to avoid close scrutiny by regulatory authorities; as a result, they tend to avoid blatant use of market power. Thus, gains in production efficiency seem likely to more than compensate for any losses in consumer surplus that might be incurred.

FIGURE 2. WELFARE EFFECT OF AGREED SPECIALISATION



and firm production functions are as given in (3); 2) the autarky production point is located on the transformation curve; 3) autarky equilibrium is characterised by tangency of this curve and a social indifference curve (i.e., price=social marginal cost); and 4) the social indifference curve is more convex than the transformation curve.[6]

Figure 2 depicts the effects of specialisation for one of the countries involved. Since economies of scale exist in both industries the transformation curve is convex to the origin.[7] The autarky equilibrium is at point a and the level of social welfare is indicated by the social indifference curve U. Assuming this country specialises in x and the terms of trade are given by p' the consumption point moves to c, production takes place at M, and the country exports Md of x in exchange for cd worth of y. The new level of social welfare given by U' is clearly superior to the autarky one. Conversely, the other country can realise similar benefits from specialising the production of y. The largest gains are realised when both countries are completely specialised in the production of one commodity. Thus, this analysis is entirely consistent with that of Figure 1 presented above.

Necessity of an Agreement

The logic of specialisation appears simple. However, why would an agreement be required? In general, an agreement is necessary because the market provides no incentive for the two countries to enter into trade and specialise. A further problem arises over the direction of specialisation; in the absence of an agreement there is nothing to determine this but chance. For specialisation to occur there must be some mechanism to 1) decide the direction of specialisation and 2) stimulate initial cost reductions in industries of specialisation. Once the initial cost reductions are realised and international trade begins, the industry of the specialising country would enjoy a cost advantage and production by

[6] For assumptions 1 to 3, see Chacholiades (1978, p. 185). He cites rationales for assumption 2 from Meade (1952, p. 33)—that government intervention assures price=social marginal cost (if valid, internal economies of scale may also be postulated in this model), and Kemp (1964, p. 111)—that all externalities are of equal severity in all industries leading to an equivalence of the ratio of marginal private cost to marginal social cost. For assumption 4 see Matthews (1949–50).

[7] In the case that only one industry is characterised by increasing returns, it may be concave, convex, or have concave and convex portions.

similar firms in other countries would eventually cease because of the inability to compete.[8] In other words, for the benefits of specialisation to be realised, some initial shock would have to alter comparative costs with the altered costs then guiding the direction of specialisation. It is hard to conceive of this happening without an agreement of some sort.

A second set of issues revolves around the division of the gains from such specialisation. Agreements will of course be easiest to reach when the distribution of these gains is rather equal. They will also be easier to obtain if specialisation occurs on a product by product basis, for example, large and small cars, than if it occurs on a broad industrial level, for example, steel and automobiles. Focusing on the product level should help maintain a roughly equal distribution of gains; this fact suggests that agreements may be easier to obtain among countries producing and consuming similar products.

Note, however, the benefits from specialisation will generally vary among countries depending on a number of factors including the extent of the scale economies involved in the industry or product of specialisation; indeed initiation of trade may be immiserising (welfare reducing) in the presence of scale economies [e.g., Bhagwati and Srinivasan (1983, pp. 261–270)]. Furthermore, when only one of two industries is subject to increasing returns to scale, an individual country apparently gains when specialising in that industry [Chacholiades (1978, p. 199)]. This suggests countries may have some conflict over the direction of specialisation; a negotiated agreement would seem the best way to solve such disputes and to create a framework for international redistribution of the gains from trade where necessary.

On the other hand, there are other factors which work to facilitate specialisation agreements. Consider the case of two countries competing with a third country which has lower costs due to the realisation of scale economies in a given industry. Suppose that if one of these two countries ceased production and imported from the other, the second country could become competitive due to the increase in scale. Specialisation could allow the industry in the second country to become competitive in the world market and the gains from increased exports could then be redistributed between the two countries. Furthermore,

[8] Several alternative paths towards specialisation have been suggested. Ohlin (1967, p. 38) suggests that increasing returns to scale will be a powerful cause of trade and specialisation arguing that when

> a number of regions are isolated from each other, and . . . their factor endowments and their demand are so balanced that the relative prices of factors and commodities are everywhere the same, . . . no trade is then possible. As a matter of fact, insofar as the market for some articles within each region is not large enough to permit the most efficient scale of production, division of labor and trade will be profitable. Each region will specialize on some of these articles and exchange them for the rest. The character of this trade will be entirely *a matter of chance* if factor equipment is everywhere the same, for it doesn't matter whether a certain region specializes in one commodity or another. (my italics)

Meade (1952, pp. 42–3) concludes that

> in the case of important increasing returns to scale in both countries *a structural jolt* might be able to shift the world economy from one position of stable equilibrium (in which one country specialized wholly on one line of product) to a second position of stable equilibrium (in which that country specialized wholly on the other line of product), and that such a change might be better for both countries, worse for both, or better for one and worse for the other. (my italics)

Finally, Janssen (1961, p. 29), in a model similar to mine, stressed that

> *Where, however, for political reasons, both countries specialize in the same product, considerable wastage results. Mutual agreements, or perhaps even a supranational form of control, will then be necessary to obtain an optimum result.* (author's italics)

for this example to be plausible the two countries must initially protect the industry involved. Thus, in addition to gaining from the specialisation of one country (and potential redistribution of the gains from specialisation), the countries could also potentially benefit from the removal of trade distortions. Of course, if two such industries existed in the two countries, the distribution question would be easier to cope with.

In the final analysis, therefore, it is highly unlikely that the benefits from specialisation in the presence of scale economies will be realised without some sort of agreement among the specialising countries. On the other hand, if the process of reaching an agreement is too cumbersome, such an agreement is never likely to materialise. There are a number of ways in which such agreements can emerge, either explicitly or *de facto*. Regional groups such as EC, COMECON, ASEAN, etc. may be appropriate. In any case, negotiations will have to have significant corporate participation. Indeed, the multinational corporation has already shown itself to be a powerful agent which can promote and coordinate specialisation of the type discussed here. This role is pursued below.

III. *Direct Foreign Investment among Industrial Countries*

Intra-industry Cross Direct Foreign Investment

Recently there is rising interest in problems associated with direct foreign investment in manufacturing sectors among industrial countries. Many manufacturing direct investments among industrial countries are apparently motivated by the desire to overcome tariffs, voluntary export restraints, and other non-tariff barriers to trade. In some countries, these barriers result in some cases from large trade imbalances. Unfortunately, however, "trade barrier-induced direct investment" can result in the movement of production from a lower-cost to a higher-cost location and thereby bring about a waste of real resources for the two countries together. If the investing firm can transfer the source of its competitive advantage (e.g., technology or some other intangible asset) from country to country the investment may alleviate this problem by stimulating efficiency in the recipient country. Yet, all too often this does not occur and "trade barrier-induced direct investment" results in increased production costs.

This problem does not occur as often when direct investment is not trade-barrier induced. If a country makes a direct investment in industries in which the host country has a comparative advantage, production will be moving from higher-cost to lower-cost locals and efficiency will increase. Often times this type of investment will stimulate exports from the host country to the investing country. If such investment is undertaken in industries which are subject to increasing returns, specialisation will be accelerated and costs of production will fall even further. In addition, this type of investment will be particularly useful in industries producing differentiated products. When such investment occurs within a given industry, it enhances the possibility for intra-industry specialisation. This type of intra-industry investment is similar to the "Japanese-type" of direct investment I have described in previous papers [Kojima (1978)].

Cross investment refers to simultaneous direct investment between two countries. In recent years a large amount of intra-industry cross investment has taken place among industrialised countries. A good example of beneficial intra-industry cross investment can

be constructed by considering the Japanese and U.S. passenger car industries. It is reasonable to assume that Japanese firms have a comparative advantage in the manufacture of smaller cars and that U.S. firms have a comparative advantage in the manufacture of larger cars. Further assuming that production of all passenger cars is subject to scale economies, production costs could be lowered if Japanese firms specialised in smaller cars and U.S. firms specialised in larger cars.

The process of specialisation would be accelerated if Japanese firms invested in the production of large cars in the United States and U.S. firms invested in the production of small cars in Japan. Of course, this investment does not necessarily have to involve setting up additional factories. It could involve equity, technical, or marketing contributions to already existing firms; this cooperation would be of particular help in adapting differentiated products to the preferences of consumers in the investing country. Finally, note that, if the equity participation were sufficiently small, this type of activity would be defined as portfolio, not direct, investment.

Nonetheless, all these forms of investment have one thing in common; they work to stimulate production in relatively low cost locals and thereby expand the basis for international trade. This is the primary cause for the success of trade oriented investment and offshore sourcing. In the case of U.S. investment in Japan's small car production, this allows the U.S. firm to import cars at lower cost (possibly passing the savings on to U.S. consumers) while insuring the Japanese firm access to the U.S. market. Furthermore, in the presence of scale economies, costs will be minimised when low cost locals expand production to the point of market saturation. In this case, firms are thus motivated to remove all forms of protection so as to facilitate the growth of relevant markets. This is a second factor leading to the success of offshore sourcing.[9]

It is also important that, in the case of intra-industry cross investment, the difficulties associated with specialisation's displacement of labour are minimised. In other words, specialisation of this type generally requires the modification of existing factories, not the elimination of a whole group of plants as might happen in the case of inter-industry specialisation. This limits the displacement of labour involved and allows firms to retain expert workers in related lines of employment. Furthermore, in addition to the scale economies realised from expansion of inputs in a given production process, technical progress might also result, thereby leading to a downward shift of the cost curves involved.

The example of small and large cars discussed above is but one possibility among many. Within the automobile industry itself specialisation in buses, trucks, and various parts or any combination thereof is entirely possible. Ample room for such intra-industry speci-

[9] The benefits of this type of intra-industry cross investment are implicit in the theory of agreed specialisation discussed above. Bhagwati's (1972, p. 457) "theory of mutual equity interpenetration" raises a similar argument. He says:

> Thus, the MNC in U.S. (say, GM) that finds it difficult to compete in the small-car field with the MNC in Japan (say Toyota) that finds it difficult to compete with the MNC in U.S. in the large-car field, would each decide that the best strategy if you cannot compete with comfort is to follow that policy: 'if you cannot beat them, buy them.' Thus GM would want to buy equity in Toyota for the small-car production and Totoya in GM for the large-car production; and GM in the U.S. would go off spending resources in producing and improving its own small cars while Toyota in Japan would similarly hold back on its own large-car efforts. One thus gets mutually interpenetrating MNCs within industries, with accompanying division of labour and a novel form of 'cartelization' which goes by sub-products.

alisation also appears to exist in industries such as textiles and garments, steel, office machines, and even hotels. Furthermore, given the existence of modern conglomerates which are involved in several activities, cross investment between industries (i.e., inter-industry cross investment) may also facilitate the desired specialisation. However, since firm decisions are involved there is no guarantee of reciprocity of cross investments; moreover, in the presence of increasing returns and associated market imperfections there is no guarantee that such investments will be welfare increasing. Here again, formal and/or informal agreements which minimise potential problems may be required.

Forms of Offshore Procurement

Below I will summarise some important trends in Japanese-U.S. cross direct investment in recent years. However, before proceeding it is important to put such DFI in proper perspective since there are several forms of procuring overseas assets or products, including different types of direct investment. In the balance of payments, direct investment is defined as a capital movement which results in the acquisition of an ownership share larger than some given threshold; for example, 10 percent is a commonly used threshold. Capital movements resulting in smaller ownership shares are then defined as portfolio investments.

The establishment of wholly-owned overseas subsidiaries has traditionally been considered the best example of direct investment. However, recently "new forms" of foreign investment have attracted significant attention [e.g., Oman (1984)]. The new forms are defined to include the purchases of equity in a foreign firm or the establishment of a joint venture. This type of foreign investment is then recorded in the balance of payments according to the ownership criteria described above. There are also other new forms of procurement which may or may not involve capital transfers and accordingly may or may not be recorded as direct investment in the balance of payments. These include the following:

a) production sharing contracts—contracts for foreign and domestic firms to cooperate in production activities;

b) original equipment manufacturing (OEM) contracts—contracts for foreign and domestic firms to share brand names, trademarks, and so on;

c) technological cooperation contracts—contracts for domestic and foreign firms to jointly undertake R&D and other technology development;

d) marketing cooperation contracts—contracts for domestic and foreign firms to sell the partner's products through their respective distribution networks;

e) long term purchase contracts—contracts for a domestic (foreign) firm to purchase the output of a foreign (domestic) firm.

Analytically it is most appropriate to think of these contracts as forms of direct investment because they involve, to a greater or lesser degree, foreign control of the means of production. However, it is also important to remember that the statistics we use in this paper are usually only measures of capital flows. In this sense the empirical analysis conducted in this paper cannot capture the breadth of direct investment which it would be desirable to study.

American Direct Investment in Japan and Related Trade

According to Japanese statistics, American DFI in Japan has increased rapidly since

1980. The number of new ventures was 112 in 1982, 149 in 1983, 182 in 1984, 185 in 1985, and perhaps more than 200 in 1986. The number of technological cooperation agreements involving cross licensing and R&D almost doubled from 243 in 1984 to 448 in 1985. The U.S. share of total new investment in Japan increased from an average of 3.5 percent in 1976–80 to 16.7 percent in 1981–85. In manufacturing, the U.S. share went from 4.2 percent to 25.7 percent in each period respectively. The expansion of U.S. DFI in Japan is also reflected in the equity shares of U.S. partners in Japanese firms. For example, GM controls 5.0 percent of Suzuki's capital and 38.6 percent of Isuzu's capital, Ford controls 24.4 percent of Mazda's capital, and Chrysler controls 24.0 percent of Mitsubishi's capital.

It is significant that U.S. multinationals are establishing production bases in Japan from which they can export back to the United States or to third countries. These exports consist of final products as well as intermediate goods with OEM contracts playing an important role in exports back to the United States. JETRO estimates OEM contract-related exports from Japan to the United States totalled $5 billion in 1984; this represents 8 percent of Japan's $60 billion exports to the United States. A city bank estimated that OEM-related exports accounted for $2.2 billion of VTR exports, half of Japan's total VTR exports to the United States. As for computer related equipment the corresponding share reached 80 percent with OEM-related exports totalling $2.2 billion. 0.3 million of Japan's VER ceiling of 2.3 million car exports to the United States were also produced under OEMs.

Established U.S. firms have a tendency to export substantial amounts of goods back to the United States and smaller quantities to third countries. In 1984, Japan IBM exported a total of 220 billion yen worth of goods; this represents over 28 percent of its total sales (770 billion yen). Japan TI also exported about 20 percent of its total semi-conductor production (100 billion yen).

In all, JETRO estimates that U.S. firms exported about US$2 billion worth of goods back to the United States in 1984. Combined with US$8 billion of contracted parts exports, the $5 billion in OEM exports, and other procurements, direct involvement of U.S. firms in Japan's economy accounted for US$19 billion or 32 percent of Japan's total exports to the United States. Thus, U.S. involvement in Japan, including its direct investment, apparently consists of a substantial amount of offshore procurement.[10]

[10] According to the U.S. Department of Commerce, non-bank U.S. affiliates in Japan accounted for close to 8.9 percent of total U.S. imports in recent years (1982–85). Note, this only refers to the operations of U.S. affiliates in Japan, not to contracting which involves no direct investment in the balance of payments sense.

Imports from Non-bank U.S. Affiliates in Japan and Total U.S. Imports from Japan

(US$ millions)

Year	Imports from U.S. Affiliates	Total Imports	U.S. Affiliate Share (%)
1977	1,162	18,565	6.3
1982	3,934	37,683	10.4
1983	3,860	42,844	9.0
1984	4,212	60,210	7.0
1985	6,300	65,653	9.6
1982–85	18,306	206,390	8.9

Japanese Direct Investment in the United States

Japanese direct investment in the United States has recently increased tremendously. According to the approval based statistics of Japan's Ministry of Finance, the annual flow increased from US$686 million in 1977 to US$5,395 million in 1985. This represents a 7.9 fold increase and the cumulative total for 1951–85 climbed to US$25.29 billion. Correspondingly, the U.S. share of total Japanese DFI abroad increased from 24.4 percent in 1977 to 44.2 percent in 1985.

Japanese DFI in the United States has traditionally been concentrated in commerce, finance, and services but the share of this DFI in the cumulative total has declined from 77.4 percent in 1972 to 66.5 percent in 1984. In contrast, the share of manufacturing has risen from 13.8 percent in 1972 to 29.8 percent in 1984. Japanese DFI in U.S. manufacturing has been undertaken in a chain of industries progressing from textiles to steel, colour televisions, automobiles, and now VTRs and semi-conductors. A variety of forms such as fully-owned subsidiaries, joint ventures, equity participation, technical cooperation, and marketing cooperation, have been employed by the Japanese firms involved.

A large part of the recent increase in the share of manufacturing results from events in the automobile sector. Honda, Toyota, Nissan, Mazda, Mitsubishi, Isuzu, and Suzuki have all established or plan to establish assembly factories in the United States or Canada. Some of these firms are involved in joint ventures with the Big Three. If these plans are realised, Japanese assembly plants in North America will have a capacity of 2 million units. A problem of over-capacity may emerge if Japan's exports remain at their present level (2.5 million passenger cars and 1.1 million commercial vehicles) and competitors (both U.S. and third country firms) expand their production.

Japanese DFI in the U.S. automobile industry has its roots in the VER the Japanese industry became subject to in the early 1980s. DFI was seen as a way to expand sales beyond the limit set by the VER. The drastic rise of the yen beginning in September 1985 and continuing into 1986[11] then accelerated the flow of investment into the United States as, in addition to being a way of expanding sales to this large market, the possibility of exporting from the United States emerged. These two factors, trade restraints, either actual or potential, and exchange rate adjustments have had substantial impacts in a number of other industries as well.

Investment in the automobile industry has been very significant, however, because it has been stimulated by a number of related investments in intermediate good industries. For example, more than 40 Japanese producers of parts and other intermediate goods used

Sources: US (United States), DOC (Department of Commerce), BEA (Bureau of Economic Analysis), 1981. *U.S. Direct Investment Abroad, 1977,* Washington, D.C.: BEA.

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Survey of Current Business, June 1987.

[11] The exchange rate went from 237 yen/dollar in September 1985 to 154 yen/dollar in August 1986 and further to 141 yen/dollar by May 1987 (period average exchange rate from IMF, *International Financial Statistics*).

in automobile production presently plan to set up production lines in the United States. The motivating factor in this case is the local content requirement U.S. policy imposes on Japanese affiliates. However, in order to realise scale economies, these intermediate input producers must sell, not only to Japanese affiliates, but to the Big Three as well.

Investment in the automobile and related sectors is typical of much Japanese investment in the United States in that it has served primarily as a means of circumventing trade barriers. Until the drastic appreciation changed the cost structure drastically, it was also true that this investment represented a transfer of resources from a lower-cost local (Japan) to a higher-cost local (the United States). As a result such DFI works in an anti-trade oriented or export substituting manner. This has paradoxically been called American-type DFI in previous papers. It is also paradoxical that U.S. DFI in Japan is largely trade creating or trade oriented in that its focus is offshore sourcing; I have called this Japanese-type DFI in previous papers.

However, note that the character of Japanese DFI in the United States may change over time. Already Mitsubishi is planning to produce a sports car in the United States and import 12 thousand units back to Japan in 1988. If this kind of DFI increases, Japanese DFI in the United Stares will become more trade oriented and create additional opportunities for specialisation and increased efficiency in the two countries.

IV. *Cross Direct Investment and Intra-Industry Trade*

In this section a simple attempt at quantifying the relationship between cross direct investment and intra-industry trade is made. Here we expect to find that increases in the degree of cross direct foreign investment are correlated with increases in the degree of intra-industry trade with the strength of the correlation being positively related to the extent to which the cross investments are trade-oriented (i.e., the degree to which DFI promotes offshore sourcing).[12]

The first step in this task is to construct some indices which measure the relative importance of intra-industry trade and cross direct investment in various industries. An index of intra-industry trade, or T-index, for Japan-U.S. trade in commodity i can be defined as follows:

$$T_i=(X_i/M_i)-1 \tag{5}$$

where Xi=Japanese exports to the United States (U.S. imports from Japan) of commodity i and Mi=Japanese imports from the United States (U.S. exports to Japan) of commodity i ($i=1, 2, \ldots, n$). In essence this index measures the deviation from balanced trade in industry i where T_i is defined as zero if trade is balanced. Thus, in this context, the degree of intra-industry trade refers to the extent to which trade within an industry is balanced. Correspondingly, the degree of intra-industry trade is smaller the greater the trade imbalance in an industry i and the larger the absolute value of T_i. The direction of an existing trade imbalance is then indicated by the sign of T_i, a positive sign representing a Japanese surplus

[12] John H. Dunning (1980) postulated a positive correlation between cross investment and intra-industry trade and founded some evidence of such a correlation for nine industries in Japan, Sweden, the United Kingdom, the United States, and West Germany.

and a negative sign a U.S. surplus. Finally, note that we can measure changes in the degree of intra-industry trade by taking the difference of the absolute value for T_i indices in two years. If the difference is positive then the degree of intra-industry trade is greater in the second year.[13]

We then construct a similar index, C_i, measuring the degree of intra-industry direct investment in industry i as given below:

$$C_i=(J_i/A_i)-1 \tag{6}$$

where J_i=Japanese DFI in U.S. industry i and A_i=U.S. DFI in Japanese industry i ($i=1, 2, \ldots, n$). The interpretation of T_i described above also applies to C_i.

Japan-U.S. Cross Direct Investment

Table 1 is constructed using the U.S. Department of Commerce data presented in the *Survey of Current Business:* note that these data refer to the actual book value of the DFI positions involved. Unfortunately, the industry classification in these annually published data is limited and industry definitions are too broad for detailed analysis. Furthermore, due to a policy of not revealing investments made by individual firms, some figures are not disclosed (indicated by D). Nonetheless, these data provide the most comprehensive and accurate coverage of direct investment between Japan and the United States and are therefore used here. The data reveal the following trends.

1) Between 1980 and 1985, Japanese DFI in the United States increased rapidly from US$4.2 billion to US$19.1 billion. U.S. DFI in Japan increased much more slowly from US$6.2 billion to US$9.1 billion. Although U.S. investment in Japan exceeded Japanese investment in the United States in 1980 ($C=-0.32$), Japanese DFI in the United States increased much more rapidly in the next five years and became twice as large as U.S. DFI in Japan by 1985 ($C=1.10$). Thus, the overall degree of cross investment decreased somewhat as indicated by the difference in the last column of Table 1.

2) Correspondingly, the degree of cross investment decreased in 1980–85 for 4 of the 7 industries for which meaningful data are available.[14]

2a) The trade industry accounted for more than half of Japan's investment in United States and a significant portion of U.S. DFI in Japan. In this category Japanese DFI in the United States has always been much larger with C_i growing rapidly from 1.07 in 1980 to 7.20 in 1985. This correlated with a large fall in the C_i for this industry.

[13] A more sophisticated index has been proposed by Grubel and Lloyd (1975) as follows:

$$T_i=((X_i+M_i)-|X_i-M_i|)/(X_i+M_i)$$
$$=1-|X_i-M_i|/(X_i+M_i)$$

where X_i and M_i are defined as in the text. This index varies between 0 and 1 with the degree of intra-industry trade being positively related to the index's value. This property makes this index easier to interpret as a measure of the degree of intra-industry trade but it does not distinguish surplus and deficit countries when they exist. Since analysing the direction and changes in surpluses and deficits is an important part of the following analysis we use the simpler index given in the text since it can facilitate such analysis.

Note a similar index has also been proposed by Aquino (1978).

[14] Necessary data were not disclosed for 'finance, insurance, and real estate' and 'other industries' while there was no substantial investment by either country in 'mining.'

TABLE 1. THE DEGREE OF CROSS INVESTMENT
(J_i and A_i in US$ millions)

	1980		1985		$C_i=(J_i/A_i)-1$		
	J_i	A_i	J_i	A_i	1980	1985	$\lvert C_i\ 1980\rvert - \lvert C_i\ 1985\rvert$
All Industries	4,225	6,234	19,116	9,095	−0.3223	1.1018	−0.7795
Trade	2,307	1,115	11,822	1,442	1.0691	7.1983	−6.1292
Finance, Insurance, & Real Estate	889	D	4,062	696	D	4.8362	D
Other Industries	134	D	575	157	D	2.6624	D
Food and Kindred Products	26	162	149	127	−0.8395	0.1732	0.6663
Other Manufacturing	169	425	1,005	665	−0.6024	0.5113	0.0911
Machinery	176	1,603	624	2,535	−0.8902	−0.7538	0.1364
Primary & Fabricated Metals	240	82	575	50	1.9268	10.5000	−8.5732
Mining	0	0	7	0	—	—	—
Petroleum	58	1,570	31	2,178	−0.9631	−0.9858	−0.0227
Chemicals & Allied Products	227	700	267	1,244	−0.6757	−0.7854	−0.1097

Source: U.S. Dept. of Commerce, *Survey of Current Business*, August 1982 and August 1986.

TABLE 2. THE DEGREE OF INTRA-INDUSTRY MERCHANDISE TRADE
(X_i and M_i in US$ millions)

	1980		1985		$T_i=(X_i/M_i)-1$		
	X_i	M_i	X_i	M_i	1980	1985	$\lvert T_i\ 1980\rvert - \lvert T_i\ 1985\rvert$
Total	31,367	24,408	65,278	25,793	0.2851	1.5308	−1.2457
Other Light Manufactures	1,606	1,665	3,770	1,519	−0.0354	1.4819	−1.4465
Textiles	593	216	1,074	169	1.7454	5.3550	−3.6097
Nonmetalic Mineral Products	464	155	766	179	1.9935	3.2793	−1.2858
General Machinery	3,668	2,013	10,198	2,907	0.8222	2.5081	−1.6859
Electric Machinery	5,135	1,489	14,987	2,326	2.4486	5.4433	−2.9947
Precision Machinery	1,698	405	3,266	586	3.1926	4.5734	−1.3808
Transportation Equipment	12,802	1,091	24,010	1,726	10.7342	12.9108	−2.1766
Steel and Non-ferrous Metal Products	4,167	1,020	4,619	773	3.0853	4.9754	−1.8901
Raw Materials and Fuels	78	8,481	125	6,465	−0.9908	−0.9807	0.0101
Food	145	5,171	401	5,085	−0.9720	−0.9211	0.0509
Chemical Products	767	2,536	1,407	3,396	−0.6976	−0.5857	0.1119

Source: MITI, *White Paper on International Trade*, 1981 and 1986.

Although indices cannot be calculated for 1980, for 1985, C_i in 'finance, insurance, and real estate,' and C_i in 'other industries' (mainly services) were rather high, 4.84 and 2.66, respectively. Furthermore, given the rapid growth of Japanese DFI in these sectors between 1980 and 1985, it is also reasonable to expect that the degree of cross investment decreased in these industries as well.

A decrease in the degree of cross investment was also observed in 'primary and fabricated metals' (mainly steel) where C_i went from 1.93 to 10.50. The move to strong one-way Japanese DFI in this industry coincided with increasing U.S. protection of its steel industry.

Similarly, the degree of cross investment decreased in 'petroleum' and 'chemicals and

allied products.' However, in these cases, U.S. DFI in Japan was relatively large and C_i in these industries fell somewhat between 1980 and 1985.

3) In contrast to the industries mentioned above, the degree of cross investment increased in 'food and kindred products,' 'other manufacturing' (mainly textiles and other light manufactures), and 'machinery.' In 1980, U.S. investment in Japan was relatively large in all these sectors. However, Japanese DFI in these U.S. sectors grew more rapidly during the 1980–85 period and overtook U.S. investment in Japan in the 'food and kindred products' and 'other manufacturing' categories. In these two industries, C_i indices were close to 0, 0.17 in 'food and kindred products' and 0.51 in 'other manufacturing,' indicating a high degree of cross investment. In 'machinery,' on the other hand, the degree of cross investment was still somewhat weaker in 1985 ($C_i = -0.75$).

Intra-industry Trade and Its Relationship to Cross Investment

Table 2 provides data on Japanese-U.S. merchandise trade taken from MITI's *White Paper on International Trade.* Japanese exports to the United States increased tremendously during the 1980–85 period, from US$31.4 billion to US$65.3 billion, while imports from the United States stagnated at US$24.4 and US$25.8 billion. As a result the overall T increased from 0.29 to 1.53, indicating a decreased degree of intra-industry trade. Note that this decrease coincides with a decrease in the degree of cross investment.

On the other hand, in seven manufacturing industries, 'other light manufactures,' 'textiles,' 'non-metallic mineral products,' 'general machinery,' 'electric machinery,' 'precision machinery,' and 'transportation equipment,' T_i increased as Japanese surpluses grew and the degree of intra-industry trade decreased between 1980 and 1985 in these industries. This decrease in the degree of intra-industry trade contrasted with the increasing degree of cross investment in corresponding industries, 'food and kindred products,' 'other manufacturing,' and 'machinery.' In other words, contrary to the expected pattern, changes in the absolute values of C_i and T_i are inversely related in these cases.

What is the cause of this inverse relationship between changes in trade and investment surpluses? Here it is hypothesised that the relationship results, at least partially, because the growth of Japanese investment in these sectors was not motivated by the desire for offshore sourcing whereas this motive was more important for U.S. investment. As a result, Japanese exports to the United States (by Japanese firms and U.S. affiliates) grew faster than total trade in these industries and the degree of intra-industry trade fell. In addition, the rapid growth of Japanese DFI in the United States also led to a marked increase in the U.S. demand for Japanese intermediate and capital goods, this demand originating in Japanese affiliates in the United States and U.S. firms serving them.

In contrast to the manufacturing industries listed above, the United States had trade surpluses in 'raw materials and fuels,' and 'chemical products'; furthermore, in these industries, the degree of intra-industry trade increased slightly. However, changes in the absolute values of C_i and T_i were also inversely related in these cases as the degree of cross investment in the corresponding 'petroleum' and 'chemicals and allied products' categories declined. Here it seems likely that U.S. firms are the ones which are not motivated by the desire to undertake offshore sourcing. Indeed, in view of relatively high refining and storage costs, it appears that the only plausible motive for U.S. petroleum firms to operate in Japan

results from the economic rents these firms can earn by producing and selling to the highly protected domestic market.

Steel was the only case in which changes in the absolute values of T_i and C_i were positively correlated as postulated. Here both the degree of intra-industry trade in 'steel and non-ferrous metal products' and the degree of cross investment in 'primary and fabricated metals' declined. On the trade side, Japanese exports of these commodities stagnated during this period, largely as a result of trade barriers such as the trigger price mechanism and VERs; nonetheless, a slow rate of growth was realised and U.S. exports to Japan actually fell leading to an increase in the already positive T_i. Meanwhile, again due to the problems created by trade barriers, Japanese DFI in this industry increased rapidly and U.S. firms actually divested from Japan leading to a fall in the U.S. DFI stock and amplifying the large increase in C_i. However, the observation of a positive correlation in this case is not thought to be a result of offshore sourcing by Japanese steel firms in the United States. Rather, such DFI is thought to be tariff-induced and trade-substituting and the correlation is probably spurrious and of little significance.

Thus, in no case do we find a meaningful positive correlation between the degree of intra-industry trade and the degree of cross investment. The steel example in particular illustrates the difficulty in empirically identifying and interpreting the relationship between intra-industry trade and cross investment. Numerous other elements are also involved in this relationship and a narrow focus on cross investment and intra-industry trade alone may therefore ignore important interactions which result in the observed relationship. However, it is possible in several cases to attribute an inverse relationship to the lack of trade oriented, offshore-sourcing type DFI. Further investigation of the relationship involved is thus called for.

V. *Conclusion*

This paper has attempted to 1) describe the potential benefits of specialisation in the presence of scale economies and the need for an agreement to facilitate such specialisation, 2) illustrate the role DFI might play in a specialisation scheme, and 3) empirically analyse the relationship between cross direct investment and intra-industry trade between Japan and the United States.

Since Ricardian and H-O trade theories cannot be used to analyse the international trade among countries with identical factor endowments and technologies, a new approach to the international division of labour which advocates agreed specialisation was formulated. This agreed specialisation was based on the premise of reaping the benefits of increasing returns to scale which exist in many manufacturing activities. It was also argued that direct investment can play an important role in an implicit or explicit agreement of this nature.

It was then suggested that intra-industry trade is accelerated by direct investment of the offshore sourcing type whereas trade-barrier induced investment works to discourage such trade and the empirical evidence offered some support for this notion. Finally, it was argued U.S. investment in Japan seems largely of the former type (akin to Japanese-type DFI discussed in previous papers) and Japanese investment in the United States was of

the latter type (like the American-type DFI identified previously). In this respect, Japanese firms should work to expand the offshore sourcing type of DFI, not only in the United States but also in Asia.

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