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ESSAYS ON INTERNATIONAL JOINT VENTURES AND FOREIGN WHOLLY-OWNED SUBSIDIARIES

By

Wing-Fai Leung

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ABSTRACT

ESSAYS ON INTERNATIONAL JOINT VENTURES AND FOREIGN WHOLLY-OWNED SUBSIDIARIES

By

Wing-Fai Leung

Foreign direct investment (FDI) have grown very fast in the past several decades. Apart from establishing wholly-owned subsidiaries, multinational enterprises frequently join with local firms to form joint ventures. This dissertation emphasize three issues related to wholly-owned subsidiaries and international joint ventures: coexistence of both types of affiliates in a country, a comparison of host-country welfare under alternative forms of FDI, and a comparison of the duration times of different kinds of affiliates in a host country.

Chapter 3 uses a model of monopolistic competition to explain why there are both foreign wholly-owned enterprises and international joint ventures coexisting in a single industry. The theory is based on the existence of both firm-specific knowledge and local knowledge to explain the entry of a firm into a foreign country. In addition, differences in production costs of different plants within a firm may be the reason of the coexistence of both types of affiliates in a country.

Chapter 4 compares welfare between closed economies, free FDI and restricted FDI under the assumption of intra-industry and interindustry spillovers. Preferences, the rate of technology transfer, and technology gaps between the countries are factors affecting the welfare level. Although it is found that under the minimum local ownership policy the

welfare effects are ambiguous, this policy is at least no worse than a closed economy.

Though joint-venturing allows the parents to contribute their own advantages, the parents learn from the partners, implying that the benefits of a joint venture to a firm are lower over time. On the other hand, the cooperation costs may not be easily eliminated. It is hypothesized that on average, a foreign wholly-owned subsidiary should have a higher stability rate than an international joint venture. In chapter 5, samples of U.S. FDI and FDI in the United States are applied. On the whole, U.S. investment abroad supports the hypothesis while the evidence of FDI in the United States is not strong.

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Chapter 1

Introduction

1.1 What is Foreign Direct Investment?

Interest regarding foreign direct investment (FDI) has been renewed in recent years for several reasons[1]. The first reason is the rapid growth in global FDI flows. For example, the flows were increased from $47 billion in 1980 to $139 billion in 1985. Another reason is the large amount of FDI inflows into the United States during the 1980s. Moreover, developing countries realize that FDI is an important source for their economic development.

FDI implies that a person or an organization has some interests in a foreign country or has influence in the management of an enterprise in a foreign country. That is, FDI applies to the activities of foreign-oriented capital or resources which are at least partly controlled by foreigners. On the other hand, foreign indirect investment is related to the foreign oriented capital inflow with no participation in running a business locally. Portfolio investments are typical examples of this kind of indirect investment.

A multinational enterprise (MNE) refers to a corporation operating in more than one country. FDI is closely related to the concept of MNEs although the two may not be the

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[1]The reasons were suggested by Lizondo (1993).

same thing. For example, licensing is a kind of FDI but the foreign licensor need not be a MNE. From the viewpoint of the host country, FDI usually implies that a foreign corporation participates in the local economy more actively and the local market structure may be affected by the foreign firm; therefore, MNEs have become the main interest in the recent literature about FDI.

One important point is that FDI is not necessarily related to capital inflows[2]. Since the financial market in the world is well connected, a subsidiary of a MNE may raise funds locally and the headquarters may only provide management control and technological advice.

To illustrate the effects of FDI, the first task is to define FDI. Several interpretations have been mentioned above, but a primary problem is that a corporation will combine stockholders of different nations. Conceptually, we can use the share of voting power as a standard to determine whether the firm is foreign or local. As a practical matter, however, it is very difficult to form a clear-cut definition. For example, the U.S. Department of Commerce defines a foreign investment as direct investment when a single foreign investor owns at least 10% of the shares in a U.S. firm[3]. A defect in this

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[2]Here capital refers to the physical inputs to production. If "capital" includes the intangible assets, of course FDI is still related to "capital" flows.

[3]This example is referred to in Graham and Krugman (1991, pp.9). The definition of U.S. FDI can be drawn from the U.S. Department of Commerce (1992, pp.M-4). It is said that "U.S. direct investment abroad is the ownership or control, directly or indirectly, by one U.S. person of 10 percent or more of the voting securities of an incorporated foreign business enterprise or an equivalent interest in an unincorporated foreign business enterprise... 'Person' is broadly defined to include any individual, branch, partnership, associated group, association, estate, trust, corporation or other organization (whether or not organized under the laws of any State), and any government (including a foreign government, the U.S. Government, a State or local government, and any agency, corporation or financial institution, or other entity or instrumentality thereof, including a government-sponsored agency)."

definition is that, for example, if a firm contains 12 foreign single investors, each having 5% of the shares, then according to the U.S. Department of Commerce, the firm is not directly invested from foreign countries. It is ridiculous that a firm dominated by foreign investments is not counted as a foreign investment. (Of course, who holds the administrative rights is still an issue.)

In this thesis, only the concepts related to FDI theory are analyzed. The practical difficulties of the official definition are ignored. For the sake of convenience, FDI is defined as any local business activity with at least some decisions made by foreign parties. Sometimes, the MNE is distinguished from other alternatives such as licensing, franchising, subcontracting and joint ventures. However, here we will focus on two types of MNEs: joint ventures with other firms in a foreign country and wholly-owned subsidiaries.[4]

1.2 A Few Facts about FDI

The Recent Trend of FDI Outflows in the World

In the 1980s, the growth of FDI in the world was very weak in the first half of the decade while it grew very quickly in the second half. Table 1.1 summarizes the inflows

[4]Omen's (1984) definition of FDI is broader - including "new forms" of international investments. The so-called "new forms of investment" refer to:

(a) Joint international business ventures in which foreign-held equity does not exceed 50%;

(b) various international contractual arrangements which involve at least some investment from the foreign firm, but without equitable participation.

International investments comprise wholly-owned subsidiaries, joint ventures, licensing agreements, franchising, management contracts, turnkey contracts, production-sharing contracts and international subcontracting.

and outflows of FDI within this period.[5]

Figure 1.1 compares the trends of global FDI outflows and gross domestic product for the last two decades. From the figure, we can see that at least from 1970 to 1985, the outflows of FDI had been closely related to the cyclical fluctuations of national incomes. After 1985, FDI grew at a much higher rate than national income. Not only does the growth rate of FDI exceed gross domestic product growth in the second half of the 1980s, but FDI also grows at a faster rate than exports as shown in Figure 1.2.

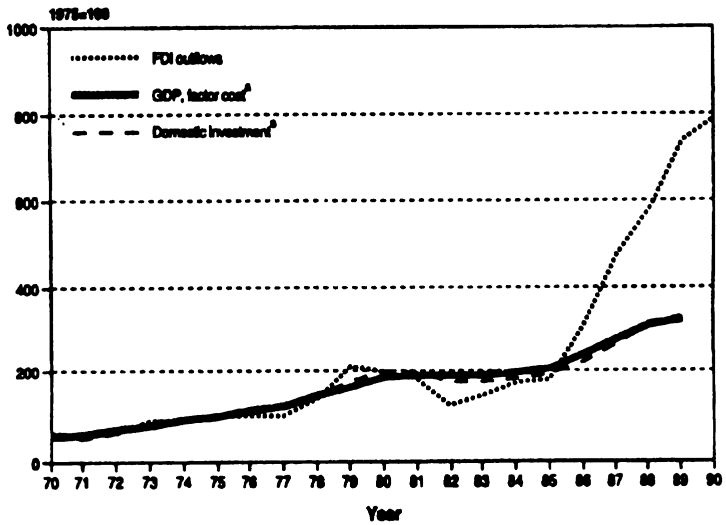
The unparalleled growth of FDI compared to global gross domestic product after 1985 may be explained in several ways.[1] First, there was a strong recovery of the world economy between 1985 and 1989. After 1985, the average annual rate of real gross domestic product grew at 3.5% in developed countries and 3.4% in developing countries, compared to 2.2% and 1.7% respectively between 1980 and 1984. The improved economic performance of some developing countries, especially those which experienced debt-servicing problems, relieved the inhibition of further investments. Increased profit distribution provided the investors the opportunity to reinvest.

[5]From the global point of view, inflows and outflows of FDI should, in principle, be balanced. But actually, there is some discrepancy between inflows and outflows. One reason is that the definition of FDI is not the same in different countries. However, in 1990 the discrepancy reached US$41 billion, an amount which is too significant for such a simple explanation. Several reasons have been cited by a recent report (United Nations 1992) to explain the discrepancy: "differences in the threshold definition between inward and outward investment; differences in the treatment of unremitted branch profits between inward and outward investment; treatment of unrealized and realized capital gains and losses, the recording of transactions of 'offshore' enterprises; differences in the method of collection and reporting of [FDI] between countries; and differences in the treatment of real estate and construction investment."

Table 1.1: Inflows and Outflows of FDI, 1980-1990

Years	Developed Countries		Developing Countries		All Countries	
Billion US$ or %	Inflows	Outflows	Inflows	Outflows	Inflows	Outflows
1986	64	86	14	2	78	88
1987	108	135	25	2	133	137
1988	129	161	30	6	158	167
1989	165	201	30	10	195	211
1990	152	217	32	8	184	225
1980-85 Growth Rate (%)	-3	-2	4	1	-1	-2
1986-90 Growth Rate (%)	24	26	22	47	24	26

Source: Table I.1, Transnational Corporations and Management Division, United Nations Department of Economic and Social Development, *World Investment Report 1991: Transnational Corporations as Engines of Growth*, United Nations, 1992, pp.14.

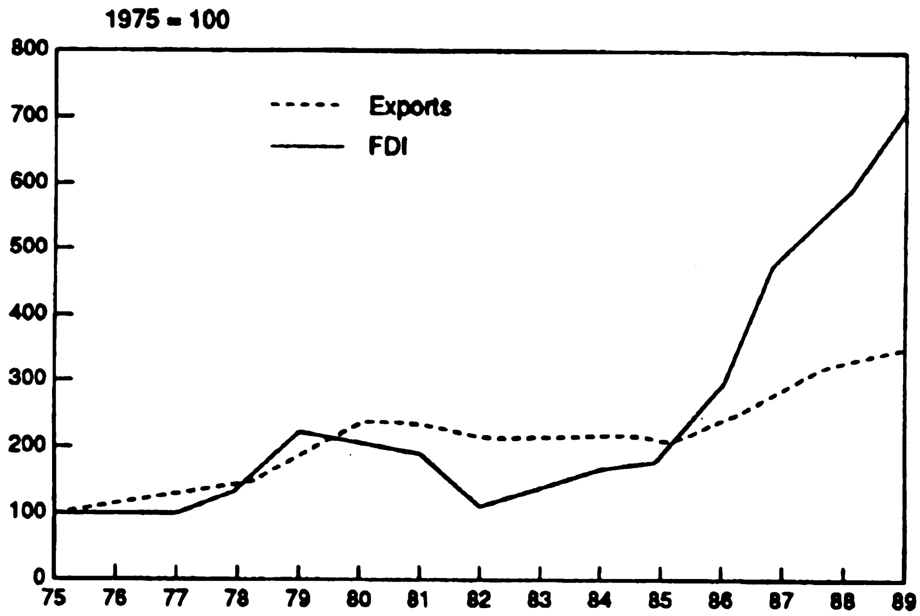


Source: International Monetary Fund, balance-of-payments tape, retrieved in December 1991; World Bank, world tables database.

a Data for 1989 are preliminary.

Figure 1.1: FDI, Gross Domestic Product and Domestic Investment, 1970-1990

Reprinted from Figure I.1, United Nations Centre on Transnational Corporations and Management Division, United Nations Department of Economic and Social Development, *World Investment Report 1992: Transnational Corporations as Engines of Growth*, United Nations, 1992, pp.17.



Sources: UNCTC estimates, based on UNCTC, *World Investment Directory* (New York, UNCTC 1991), International Monetary Fund balance-of-payments tape, retrieved on 10 January 1991; and United Nations, *Monthly Bulletin of Statistics*, October 1984 (ST/ESA/STAT/SER.Q/142) and October 1990 (ST/ESA/STAT/SER.Q/214).

Figure 1.2: Index of Current Value of Exports and FDI Outflows, 1975-1989

Reprinted from Figure I, United Nations Centre on Transnational Corporations, *World Investment Report 1991: The Triad in Foreign Direct Investment*, United Nations, 1991, pp.5.

Another factor of the unparalleled growth is that corporations in developed countries are able to invest abroad, eroding the traditional leading positions of the United States and the United Kingdom. The most significant case is Japan: from 1985 to 1989, Japanese companies increased investments abroad at an annual rate of 62%. Apart from good economic performances, the high Japanese incentive to invest abroad is partly due to the appreciation of yen against other currencies.

On the other hand, the newly industrializing countries, particularly Singapore, Hong Kong, Taiwan and South Korea, also seek to invest outwardly. This is partly due to the appreciating currencies, current account surpluses, rising production costs at home, and the threat of protectionism in the export markets.

Owing to technological and competitive forces, acquisitions and mergers across borders also contribute to the rise of FDI. The plan to integrate the European Community in 1992[6] attracted not only outside FDI but also investment between the European Community members. Finally, the rise of the importance of service goods in recent years, most of which are difficult to trade, also helped to promote FDI.

With the recession which came in 1991 (and by mid-1993 has not yet ended completely), FDI is expected to grow at a much slower rate though the actual figures have yet to be revealed.

[6]So far, the 1992 plan for the integration of the European Community has not succeeded. Economically, the global recession (except for developing countries in East Asia) was a main reason for the difficulty in carrying out the plan. Politically, worries about German domination in Europe was the other reason.

Table 1.2: Transactions of FDI in The United States

Years	Total Transactions[a]	Joint Ventures as a Share of Total Foreign Subsidiaries
1981[c]	806	8.56%
1982[c]	753	10.36%
1985[d]	801	6.12%
1986[d]	832	6.97%
1987[d]	1091	9.07%
1988[d]	880	10.34%

Sources: U.S. Department of Commerce, International Trade Administration, *Foreign Direct Investment in the United States*, 1986-1988 Transactions, U.S. Government, 1986-89.

Note: a: The number of total transactions excludes equity increase, plant expansion and real estate;
b: Others include the transaction of acquisitions and mergers, new plants and other terms;
c: For 1981 and 1982 data, both completed and pending transactions are included;
d: For 1985-88 data, only completed transactions are included.

Table 1.3: Transactions of FDI in China, 1985-89

Years	Total Transactions	Joint Ventures[a] as a Share of Total Foreign Subsidiaries
1985[b]	3073	98.50%
1986[c]	1498	98.80%
1987[c]	2233	97.94%
1988[d]	5945	93.10%
1989[d]	5779	83.89%

Sources: The People's Republic of China Government, *Almanac of China's Economy*, 1987, 1988, 1990, Economic Management Press, 1987, 88, 90 (Chinese Version).

Notes: a: Joint ventures here comprise the joint-venturing businesses, cooperating businesses and cooperating explorations;
b: Referred to pp.653, *Almanac of China's Economy, 1987*;
c: Referred to pp.731, *Almanac of China's Economy, 1988*;
d: Referred to pp.603, *Almanac of China's Economy, 1990*;

Joint Ventures in the United States and China in Recent Years

The United States is a developed country while China is a developing country. We compare joint ventures as a share of total foreign subsidiaries in the United States and China to see the different preferences of foreign firms in these two countries. Table 1.2 lists the data of international joint ventures in the United States while Table 1.3 summarizes the international joint ventures in China.

It is worthwhile to note that joint ventures are relatively insignificant in the United States. In great contrast, joint ventures are the dominant form of FDI in China. It is also interesting to note that the ratio of joint ventures in the United States increased slightly between 1985 and 1988 while the share of joint ventures in China dropped in the same period (though 1989 is included in the case of China). A possible explanation to this difference will be given in the next section.

The Japanese firms in the United States Operating Both Wholly-Owned Subsidiaries and Joint Ventures

The MNEs may not only choose either wholly-owned subsidiaries or joint ventures in a foreign country. It is very common that a MNE operates both wholly-owned subsidiaries and joint ventures joined together with the local firms. Instead of fully covering the multinational firms which comprise both types of the affiliates, Table 1.4 lists the Japanese firms in the United States with both types of affiliates. The data of this table were collected from *Who Owns Whom (1993)* which include 567 Japanese firms having affiliates in the United States. However, only 42 of which are identifed to operate both wholly-owned subsidiaries and joint ventures (with U.S. firms).[7] Though more Japanese firms have joint interests with other firms in the United States, we screen out those without U.S. partners. There are many cases that the Japanese firms joined with other Japanese firms or MNEs based in other countries. Since this thesis concentrates on the cases of the international joint ventures between foreign firms and local firms, the other joint ventures are excluded for simplification.

The subsidiaries usually have their own subsidiaries. The subsidiaries of a parent firm are belonged to "the first level". The subsidiaries of the first level subsidiaries are belonged to "the second level" and so on. In Table 1.4, The second to fifth columns list the number of wholly-owned subsidiaries for the first to fourth levels respectively. That is, WS1 refers to the first level subsidiaries and WS2 refers to the second level and so on. Similarly JV1 refers to the international joint ventures at the first level while JV2 refers to the second level. It should be noted that a second level joint venture may be the affiliate of a first level wholly-owned subsidiary. However, for the samples in the table, no wholly-owned subsidiaries are the affiliates of any joint ventures. There are many cases that joint ventures may be joined by firms from all Japanese firms or between Japanese firms and MNEs of other countries. Those cases are put in the last column - JVU. If the joint ventures cannot be identified as who's affiliates, they are also put in JVU.

[7]A Japanese firm may be the major-parnter, equal partner or minor-partner.

Table 1.4: Japanese MNEs Operating Both Wholly-Owned Subsidiaries and Joint Ventures in the United States

Japanese MNEs in the United States	Wholly-Owned Subsidiaries				Joint Ventures		Others
	WS1	WS2	WS3	WS4	JV1	JV2	JVU
Ajinomoto Co., Inc.	1	0	0	0	1	0	1
Asahi Glass Co., Ltd.	3	1	0	0	4	0	3
Bridgeston Corp.	3	7	0	0	0	1	1
The DAI-Tokyo Fire & Marine Insurance Co. Ltd.	2	0	0	0	1	0	0
Fanuc Ltd.	4	0	0	0	1	0	1
Fuji Photo Film Co. Ltd.	9	3	0	0	0	1	0
Fujikura Ltd.	3	0	0	0	1	0	1
Fujitsu Ltd.	17	3	2	4	1	0	0
Inoue Rubber Co. Ltd.	3	0	0	0	0	1	2
Ishikawajima-Harima Heavy Industries	2	0	0	0	1	0	1
Isuzu Motors Ltd.	4	0	0	0	1	0	0
Itochu Corp.	36	0	0	0	2	0	4
Kansai Paint Co, Ltd.	1	0	0	0	1	0	0
Kawasaki Steel Corp.	13	1	0	0	1	0	2
Kubota Corp.	3	0	0	0	1	0	3
Kyotaru Co., Ltd.	3	0	0	0	1	0	0
Matsushita Electric Industrial Co. Ltd.	20	59	4	0	1	0	2
Mazda Motor Corp.	3	1	0	0	1	0	1
Mitsubishi Corp.	12	0	0	0	1	0	12
Mitsubishi Heavy Industries	4	0	0	0	1	0	3
Mitsubishi Kasei Corp.	1	6	2	0	1	0	0
Mitsubishi Petrochemical Co. Ltd.	3	0	0	0	1	0	2
Mitsubishi Rayon Co. Ltd.	6	0	0	0	1	0	0

Japanese MNEs in the United States	Wholly-Owned Subsidiaries				Joint Ventures		Others
	WS1	WS2	WS3	WS4	JV1	JV2	JVU
Mitsui & Co. Ltd.	45	4	0	0	1	0	8
Mitsui Mining & Shelting Co. Ltd.	1	0	0	0	1	0	0
Nippon Lfe Insurance Co.	4	0	0	0	1	0	0
Nippon Sheet Glass Co. Ltd.	1	0	0	0	1	0	1
Nippon Steel Corp.	1	0	0	0	1	0	2
Olympus Optical Co. Ltd.	5	0	0	0	1	0	0
Settsu Corp.	4	0	0	0	1	0	1
Sumitomo Bank Ltd.	3	0	0	0	1	0	2
Sumitomo Chemical Co. Ltd.	1	0	0	0	3	0	0
Sumitomo Electric Industries Ltd.	1	0	0	0	1	0	4
Takeda Chemical Industries Ltd.	2	0	0	0	1	0	1
Tanabe Seiyaku Co. Ltd.	3	0	0	0	1	0	0
The Tokio Marine & Fire Insurance Co. Ltd.	8	2	0	0	1	0	1
Tokyo Electron Ltd.	1	0	0	0	1	0	0
Toray Industries Inc.	2	0	0	0	1	0	1
Toshiba Corp.	10	5	0	0	2	0	1
Tosoh Corp.	7	0	0	0	1	0	0
Toyota Motor Corp.	7	2	0	0	1	0	1
The Yokohama Rubber Co. Ltd.	2	0	0	0	1	0	0

We only look into one sample for a brief story. Toyota Motor Corporation (Toyota) formed a joint venture located in the United States with General Motor in 1983. The joint venture was named New United Motor Manufacturing, Ltd. and the production was carried in Fremont, California. Both parent companies own equal shares and have equal numbers of representatives within the board of directors although the president of the joint venture is selected by Toyota. The first automobile produced in the joint venture, Chevrolet Nova, was completed in November, 1984.

In 1986, Toyota established its wholly-owned plant in the United States - Toyota Motor Manufacturing U.S.A., Inc. The new plant is owned 20% by Toyota and 80% by Toyota Motor Sales, U.S.A., Inc. which itself is 100% owned by Toyota. The production was carried out in Georgetown, Kentucky and in May 1988, the first automobile, Camry, was completed. Since then, Toyota has operated both wholly-owned subsidiary and international joint venture in the United States.[8]

1.3 Purpose and Organization of This Thesis

This thesis compares foreign wholly-owned subsidiaries with international joint ventures in a host country. This comparison is related to the decision of a firm to enter a foreign market. Generally speaking, a firm compares the costs of exporting, licensing, joint-venturing, and operating wholly-owned subsidiaries to determine which is the most

[8]The details of the development of Toyota can be seen from Toyota Jid osha Kabushiki Kaisha (1988).

appropriate form of entry to a foreign country. Apart from the explicit costs, implicit costs are also very important in decision-making. The implicit costs include transaction costs from external markets and internal organization, and getting local knowledge of a specific location.

A firm can transfer management and research expertise, for example, to its subsidiaries at a very low cost. Thus, a firm may find it profitable to extend production to other locations. Such transfer of management and technology implies firm-specific advantage[9]. However, each location has different environments such as differences in laws, cultures, facilities, etc. An outside firm needs time and incurs expenses to learn the new environment. These are related to local knowledge which affects the efficiency of production.[10]

From the previous section, it is evident that the growth of global inflows and outflows of FDI exploded in the second half of the 1980s. However, the share of FDI inflows and outflows is mainly concentrated among the developed countries. This thesis does not explain this observation though some concepts central to this thesis such as firm-specific advantage and local knowledge may help to understand it. A MNE based in a developed country will find the investment environments in other developed countries more similar

[9]Firm-specific advantage refers to the efficiency raised by expanding the size of the firm and the advantages cannot be transferred easily to the outsiders. More will be elaborated in section 2.1.

[10]Local knowledge mainly refers to the specific advantages obtained by a plant at a certain location. More explanations of local knowledge will be given in Section 3.1.

to the source country, so the firm must spend fewer resources collecting information about the developed countries.

We noticed that international joint ventures are not important in the United States while joint-venturing is a dominant form of FDI in China. In addition to the encouragement of Chinese Government, local knowledge is also helpful in understanding this fact. Since China opened its market to the outside world only at the end of the 1970s, other countries have very limited information about China's market. For this reason, foreign corporations prefer to join local firms to avoid the high costs of adapting the operation in China. On the other hand, the United States has had an open market for many years, at least since World War II. Investing foreign firms know more about the local market in the United States.

As the emphasis is placed on comparing international joint ventures and wholly-owned subsidiaries, the theories explaining FDI are the stepping stones to illustrate this issue. Chapter 2 briefly reviews the new theory of FDI after the 1960s. Since the late 1980s, there has been much attention focused on entry modes. Literature on entry modes will be mentioned in the same chapter. Some models on linking international trade theory and FDI theory are also summarized in Chapter 2.

International trade theory incorporates the theory of FDI starting in the mid-1980s. However, the theory does not distinguish wholly-owned subsidiaries from joint ventures. In Chapter 3, a model is set up in an attempt to fill this gap.

Attention of Chapter 3 is paid to answering why a firm may choose to operate both wholly-owned subsidiaries and joint ventures in a foreign country. We have seen some examples in the last section that it is not a rare case. In addition to the transaction costs and local knowledge, the difference in operating costs of different subsidiaries is the reason that a corporation establishes both foreign wholly-owned subsidiaries and international joint ventures in a foreign country. Some extensions of the model are also discussed in that chapter.

Developing countries in recent years have encouraged FDI to promote their economic development. However, the governments also fear that large MNEs will dominate the local economies. Thus local participation in the foreign investment projects is preferred, which may or may not be beneficial to the developing countries. Chapter 4 compares host-country-welfare under foreign investment (in the form of a foreign wholly-owned subsidiary or a joint venture) with that under autarky economy. Assuming both interindustry and intra-industry technology transfers, a developing country may be better off in most cases by requiring minimum local ownership. However, the mandatory requirements may reduce the incentives of some foreign investors if joint-venturing is too costly. The likelihood of some factors that increase the welfare is also analyzed in that chapter.

Once an international joint venture or a wholly-owned subsidiary is set up, it is interesting to compare the performances of the two kinds of affiliates. The difference is important to the decision makers (at the governmental level and the firm level). This paper will not cover the full comparison of performance. Instead, the relative stability of international joint ventures and foreign wholly-owned subsidiaries is compared in Chapter 5. It is predicted that, on average, an international joint venture has a shorter duration time than a foreign wholly-owned subsidiary. Data of U.S. direct investment aboard and FDI in the United States are applied to test the instability of joint ventures. On the whole, the results of U.S. FDI in other countries are consistent with the prediction but the evidence of FDI in the United States is not strong.

Chapter 2

Theories Of Foreign Direct Investment: Review Of The Literature

2.1 "New Theory" Of FDI

It is usually agreed that the new theory of FDI was first discussed by Stephen Hymer in his doctoral dissertation[1]. From then, the main concern of FDI has been related to transaction costs. The basic reason for a firm producing goods in foreign countries is because the firm can operate at a lower cost by controlling more subsidiaries in different countries.

Hymer stresses the firm-specific advantage or the ownership advantage of U.S. corporations in explaining the difference between FDI and portfolio investments. The firm-specific knowledge mainly refers to the ownership of intangible assets by a corporation.[2] When setting up subsidiaries in foreign countries, U.S. firms use their

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[1]Hymer's dissertation was completed in 1960. But this important paper had not been published until 1976 (Hymer, 1976).

[2]An intangible asset may be technology or knowledge of how to produce more products or better products at given input prices, or how to produce the same product at a lower price than other firms. Examples are patented processes or designs, the know-how among the employees, marketing techniques, or innovations.

Externalities arise from the intangible assets. The intangible assets have characteristics of public-good nature, opportunism and uncertainty so that the supply of those assets may be less than optimal from the social point of view. The concept of opportunism is referred to in Williamson (1971) and it will not be explained here.

advantages in technology, management, marketing techniques, capital-abundance and other areas to overcome the disadvantages inherent in the unfamiliar environment abroad.

Another question considered by Hymer is why some U.S. managers do not transfer their technology by licensing. The answer is that the market for knowledge is not perfectly competitive, and often a firm prefers direct control over a foreign subsidiary.

Many theorists have tried in recent years to provide the most general theory for FDI. The most significant theory is John Dunning's "eclectic theory".[3]

Internalization within an industry of a certain size determines the number of firms and, in turn, affects the market structure. Internalization means that the firm absorbs the transaction costs in markets internally, i.e. the firm includes different departments which "trade" among themselves. The intermediate products, if not provided within the firm, can be exchanged from the outside market. To include all the "marketing" internally, some costs such as bargaining difficulties and suspicion arising from asymmetric information will be avoided. The word "internalization" implies that the transaction costs are transferred within a firm.

Dunning's "eclectic model" includes not only internalization but also ownership-specific advantage and location-specific advantage for viewing the decisions of a MNE. Ownership-specific advantage means that the costs are lowered by the direct control of

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[3]Dunning (1977, 1980, 1988). There may also be other "general theories": Rugman's (1980, 1981, 1985) generalized internalization theory and Teece's (1981, 1985) multinational version of Williamson's "markets and hierarchies" theory. In this thesis we are not going to introduce either theory. Rugman claimed that FDI was explained only by internalization but such theory has been criticized by many people. For example, Parry (1985) argues that it cannot explain all the characteristics of FDI. Some counter examples listed by Parry include reasons relating to trade barriers, the popularity of joint ventures and the independence of the subsidiaries from the headquarters in administration. On the other hand, Teece argues that the seeking for efficiency and organizational decisions of a firm are neglected by internalization theory. But Teece's point is not sound since internalization implicitly implies that efficiency is necessary.

the MNE over subsidiaries while location-specific advantage refers to the higher profits of production in a foreign country if that country has advantage in producing certain products. (The ownership-specific advantage is similar to the firm-specific advantage.) A firm may only export goods if there are only internalization-specific and ownership-specific advantages. A MNE arises only if there is incentive to operate in a foreign country due to the location-specific advantage.

For elaboration, Dunning uses the location-specific advantage to explain why U.S. firms operate in Europe. Serving a foreign market by producing at the same location makes it possible to avoid transport costs and tariffs. Sometimes, cheaper labor is also available abroad.

But the firm investing abroad will face different environments compared to those of the home country, making it costly for a foreign subsidiary to adapt production to the local environment. Ownership advantage helps to explain why the U.S. firms can compete with their European rivals in spite of the difficulties of local unfamiliarity. The U.S. firms are able to survive thanks to the technological gap between the United States and other countries, i.e. superior technology and efficient management.

A question arises as to why a U.S. firm does not choose to license its ownership advantage to a local European firm. The answer is the existence of internalization advantage. As long as the costs saved by operating in a foreign country (from avoiding monitoring, negotiation, etc.) is greater than the disadvantage of unfamiliarity, a MNE will choose to establish subsidiaries.

2.2 Choices Of Entry Modes

When a firm considers how to participate in a foreign market, broadly speaking, it has four choices (entry modes): exporting, licensing, joint-venturing and setting up a wholly-owned subsidiary. An older theory is developed around the fact that a firm chooses the entry mode based on the trade-off between risks and returns. Under the assumption of profit maximization, the firm makes the choice that offers the highest expected rate of return at the same level of risk.

In addition to the risk-return analysis, more recently, it is also suggested that the firm may consider resource availability and control in the foreign country[4]. Resource availability is related to the extent of a firm's financial and managerial support to the targeted foreign market. Control refers to the impact of a firm's influence on foreign markets and operation of the foreign affiliate[5]. A firm can get greater control by entering a market with a larger share of ownership. On the other hand, having a larger share of the ownership always infers higher risk and requires more resources. Therefore, a firm has to balance resource availability and control.

Comparing the four entry modes[6], we can see that exporting has the lowest risk and requires the fewest resources. Though the firm has operating control in exporting, it lacks marketing control in the foreign market. Licensing is a low investment, low risk and low

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[4]Examples of such points of views are Cespedes (1988) and Stopford and Wells (1972).

[5]This definition follows Anderson and Gatignon (1986).

[6]The comparison mainly follows the discussion of Anderson and Gatignon (1986) and Hill et al. (1990) which include the four choices. On the other hand, Hill and Kim (1988) and Rugman (1981) do not include joint ventures in their analyses.

return alternative. But the firm has only limited control on the local licensee. On the other side, establishing a wholly-owned enterprise is the highest-control option. The trade-off is a high capital requirement and high risk. Joint-venturing is somewhere between licensing and setting up a wholly-owned subsidiary in terms of control, resource requirement and risk level.

2.3 Theories Related To Joint Ventures

Since this thesis concentrates on foreign wholly-owned subsidiaries and international joint ventures, exporting and licensing will not be discussed. Moreover, as FDI theories can be directly applied to wholly-owned subsidiaries, we are going to talk more about joint ventures in this section.

A joint venture is a firm jointly created and run by two or more parent firms. A joint venture comprises not only joint ownership from different firms but also joint control by parent firms. Parent firms jointly contribute and control resources.[7] The joint control of different parents distinguishes joint ventures from other business combinations such as mergers, takeovers, or acquisition of subsidiaries in which the relationship is one-sided. All the parties contribute resources which include, but are not limited to, monetary investment.

Since it is not easy for two individual organizations to join together under diversified goals and separate plans, a joint venture must provide benefits to both parties. There are

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[7]The definition of a joint venture may not be restricted to joint management; it can be under the management of either or both parties (Clarke and Brennan (1990, pp.1)).

various internal factors leading to joint ventures.[8] The first obvious factor is that each party has its own strength which the other lacks. Some examples of the firm-specific assets are financing power, ownership of raw materials, technology skills, managerial talent and marketing intelligence. Firms usually do not have the same level of skills in these firm-specific assets.

The second reason is more market-oriented. In order not be pushed out of the market, small firms will cooperate together to compete with large firms. The joint venture may broaden product diversification by expanding product lines or achieving scale economies. As a result, the volume of products increases. The other implied advantage is that the market entry barriers of high sunk costs can be overcome. Conversely, the bigger size of a firm due to joint-venturing may create entry barriers to other potential rivals.

The third reason is that the high costs of research and development and capital or equipment investment can be shared with other firms, therefore, the risk will be reduced and the cost burden of a firm is lowered.

However, the negotiations between two different-goaled parent firms lead to lower efficiency. Cooperation between administrative staff from different parents is not easy and then decision-making is not efficient. Even if the parents find it easier to compromise on a plan, if the managers seek to maximize the benefits of their own companies, it may affect cooperation within the administrative team.

In sum, transaction costs are the main consideration of a MNE contemplating a joint venture with a local firm. On the positive side, a firm can use the advantage of the

[8]The factors are synthesized from Pitt-Watson (1990), Harrison (1985), Walmsley (1982) and Wille (1988).

partner's knowledge and the assets from a joint venture to lower its costs. On the negative side, cooperation between two independent units may be inefficient and lead to higher costs. A MNE compares the costs and benefits of a joint venture before the entry decision.[9]

2.4 Effects Of FDI On The Host Country

Apart from the theory of FDI, the welfare effects for a host country also get attention. The most important benefits to the host country are technology transfers or spillovers[10]. Evidence also supports this point of view: for example, Teece (1977) and Mansfield and Romeo (1980) find out that technological knowledge is "leaked" to the host countries by the U.S.-based firms, and Globerman (1979) shows the positive spillover effects to Canadian manufacturing industries from FDI. The literature generally emphasizes only intra-industry spillovers.

Other discussions on welfare effects include both positive and negative sides. In addition to technology spillovers, the reasons for increase in welfare owing to FDI are quite broad: the inflow of factors of production into the host country[11], promoting

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[9]Beamish and Banks (1987) use the transaction cost paradigm to explain why joint ventures sometimes may be preferred to wholly-owned subsidiaries. Contractor and Lorange (1988) discuss generally the costs and benefits of forming a joint venture. In addition to the benefits of lowering transaction costs, a joint venture can reduce a firm's risk or lower the requirement of capital inputs.

[10]Quite a lot of literature concerns technology transfer to host countries due to FDI. Some examples are Blomström (1989), Caves (1971), Das (1987), Findley (1978), Georgantzas (1991), Hymer (1979), Johnson (1970), Magee (1977) and Streeten (1971).

[11]Caves (1971).

competition in the host country[12], lower transport costs[13], higher employment rates[14] and transfer of marketing knowledge[15]. On the other hand, the host country investment may be immiserizing since the large MNEs can be anticompetitive[16] and the costs of foreign firms are not low enough to increase welfare[17]. Therefore, whether FDI is beneficial to the host country or not depends on the demand side of the market and technological advantage[18]. Moreover, whether the technology is appropriate to the host country and the extent to which local resources are used also determine the welfare effects[19]. From the viewpoint of lobbying, if there are more MNEs, the importance of protecting local markets from imports becomes lower and then the probability of more liberal policies is higher.[20]

From the viewpoint of the host country, foreign investments can lead to higher efficiency and inflows of capital, and then FDI is welcome. However, usually the foreign

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[12]Cardoso and Dornbusch (1989), Horstmann and Markusen (1989).

[13]Dei (1990).

[14]Meier (1976, p.373) and Brander and Spencer (1987).

[15]Streeten (1971).

[16]Teece (1981).

[17]Levy and Nolan (1992).

[18]Mohtadi (1990).

[19]Agarwal (1985).

[20]Hillman and Ursprung (1993). They know that their theoretical results lack evidence. One reason why they have drawn this conclusion is that their model is based on the assumption that the lobbying expenditure of the firms is spent on both liberal and conservative sides. If more MNEs produce locally in the host country, the firms will have lower incentive to spend on lobbying for protectionism, and so the share on liberal lobbying expenses is increased.

firms push the local competitors out of the markets, thus the host country loses income to the foreigners. Therefore, the host country may try to limit FDI using local ownership requirements or foreign exchange outflow restrictions. In addition to economic reasons, the political concern of preventing foreign dominance is also an important factor in those restrictions.

Recently, there have been studies concerning the effects of FDI on stock values. For, example, if a MNE spends a larger share of research and marketing expenditures on the foreign subsidiaries, the stock returns are higher.[21] From a study on U.S.-China joint ventures (in China)[22], the stock returns are higher for those firms with fewer subsidiaries abroad.

2.5 Synthesis Of Neoclassical International Trade Theory And Foreign-Direct-Investment Theory

For a long time, the development of theories on FDI has been independent from the main-stream trade theories. One of the reasons is that trade theory is traditionally based on perfect competition which cannot explain FDI[23]. With the emphasis that new trade

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[21]Morck and Yeung (1992). Their paper primarily aims to provide evidence to support the importance of internalization for FDI.

[22]Hu et al. (1992). They provide explanations for the higher stock returns on a relatively new MNE: the people expect that more aggressive strategies of such a firm will make higher profits in the future. A better established MNE, on the other hand, has only a small marginal benefit in its international presence.

[23]Baxter (1992) claims that most phenomena of trade and FDI can still be explained by a neo-classical model. She develops a two-good two-factor model with capital accumulation under constant returns to scale and perfect competition. Since the steady state equilibria are reached in different combination of consumption of the two goods, the long run production possibilities frontier is similar to the Ricardian model: a downward sloping straight line. However, Baxter gives no details on how the so-called neoclassical model can respond to the challenge of Helpman and Krugman (1985, Introduction) against the

theories place on imperfect competition, it is possible to use formal trade models to discuss FDI[24].

Krugman (1983), Markusen (1984) and Helpman (1984) are the pioneers in developing models of MNEs. Their ideas are similar to the other major FDI theories: the "public good" nature of the marketing, management and research and development (R&D) within a firm is the main reason MNEs develop. Such intangible assets are firm-specific knowledge. Since the management and research resources of the headquarters can be used by the subsidiaries with little or no cost, a firm has the incentive to operate subsidiaries in other countries. Since the firm-specific knowledge is usually a part of the fixed costs, the transfer of the knowledge to other plants implies that the production is increasing returns to scale[25].

Krugman (1983) was the first to use a formal economic model based on firm-specific

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traditional Heckscher-Ohlin (H-O) model.

For example, in Baxter's model, two identical countries need not have trade, and then the model has the same difficulty as the H-O model. Baxter remains helpless in explaining the volume of trade between similar countries. If there is a little difference in the two countries (of Baxter's model), her model has the same characteristics as the Ricardian model in which total specialization results.

In addition, intra-industry trade is not possible in Baxter's model. The assumption of perfect mobility of capital may not be relevant to intra-industry trade.

For the aspect of trade liberalization, Baxter's model only points out that the removal of government distortion will be beneficial to all. It does not face the real challenge from Helpman and Krugman: the observation that international trade leads to all-around gains to all trade partners without significant reallocation of resources which cannot be explained by the neo-classical model.

Perhaps Baxter's most unclear argument is that she provides no answer to whether FDI is possible in her model. The model totally neglects the explanation of FDI although she claims that the model can explain it.

[24]Ethier (1992) provides a brief review of the recent development of formal models on FDI theory.

[25]Subadditivity may be a better description in this case. Subadditivity of the cost function means that the production cost of different products altogether is less than the sum of the cost of producing them separately (Baumol 1977). By applying this concept to the case of existence of firm-specific knowledge, an incumbent has the advantage over a new entrant by setting up an additional plant at a lower cost (since the existing firm-specific knowledge can be transferred to the new plant). The production function is therefore an example of subadditivity.

knowledge to explain the MNEs. He uses a model of differentiated products under the assumption of the existence of firm-specific knowledge. In addition, there are transportation costs and costs of overseas production. Transportation costs are positive for exports while costs of overseas production are negligible. Due to the fact that firm-specific knowledge can be transferred to different subsidiaries, if the transportation costs are higher than the costs of overseas production, a firm finds it more profitable to produce abroad rather than to export. Though Krugman's model can explain the choice of a MNE on exporting or establishing a foreign subsidiary, the main dissatisfaction is that there may be only exports or production in the foreign country but not both.[26]

In a two-country two-good two-factor model, Markusen (1984) further assumes that one of the products is produced by a monopoly in each country. If a MNE operates a plant in each country instead of the duopoly competition, it is possible (but not necessary) for the world welfare to be increased because of the saving of the costs of producing the firm-specific knowledge.

Helpman (1984) uses a monopolistic competition model (similar to Krugman's) by assuming that the firm-specific knowledge is produced by a so-called general purpose input. In a two-country, two-good, two-factor model (the two factors are the general purpose input and labor), if the countries have different ratios of endowments in factors and if there is complete specialization of production so that factor prices are not equal

[26]Also realizing that existence of firm-specific knowledge is not sufficient for the appearance of MNE, Horstmann and Markusen (1987a) compare the conditions of exports and FDI similar to Krugman's model: the presence of transportation costs and tariff. But the model is closer to Markusen's (1984) model: a homogeneous good with increasing returns to scale. So only a monopoly exists in a market. This paper has the same problem as Krugman's paper: either exporting or FDI exists but not both.

under free trade, firms will operate subsidiaries in both countries. Therefore, whether or not a MNE has the incentive to set up a subsidiary in the foreign country depends on the endowments of factors apart from the firm-specific advantage.

Due to the "public good" nature, Markusen's (1984) model is based on a market dominated by a monopoly. It is because the expenses on the firm-specific knowledge are similar to fixed costs that increasing returns to scale occur. In a homogeneous-good market, the incumbent can monopolize the market by producing at a level that deters potential rivals from entering. Potential entrants are discouraged if the required costs of firm-specific knowledge cannot be covered by the new firm. In Krugman's (1983) or Helpman's (1984) model, different firm-specific knowledge is required for producing different varieties of a differentiated good, so more than one firm can exist within an industry. Each variety is produced by at most one firm due to the increasing returns to scale.

The three mentioned models are mainly related to horizontal integration. All of them are related to the concepts of firm-specific knowledge. On the other hand, Krugman (1983), Helpman (1985) and Ethier (1986) provide quite different reasons for vertical integration.

Krugman (1983) uses a monopsony model to explain vertical integration. If an intermediate product (produced in a foreign country) of the monopsony is characterized by increasing marginal costs, the equilibrium marginal cost of any independent supplier (equal to the marginal revenue of the monopsony) will be higher than the market price of the product because any increase in purchase of the intermediate products will bid up

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the price (of the intermediate goods) for all units. The monopsony therefore has the incentive to acquire the independent foreign suppliers. The MNE can save costs by paying the upstream subsidiaries only the marginal cost on each unit (with a different marginal cost for each unit) rather than paying the unified price on all units in an open market. In this model, firm-specific knowledge need not play a role.

Instead, Helpman's (1985) model is still based on firm-specific knowledge. He develops the model by assuming that the varieties of a differentiated product are continuous, which can be represented by a real number line. Each firm produces a number of varieties such that a variety further away from the central variety has a higher production cost. The firm-specific knowledge is incorporated into the production of intermediate goods, but both kinds of inputs (the firm-specific knowledge and the intermediate goods) can be separated from the production of the final goods. By also assuming that there are only two basic factors (as in the 1984 model), it is possible for a firm to have downstream integration in a foreign country when the factor prices are not equalized under trade.

Ethier (1986) follows Dunning's argument on the role of internalization. He emphasizes the importance of uncertainty and asymmetric information on vertical integration. In the model, uncertainty affects R&D in a way that the turnout of production may be either high- or low-cost. The possibility of low-cost production is higher if more labor is involved in R&D. The problem of asymmetric information arises in the production of the downstream final good. The supplier of the upstream good has better information on the production costs than the manufacturer of the final good, thus a contract has to be designed to be incentive compatible so that the supplier has no incentive to tell lies and the supplier bears the whole risk. FDI is possible if the wage rates are different in the two countries. If the dispersion of research is so large that the high-cost turnout leads to negative profits but the possible low-cost turnout leads to positive profits, the supplier may prefer to set up a downstream subsidiary abroad. This is because, in this case, more labor in the source country can be put into R&D while the foreign wage rate will be lowered under the MNE's direct control over downstream production.

One insight from the Krugman-Markusen-Helpman (K-M-H) model is that general equilibrium can give a clear map of the role of firm-specific knowledge. Generally speaking, the firm-specific knowledge alone may not lead to FDI. Due to input constraints (mainly immobility of labor), a firm will choose to operate in foreign countries for the purpose of maximizing profits due to the location-specific advantage in a foreign country (in addition to the firm-specific advantage).[27]

There are authors applying formal models on entry modes. Horstmann and Markusen (1987b) compare licensing and FDI. Under a world of imperfect information and asymmetric costs, they show the conditions for a firm choosing licensing or FDI. The model includes high- and low-quality of a good and the techniques in producing the high-quality good can only be supplied by the MNE. The price and cost are higher for the

[27]One other explanation of the rise of MNEs is that the service sectors require production in the local areas. Boddewyn et al. (1986) provide a good description of the investment in services. The main characteristics of services include: intangibility (a telephone call), perishability (a flight ride), customization (an engineering plan of a factory), simultaneity of production and consumption (a bank loan), consumer participation in production (remote computer data-processing), and use without ownership (a car rental), etc.

high-quality good while the price and cost are lower for the low-quality good. If the local firm in the host country can produce economies of scale by combining the high- and low-quality goods so that the cost combined is lower than the sum of producing the goods separately, licensing is more attractive. However, when the market is larger, the local firm has higher incentive to produce low-quality goods, and the reputation of the MNE is damaged. Since the multinational firm finds it hard to detect such cheats, FDI is preferred. One problem is that this paper takes transferability of firm-specific knowledge to other firms for granted but in reality, the transferability is not generally true.

Ethier and Markusen (1991) further compare exporting, licensing and establishing a wholly-owned subsidiary (not including joint ventures). They stress the technology transfer from a MNE to the host country, and they analyze the different entry modes in a two-period model. Under the assumption that exports are costly while licensing or establishing a subsidiary leads to an earlier loss of advanced knowledge, a MNE has to compare costs of different entry modes to achieve the highest profits.

In addition to the explanation of appearance of MNEs, Horstmann and Markusen (1989) work out a model on welfare effects based on the existence of firm-specific knowledge. Since the firm-specific costs can be saved in the host country, if the price is forced down to the average cost due to competition among MNEs and the market of the host country is too small to support a domestic firm, FDI is beneficial to the host country.

Chapter 3

A Theory Of the Coexistence Of International Joint Ventures And Wholly-Owned Enterprises

3.1 Introduction

The previous chapter explained briefly that a joint venture is set up if joint-venturing is beneficial to all the partners. For international joint ventures, the local partner can provide a special benefit to the foreign partner. From recent empirical work investigating the incentives for multinational firms based in Sweden to form joint ventures[1], it is found that the firms with less experience in FDI and with more diversified products are more likely to participate in joint ventures. It is advantageous for a foreign firm to cooperate with the local firm when the multinational enterprise has less experience in FDI. Moreover, the set-up costs will be much higher for an international corporation when the firm needs to develop more different types of knowledge. For example, when a firm produces more diversified products, it needs more information on the local market. Local knowledge is a special kind of asset the local firms own, so an international corporation with less experience or more diversified products should find it profitable to form a joint venture with a local firm. Therefore, it is reasonable to suggest that there exists local

[1]Blomström and Zejan (1991).

knowledge in contrast to firm-specific knowledge.

Local knowledge is available to a firm after getting experience in production at a certain location. In such a case, the firm has the advantage over other late comers to a particular location. One example of an advantage is better knowledge of the local labor market (so that recruitment and training of workers is more efficient). Another example is better connection to other local suppliers and a better developed network with local distributors. Moreover, a local firm has the advantage over foreign firms if there are language and cultural barriers. The importance of cultural factors in a multinational enterprise choosing between a wholly-owned subsidiary and a joint venture (with a local firm) has already been pointed out[2].

This chapter concentrates on the existence of local knowledge as an explanation of why a multinational enterprise chooses to establish wholly-owned subsidiaries or joint ventures in a foreign country; furthermore, this chapter tries to identify the conditions that determine why a multinational enterprise sets up both wholly-owned subsidiaries and joint ventures in a foreign country. The problem of internalization is not considered here. It is simply assumed that all the subsidiaries of a firm can utilize the firm-specific advantage of a firm without costs. Local advantage is assumed to be reflected in the difference in marginal costs.

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[2]Kogut and Singh (1988).

3.2 A General Equilibrium Model

The model can be taken as a revised version of Krugman (1983)[3] while including some elements of the set-up of Markusen (1984) and Helpman (1984). The model includes two countries with only one differentiated good (as in Krugman) and two inelastically supplied factors of production (similar to Helpman) while the firm-specific knowledge is produced by labor from the headquarters (Krugman and Markusen). The factors are labor and plant-specific input. The latter refers to the advantages of local knowledge which is assumed non-transferable to other plants.

It is assumed that the two countries have different technology levels such that country S has higher labor productivity than country H. This assumption projects the investment flows from developed countries to developing countries.

Good X is assumed to be differentiated in any number of varieties and all varieties are symmetric to satisfy a typical consumer. An unusual assumption critical to the conclusion is that N of the varieties produced have lower production costs than the other varieties. In other words, it is assumed that the production of a fixed number of varieties has local advantage such that the costs are lower. Each country is assigned N varieties with plant-specific input.

The rationale of assuming two types of production costs can be seen in a historical way. We may consider that there were only N firms entering the market in the previous period with each firm producing one variety. Each firm developed local knowledge by producing the certain variety. In the present period, the N old varieties can be produced

[3]Krugman's model of a differentiated good is adopted from his earlier papers (Krugman (1979, 1980)).

at lower costs and then less labor is hired. Therefore, new varieties (without local knowledge) can be produced by using the "leftover" labor. Although it is interesting to look into a two-period model, only the static condition is considered here since a static model is simple enough to fulfill the purpose in distinguishing the entry modes of wholly-owned subsidiaries and joint ventures.

(A) Assumptions of the production side

The supply of possible varieties of good X can be unlimited but the feasible number is constrained by the production and consumption functions. There are M and M^* varieties available in country H and country S respectively. Each variety is assumed to be produced by only one plant. But one firm can operate more than one plant. The industry consists of a finite number of firms (at most N) with multiple plants within each firm. The rest of this chapter assumes that in equilibrium, $M>N$ and $M^*>N$. These conditions can be fulfilled if the amount of labor supply is very large.[4]

Each country is endowed with L units of labor and N units of the plant-specific input. Labor is freely mobile within a country but immobile across countries. Firm-specific knowledge (an aggregate input representing marketing, technology and management skills) is produced by labor. It is assumed that F units of labor are required to produce the minimum amount of firm-specific knowledge needed to operate any number of plants. The location of manufacturing can be separated from the headquarters which provide the firm-specific services, so each firm uses only F units of labor to produce the firm-specific

[4]Please refer to equation (28) of a working paper with the same title.

knowledge.

Every unit of plant-specific input is used for producing a certain variety, non-transferable to other varieties, and affixed to only one plant. Each firm in the market (at most N firms) owns 1 unit of plant-specific input. While plant-specific input is not necessary in the production of a variety, utilizing a unit of plant-specific input makes the production costs lower for the same quantity of output. That is, the production of a plant (apart from the firm-specific knowledge) may either include labor and plant-specific input or include only labor. Accordingly, there are at most N varieties of good X produced with plant-specific input while the other varieties are produced by using labor and firm-specific knowledge only. The organization of a firm is shown in Figure 3.1.

Let us call the plants using plant-specific input low-cost-plants and the plants without plant-specific input high-cost-plants. Each firm has at most one low-cost-plant but it can operate any number of high-cost-plants. Firm-specific knowledge is provided by the headquarters to the subsidiary plants so each plant need not produce the firm-specific knowledge. The total number of plants in country H is M but each firm need not have the same number of plants. Since the profit of a high-cost-plant is assumed to be zero (which will be discussed in section 3.2), a firm cannot make more profits by operating more plants.

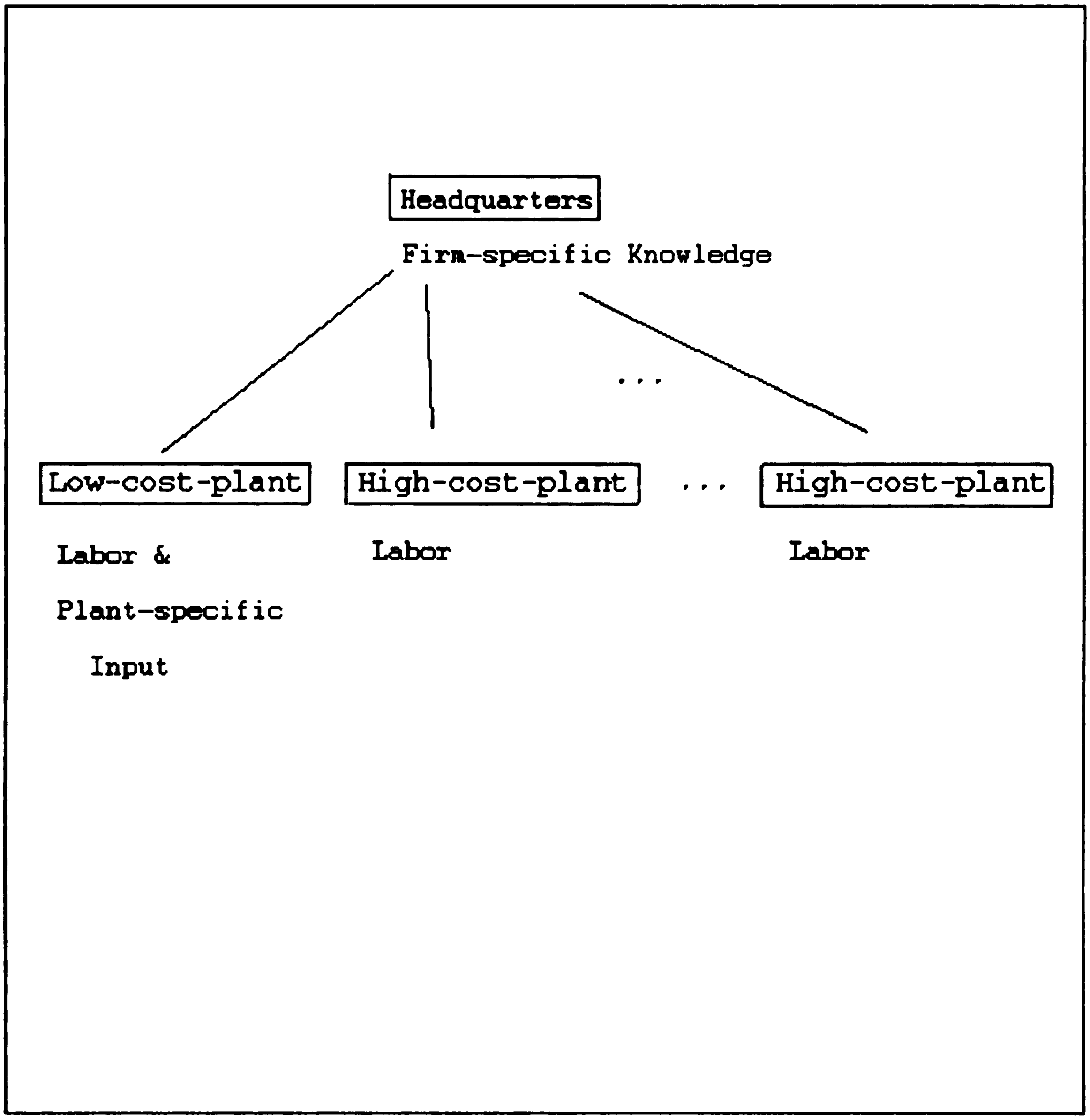

Figure 3.1: The Organization of a Firm

As all the N units of plant-specific input are owned by N different firms, an oligopoly of at most N firms arises in the product market. Although entry is potentially possible, the new entrants cannot compete with the incumbents. The existence of plant-specific input and firm-specific knowledge makes the incumbents efficient enough to block potential rivals from entry because an existing firm need not produce the firm-specific knowledge for operating a new plant. But new entrants have the additional costs of producing the firm-specific knowledge for operating the first plant. Moreover, the additional profits from a low-cost-plant allow an existing firm to survive under zero profits in each new plant (high-cost-plant), so the incumbents have the advantage over all potential rivals.[5]

It is more convenient to use cost functions in the supply side to describe the production of good X. The difference between low-cost-plants and high-cost-plants is only reflected in marginal costs. Fixed costs are the same for all plants. The labor required in producing a variety can be summarized as:

Low-cost-plants:

$$L_i = A + B_l x_i \,, \qquad i = 1, \ldots, N \,, \tag{3.1a}$$

[5]This is related to the contestable market theory (please refer to Baumol et al.(1982)). Under this theory, a monopoly cannot make profits in the face of potential rivals because the monopoly keeps the price low enough to block entrants; consequently no profits are made if all firms have the same technology. But as Shepherd (1984) points out, the contestable "competition" holds only in some restrictive conditions.

In this model, the producer of each variety has some monopoly power. Due to the entry of new plants for producing different varieties, the profits of all the plants without plant-specific inputs will be equal to zero, however, the plants with local knowledge can make positive profits by operating at a lower cost.

High-cost-plants:

$$L_j = A + B_h x_j , \qquad j = N+1, \dots ,M , \qquad B_h > B_l , \tag{3.1b}$$

where A, B_l and B_h are constants; x_i and x_j are outputs of a low-cost-plant and a high-cost-plant respectively. Due to the lower costs from using plant-specific input, B_l is smaller than B_h. B_l denotes the marginal cost of a low-cost-plant which has a lower cost while B_h denotes the marginal cost of a high-cost-plant which has a higher cost. L_i and L_j are the labor required in producing good X by a low-cost-plant and a high-cost-plant respectively. When producing the same quantity of outputs, a low-cost-plant uses less labor than a high-cost-plant, i.e. $L_i < L_j$ if $x_i = x_j$.

To get total cost functions, one simply multiplies (3.1a) and (3.1b) by the wage rate:

Low-cost-plants:

$$TC_i = L_i w = (A + B_l x_i) w, \qquad i = 1, \dots ,N , \tag{3.2a}$$

High-cost-plants:

$$TC_j = L_j w = (A + B_h x_j) w , \qquad j = N+1, \dots ,M , \tag{3.2b}$$

where w is the wage rate. By assuming that labor is perfectly mobile within a country and all workers are identical, the wage rate is the same for all workers. The total cost of a plant is simply equal to the amount of labor used multiplied by the wage rate. Let AC_l and AC_h be the average costs of a low-cost-plant and a high-cost-plant respectively; MC_l and MC_h are the marginal costs of a low-cost-plant and a high-cost-plant respectively. It can be easily seen that $AC_\ell < AC_h$ and $MC_\ell < MC_h$ in the same quantity produced. Furthermore, AC_ℓ and AC_h decrease as outputs increase.

Country S is only different from country H at the technology level. It is assumed that the only difference is shown by the fixed costs, therefore, in country S, the total cost functions of low-cost-plants and high-cost-plants are:

Low-cost-plants (country S):

$$TC_i^* = L_i^* w^* = (A^* + B_\ell x_i^*) w^* , \qquad i = 1, \dots ,N ,$$

High-cost-plants (country S):

$$TC_j^* = L_j^* w^* = (A^* + B_h x_j^*) w^* , \qquad j = N+1, \dots ,M^* ,$$

$$A^* < A ,$$

where the asterisks represent the different values in country S. All the difference is due to the technology gaps, i.e. $A^* < A$.

(B) <u>Assumptions of the demand side</u>

The consumers are divided into workers and entrepreneurs. Each worker owns 1 unit of labor while each entrepreneur owns 1 unit of plant-specific input and 1 unit of labor and operates at most 1 firm. Each entrepreneur may choose to maintain his status or choose to be a worker but he cannot play both roles. If all the plant-specific inputs are utilized, there are L workers and N entrepreneurs in a country. Let c_i denote the consumption of variety i of good X by a worker and d_i denote the consumption of variety i by an entrepreneur. And by assuming that preferences of all individuals are identical, an individual (of country H) has the utility function:

$$U = \sum_{i=1}^{Q} e_i^{\theta}, \qquad 0 < \theta < 1 , \tag{3.3}$$

$$e_i = c_i \quad or \quad e_i = d_i ,$$

where Q is the number of varieties of good X consumed. (In autarky, it should be noted that Q=M.) It is easily seen that the first derivative of the utility function with respect to e_i is positive but the second derivative is negative. As everyone has the same utility function as (3.3), it is well-known that the elasticity of demand for each variety becomes:

$$\varepsilon = \frac{1}{1-\theta} .$$

Analogously, a consumer in country S has the following utility function:

$$U = \sum_{i=1}^{Q^*} e_i^{*\theta}, \qquad 0 < \theta < 1 ,$$

$$e_i^* = c_i^* \quad or \quad e_i^* = d_i^* ,$$

Since the incomes may be different in the two countries, the consumption level may also be different.

(C) Full employment

The full employment condition is fulfilled by the assumption of perfectly mobile labor. The labor is used in the two types of plants and in production of firm-specific knowledge. If all the plant-specific input is used, there are N firms with totally N low-cost-plants and

(M-N) high-cost-plants. The full employment condition in country H is represented by:

$$L = \sum_{i=1}^{N} (A + B_l x_i) + \sum_{j=N+1}^{M} (A + B_h x_j) + NF \quad (3.4)$$

The full employment condition in country S is represented by:

$$L = \sum_{i=1}^{N} (A^* + B_l x_i^*) + \sum_{j=N+1}^{M^*} (A^* + B_h x_j^*) + NF$$

It is possible that not all units of plant-specific input are used or no high-cost-plants are operating.

3.3 Equilibrium In A Closed Economy

In this section, only country H is analyzed. The equilibrium conditions of country S follow straight-forwardly. In addition to the assumptions of profit maximization and free entry (new plants, not new firms), a rather strict assumption is that the firms from the same country cannot cooperate together, and there is no strategic interdependence between firms. This assumption may not be realistic as the firms have the incentive to join together for saving firm-specific costs and yielding more profits from greater monopoly power. To partly solve this problem, it is assumed that the firms are prohibited from joining together or merging together locally by law (but joint-venturing with or taking over foreign firms is allowed). And N is assumed to be large enough to make strategic behaviors insignificant.

In order to guarantee that an entrepreneur does not choose to be a worker, the profit rate must not be less than the wage rate. Let π be the profit earned by a representative entrepreneur (we will see that the profits of all firms are the same) and w be the wage earned by a typical worker; the condition for a firm staying in the market is that $\pi \geq w$.[6]

Demand functions

All consumers are assumed to maximize their utilities. The workers earn only wages and the entrepreneurs earn only profits. Let U^w be the utility of a worker. Every worker maximizes his utility function of (3.3) subject to his budget constraint:

$$Max \quad U^w = \sum_{i=1}^{M} c_i^{\theta}$$

$$Subject\ to \quad w = \sum_{i=1}^{M} p_i c_i \ ,$$

where p_i is the price of ith variety of good X. Using the Lagrange Multiplier λ and solving the first order condition, we have:

$$\theta c_i^{\theta-1} = \lambda p_i \ . \tag{3.5}$$

Similarly, let U^π be the utility of an entrepreneur. Every entrepreneur maximizes his utility function subject to the budget constraint as follows:

[6]The meaning of profits is different from the usual definition. The accounting concept is adopted in this chapter. Let EP be the economic profits; it is easy to see that $\pi \geq w$ as $EP \geq 0$ and vice versa.

$$Max \quad U^{\pi} = \sum_{i=1}^{M} d_i^{\theta}$$

$$Subject\ to \quad \pi = \sum_{i=1}^{M} p_i d_i \ .$$

The main difference between a worker and an entrepreneur is that the profit rate may not be the same as the wage rate. Using the Lagrange Multiplier μ and solving the first order condition, we have:

$$\theta d_i^{\theta-1} = \mu p_i \ . \tag{3.6}$$

There are two kinds of varieties to be consumed: low-cost or high-cost, i.e. $i=\ell$ or h. From either (3.5) or (3.6), the ratio between the prices of a low-cost-variety (output of a low-cost-plant) and a high-cost-variety (output of a high-cost-plant) can be written in terms of the ratio between the quantity demanded of a low-cost-variety and a high-cost-variety:

$$\frac{P_l}{P_h} = \left(\frac{x_h}{x_l}\right)^{1-\theta} \ . \tag{3.7}$$

Profit maximization

By assuming that all firms seek profit maximization, we have the following condition for sector X:

$$MC_i = MR_i \, , \qquad i = 1, \, \dots \, , M \, , \tag{3.8}$$

where MC_i and MR_i are respectively the marginal cost and the marginal revenue of either a low-cost-plant or a high-cost-plant. Since the marginal cost of a low-cost-plant is lower than that of a high-cost-plant, we will see that the output of low-cost-plant is larger than a high-cost-plant. Let the total revenue for variety i be $TR_i = p_i x_i$, the marginal revenue for variety i can be derived by using the fact that $\varepsilon = 1/(1-\theta)$:

$$MR_i = p_i \left(1 - \frac{1}{\varepsilon} \right) = p_i \theta \, . \tag{3.9}$$

From (3.2a) and (3.2b), we have the marginal costs as follows:

Low-cost-plants:

$$MC_i = B_l w \, , \qquad i = 1, \, \dots \, , N \, , \tag{3.10a}$$

High-cost-plants:

$$MC_j = B_h w \, , \qquad j = N+1, \, \dots \, , M \, . \tag{3.10b}$$

Therefore, from the profit maximizing (3.8), combining (3.9) with (3.10a) and (3.10b) separately, the equilibrium prices of a low-cost-variety and a high-cost-variety are in terms of the wage rate:

Low-cost-varieties:

$$p_i = \frac{B_l}{\theta} w \, , \qquad i = 1, \, \dots \, , N \, , \tag{3.11a}$$

High-cost-varieties:

$$p_j = \frac{B_h}{\theta} w , \qquad j = N+1, \ldots ,M . \tag{3.11b}$$

Determination of the number of plants

The profit of each plant is the difference between the total revenue and the total cost of the respective plant:

Low-cost-plants:

$$\pi_i = p_i x_i - (A + B_\ell x_i) w , \qquad i = 1, \ldots ,N , \tag{3.12a}$$

high-cost-plants:

$$\pi_j = p_j x_j - (A + B_h x_j) w , \qquad j = N+1, \ldots ,M . \tag{3.12b}$$

Let us assume that the profit rate of a low-cost-plant net of the firm-specific costs is not less than the wage rate. Under free entry, the profits of all high-cost-plants are equal to zero, i.e. $\pi_j=0$. Because the demands for all varieties are symmetric and the marginal costs of all plants of the same kind are equal, the prices, outputs and profits of all high-cost-varieties are the same: $p_j=p_h$, $x_j=x_h$ and $\pi_j=\pi_h=0$, $j=N+1,\ldots,M$. Similarly, for all low-cost-varieties: $p_i=p_\ell$, $x_i=x_\ell$ and $\pi_i=\pi_\ell$, $i=1,\ldots,N$. (The total profits of a firm combines the profits from all subsidiary plants minus the firm-specific costs. The firm profit function will be shown later in (3.16).) Then from the zero profit condition of a high-cost-plant and applying (3.11b), we have:

$$x_h = \frac{Aw}{p_h - B_h w} = \frac{\theta}{1-\theta}\frac{A}{B_h} \qquad (3.13)$$

Let

$$\beta = \left(\frac{B_h}{B_l}\right)^{\frac{\theta}{1-\theta}} > 1$$

Substituting the equilibrium prices ((3.11a) and (3.11b)) and the equilibrium output of a high-cost-variety (equation (3.13)) into the demand function (equation (3.7)), the equilibrium output of a low-cost-plant is in terms of the exogenous variables:

$$x_l = \frac{\theta}{1-\theta}\frac{A}{B_l}\beta > x_h \qquad (3.14)$$

The next variable we want to solve for is the equilibrium profit of a low-cost-plant. Substituting (3.11a) and (3.14) into (3.12a), we have:

$$\pi_l = (\beta - 1)Aw \qquad (3.15)$$

π is the total profit for the firm:

$$\begin{aligned} \pi &= \pi_l - Fw \\ &= [(\beta - 1)A - F]w \,. \end{aligned} \qquad (3.16)$$

Substituting the equilibrium prices ((3.11a) and (3.11b)) and outputs ((3.13) and (3.14)) into the full employment condition (equation (3.4)), the number of varieties available in country H is:

$$M = \frac{(1-\theta)(L-NF) + \theta NA(1-\beta)}{A} \tag{3.17}$$

As all the owners of plant-specific input choose to be entrepreneurs, it must be $\pi \geq w$. Comparing π (i.e. (3.16)) and w, we have:

$$\left(\frac{B_h}{B_l}\right)^{\frac{\theta}{1-\theta}} - 1 \geq \frac{F+1}{A},$$

$$\rightarrow \theta \geq \frac{\ln\left(\frac{F+A+1}{A}\right)}{\ln\left(\frac{B_h}{B_l}\right) + \ln\left(\frac{F+A+1}{A}\right)} = \phi \tag{3.18}$$

This chapter assumes that (3.18) holds. The equilibrium conditions for (3.18) not holding are discussed in a working paper with the same title.[7]

3.4 Equilibrium Condition Under Free Trade But Without FDI

Suppose that trade is allowed freely in both countries but FDI is prohibited. From the utility functions we can see that the consumers prefer more varieties within the same budget constraint. A variety produced in either country will be consumed by all consumers, therefore, there is intra-industry trade between the two countries[8].

Because there is no mechanism to ensure that the incomes of the workers will be equal

[7]Please refer to pp.22-28 of the working paper.

[8]This is the basic result under a model of monopolistic competition (Krugman 1979, 1980).

in both countries (and indeed they are different), the demand functions for the varieties produced in country H may be different from those in country S, and then the prices are different in the two countries. But it can be shown that the price elasticities of demand for all varieties are still the same ($\varepsilon = 1/(1-\theta)$). The output of a variety is then the same as in a closed economy:

$$x_h = \frac{\theta}{1-\theta}\frac{A}{B_h}, \qquad (3.13)$$

$$x_l = \frac{\theta}{1-\theta}\frac{A}{B_l}\beta; \qquad (3.14)$$

$$x_h^* = \frac{\theta}{1-\theta}\frac{A^*}{B_h}, \qquad (3.19)$$

$$x_l^* = \frac{\theta}{1-\theta}\frac{A^*}{B_l}\beta. \qquad (3.20)$$

Since $A^* < A$, the output of a variety (produced by a same-class-plant) in country S is smaller than that in country H, i.e. $x_h^* < x_h$ and $x_l^* < x_l$.

On the other hand, the output can be represented as the sum of consumption by all consumers. Let the variables with superscripts H be consumption of the varieties produced in country H; the variables with superscripts S are consumption of the varieties produced in country S. Then we have:

$$x_k = L(c_k^H + c_k^{*H}) + N(d_k^H + d_k^{*H}) \quad , \qquad k = h \ \ or \ \ l \ , \tag{3.21}$$

$$x_k^* = L(c_k^S + c_k^{*S}) + N(d_k^S + d_k^{*S}) \quad , \qquad k = h \ \ or \ \ l \ . \tag{3.22}$$

The subscript h denotes the output or individual consumption on high-cost-variety while the subscript ℓ denotes a variable on a low-cost-variety.

Taking the first derivative of the utility function of a country H worker, the following first order conditions can be found:

$$\theta c_k^{H\ \theta-1} = \lambda p_k \ ,$$

$$\theta c_k^{S\ \theta-1} = \lambda p_k^* \ , \qquad k = h \ \ or \ \ l \ ,$$

where p_k and p_k^* are the prices of the varieties produced in country H and country S respectively. From the first order condition, accordingly, the relationship between c_k^H and c_k^S is:

$$c_k^S = \left(\frac{p_k}{p_k^*}\right)^{\frac{1}{1-\theta}} c_k^H \ .$$

The similar relationship for the other type of consumers (entrepreneurs) in country H can be derived in the same way:

$$d_k^S = \left(\frac{p_k}{p_k^*}\right)^{\frac{1}{1-\theta}} d_k^H \ .$$

The relationships also apply to the consumers in country S. Then substituting all the four relationships into (3.21) and dividing the result by (3.22), the relationship between the prices and the outputs is:

$$x_k^* = \left(\frac{p_k}{p_k^*}\right)^{\frac{1}{1-\theta}} x_k \; .$$

From (3.13) and (3.19), we already know that $x_h^* < x_h$, and because $0 < \theta < 1$, the following relationship can be seen:

$$\left(\frac{p_h}{p_h^*}\right)^{\frac{1}{1-\theta}} < 1 \quad \rightarrow \quad p_h^* > p_h \; .$$

Similarly, $P_\ell^* > P_\ell$. Since the wage rate has the same positive relationship with the respective price, we have $w^* > w$.

It is interesting to note that the lower fixed cost in country H leads to a higher price. A possible explanation is that as a higher fixed cost of a variety requires a larger production of that variety so that the disadvantage of higher cost is compensated for by the economies of scale. We already have the fact that $x_h^* < x_h$ and $x_\ell^* < x_\ell$. Because the demands for all varieties are symmetric, when the supply of a variety is larger, the price will be lower. The reverse is true for a lower fixed cost.

The profit rates of a firm H and a firm S are respectively:

$$\pi = [(\beta - 1)A - F]w . \tag{3.16}$$

$$\pi^* = [(\beta - 1)A^* - F]w^* . \tag{3.23}$$

Comparing the profit rate between a firm S and a firm H, we have:

$$\pi^* - \pi = \left\{ A\left[\left(\frac{A^*}{A}\right)^{\theta} - 1\right](\beta - 1) - F\left[\left(\frac{A}{A^*}\right)^{1-\theta} - 1\right]\right\} w < 0 .$$

$\pi^* < \pi$ since both the first and the second terms within the braces are negative (recall that $A > A^*$). This result implies that the profit rate in the advanced country is lower. Intuitively, when the fixed cost is lower for producing a variety, more varieties can be produced with the same resources but each variety is sold in lower quantity. Though the prices are higher for the products from country S, the higher revenue per unit may not compensate for the loss in the quantity sold. Moreover, since the production is subject to increasing returns to scale, as the quantity produced is smaller, a firm loses the advantage of the economies of scale. As a result, the profit rate of a firm S is lower than that of a firm H.

Dividing (3.16) and (3.23) by w, we have the following relationship:

$$\frac{\pi}{w} = (\beta - 1)A - F = \frac{\pi}{w}(A)$$,

$$\frac{\pi^*}{w^*} = (\beta - 1)A^* - F = \frac{\pi^*}{w^*}(A^*)$$.

The relationship between π/w and θ (or π^*/w^* and θ) is shown in Figure 3.2. $\pi/w(A)$ and $\pi^*/w^*(A^*)$ represent the above relationship in which the former depends on A while the latter depends on A^*. From (3.18), we have seen that if all N firms stay in one country, $\theta \geq \phi$ for ensuring $\pi \geq w$. Therefore, if $\theta < \phi$, some entrepreneurs become workers and the remaining firms can earn a profit rate equal to the wage rate only. So both curves are horizontal at the level equal to $\pi/w = 1$ or $\pi^*/w^* = 1$. If $\theta \geq \phi$, the difference between π and w (or π^* and w^*) becomes larger and both curves rise upwardly. As $0 < \theta < 1$, the curves have a rightward bound of $\theta = 1$. The income distribution is more uneven in country H than in country S, so $\pi/w(A)$ is laid above $\pi^*/w^*(A^*)$ at the portion of $\theta > \phi$.

It is interesting to note that if the technology level is higher (the fixed cost is lower), the relative income differential between the two kinds of consumers is narrower. It is directly implied by the fact that $\pi > \pi^*$ but $w < w^*$. One further reason for this result is that when the supply of varieties of good X is larger, the competition for labor is tighter and then the income is more likely to be transferred from the entrepreneurs to the workers.

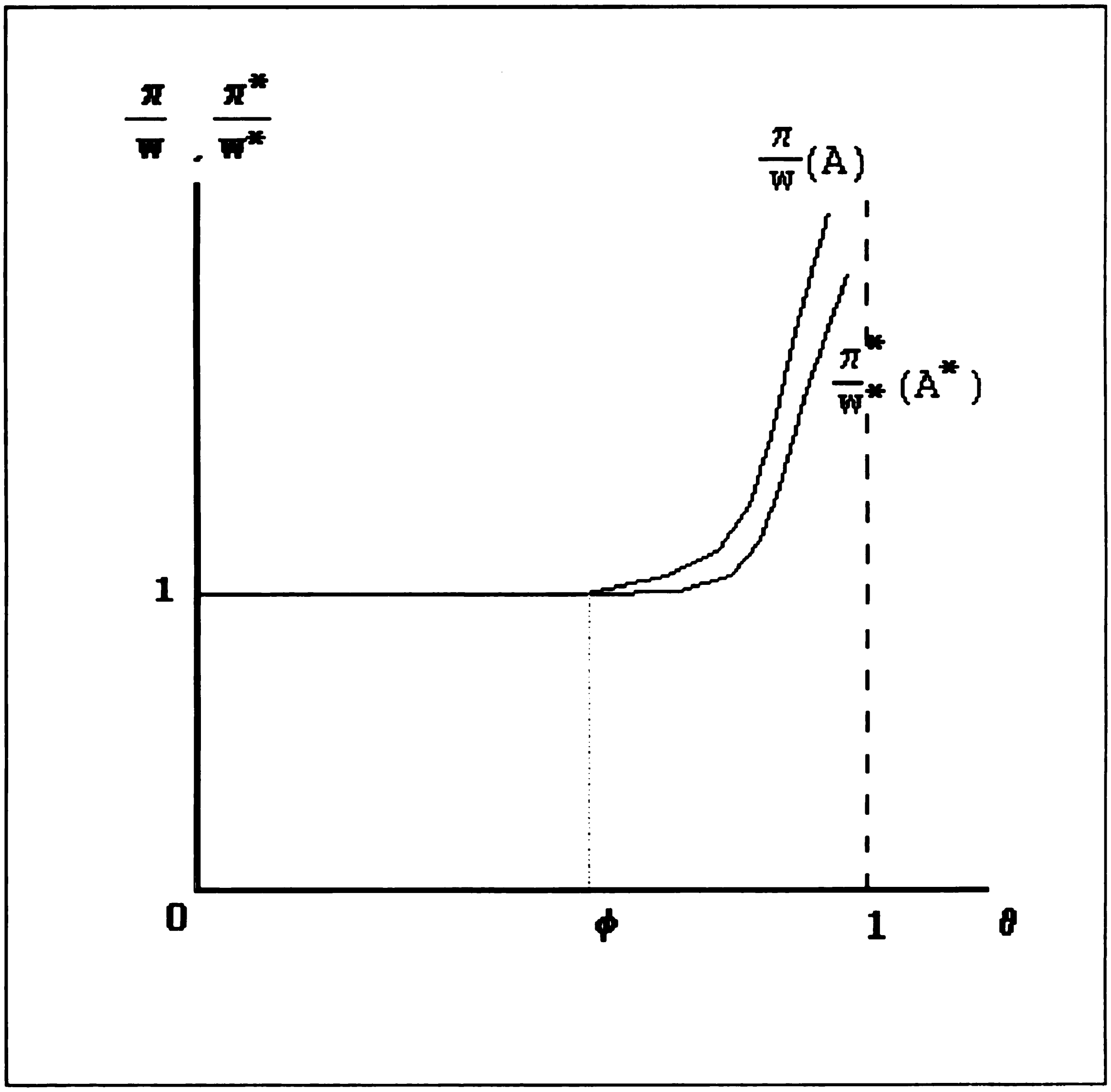

Figure 3.2: The Profit-Wage Ratio with respect to θ

3.5 Decisions On FDI

Now suppose that the two countries agree to trade freely and FDI is allowed with no impediments (but labor is not mobile across countries). Since country S is the developed country ($A^* < A$), it is clear that country S may find it profitable to set up subsidiaries in country H as the production costs are lower in country H ($w < w^*$). It is assumed that the technology level is based on the firm-specific knowledge, therefore, although the wage rate is lower in country H so the firm-specific knowledge can be produced in that country more cheaply, country S has to be the headquarters of multinational enterprises in order to get the advanced technology.

A firm S (a firm with the headquarters in country S) can choose the following activities to get into the market in country H: exporting, setting-up a new plant, acquiring a local plant or forming a joint venture with a local firm.

While a multinational enterprise can get benefits by joint-venturing, there will be additional costs within a joint venture because the parent firms may have different targets or both try to get a larger share of profits at the expense of the partner(s)[9]. We will not go in details into these matters but simply assume a fixed labor usage, J, being the cooperation cost.

An acquisition or merger is an alternative to setting up a new plant or joint-venturing. Buyout of an existing firm has a purpose similar to joint-venturing because of access to the plant-specific input. However, the adaptation of the acquirer's existing management system to the acquired's system may be very costly. Moreover, acquisitions or mergers

[9]Recent models on the problem of cooperation between two partners within a joint venture can be found in Darrough and Stoughton (1989) and Chan and Hoy (1991).

require much more capital investment so they are more risky. Capital involvement and uncertain matters are neglected in order to simplify the model. Only a fixed labor requirement, R, is assumed to exist from the acquisition of a local firm.

Moreover, since cultural differences increase the difficulty for foreign investors, it is assumed that there is extra labor usage of C for any foreign firm adapting to the local environment. Therefore, if a firm S sets up a new plant in country H, the plant has to use extra labor of C units in addition to the total cost of a high-cost-plant in country S. If the firm acquires a plant in the host country, the extra labor usage is C+R. If the firm joins with a local firm to run a plant, the extra labor need is C+J. It is clear that a firm S prefers setting up new plants in country H rather than acquiring or joint-venturing if the local plant has no advantage over the investing firm. That is, a firm S will not acquire or act as a partner for any high-cost-plant which has no local advantage.

Proposition 3.1: A necessary condition for the appearance of FDI is $A > A^* + C$.

Proof:

When a firm S decides whether to set up a plant in country H or not, it has to compare its gains from advanced technology with the costs from adaptation to the local market. A subsidiary plant (high-cost-plant) of a firm S in country H has the total cost $(A^* + C + B_h x_h)w$ while a high-cost-plant of a firm H has the total cost $(A + B_h x_h)w$ when the outputs of both plants are the same. If $A > A^* + C$, a firm S can run a high-cost-plant in country H in a lower cost than the local high-cost-plants. It is obvious that firms S will invest in country H. Then all the high-cost-plants in country H are operated by firms S while firms H can only retain, at most, low-cost-plants. If $A < A^* + C$, firms S cannot compete with the local firms in production in the host country. Firms S have no incentive to invest in country H at all. Since at most, only one means of investment is possible, no FDI appears in this case.

It should be noted that if $A = A^* + C$, a firm S has no disadvantage in operating a high-cost-plant in country H as the local high-cost-plants. However, since the profit of each existing high-cost-plant is zero, one more plant will only lead to negative profits, consequently, firms S do not have any interest in investing in country H. Therefore, the condition of a firm S becoming a multinational enterprise is $A > A^* + C$ instead of $A \geq A^* + C$. □

From the proof above, it is immediate to have a lemma:

Lemma 3.1: If $A > A^* + C$, all the high-cost-plants in country H are operated by firms S.

When a firm S becomes a multinational enterprise, there is further consideration about how to invest. Assume that an owner of plant-specific input prefers not to transfer his or her ownership unless he or she has a higher income. Also assume that an owner does not want to change his or her status as an entrepreneur unless he or she can earn more income. However, if an entrepreneur has the same income to remain as an owner or to become a worker, he or she prefers the status quo. The following propositions summarize the decisions of firms H and firms S on whether forming joint-ventures or not.

Let π^J and π^{R*} be the profits of a joint venture and a wholly-owned subsidiary transformed from acquisition respectively; π^I denotes the profit of a firm H. We have some propositions below.

Proposition 3.2: If $A > A^* + C$, the necessary condition for a firm S forming a joint venture with a firm H is $\pi^J \geq Max[\pi^{R*}, w]$.

Proof:

As a firm is assumed to maximize its own profit, it chooses a kind of investment which provides the greatest profit rate. If the multinational firm can earn more profits from acquisition, i.e. $\pi^{R*} > \pi^J$, acquisition will be preferred to joint-venturing. If the wage rate is higher than the joint venture, i.e. $w > \pi^J$, the joint venture cannot provide sufficient remunerations to the entrepreneur H. Joint venturing is preferred if $\pi^J > \pi^{R*}$ and $\pi^J > w$. If $\pi^J = \pi^{R*} = w$, an entrepreneur H still prefer joint-venturing as they can maintain the operation of a plant if all the profit from the joint venture goes to the entrepreneur. So the necessary condition for a firm S forming a joint venture with a firm H is $\pi^J \geq Max[\pi^{R*}, w]$. □

Proposition 3.3: If $A > A^* + C$, a firm H will be out of business if $\pi^I < w$ or

$$\beta < \frac{F + A + 1}{A^* + C} , \tag{3.24}$$

unless a firm S is willing to cooperate with it.

Proof:

When $A > A^* + C$, according to Proposition 3.1, firms S invade country H and all high-cost-plants are controlled by firms S. Firms H retain only at most low-cost-plants. Suppose a firm H runs the business under its whole control, it has the profit as:

$$\pi^I = p_l x_l^I - (A + B_l x_l^I)w - Fw , \tag{3.25}$$

where the superscript I denotes the equilibrium state under the invasion of firms S. The profit of a high-cost-plant in country H, on the other hand, is equal to zero due to free entry of firms S:

$$\pi_h^{I^*} = p_h x_h^I - (A^* + C + B_h x_h^I)w = 0 .$$

The prices of all varieties have the same forms as in a closed economy ((3.11a) and (3.11b)) with only a (possible) difference in wage rates due to constant price elasticities of demand and the same marginal costs. But the equilibrium outputs are different:

$$x_l^I = \frac{\theta}{1-\theta}\frac{A^* + C}{B_l}\beta ,$$

and

$$x_h^I = \frac{\theta}{1-\theta}\frac{A^* + C}{B_h} .$$

Substituting the equilibrium price function (3.11a) and the above equilibrium output of x_l^I into (3.25), it follows that the profit rate of a firm H is:

$$\pi^{I} = [\beta(A^{*}+C) - (F+A)]w \quad (3.25')$$

The entrepreneurs H prefer to be workers if $\pi^{I} < w$. From (3.25'), we have the condition that no firms H are willing to stay in the market unless firms H and firms S join together:

$$\beta < \frac{F+A+1}{A^{*}+C} \quad (3.24)$$

□

It is interesting to note that if $A^{*}+C$ is smaller or $F+A+1$ is larger, β is more likely to be smaller than $(F+A+1)/(A^{*}+C)$. This means that when the fixed costs of the foreigners are relatively smaller, the local advantage of the local firms becomes less favorable and then the profit rate of an entrepreneur H is more likely to be lower than the wage rate. However, if a firm S offers to join with a firm H by providing the latter a share at least the same as the wage rate, the firm H will stay in the market by forming a joint venture with the foreign partner; otherwise, the firm H will leave the market.

Proposition 3.4: If $A > A^{*}+C$ and $\beta < (F+A+1)/(A^{*}+C)$ (i.e. $\pi^{I} < w$), the conditions for a firm S forming a joint venture with a firm H are $F+A > A^{*}+C+J$ (or $\pi^{J} \geq w$) and $R \geq J+1$ (or $\pi^{J} \geq \pi^{R*}$).

Proof:

This proposition follows Proposition 3.2 and Proposition 3.3. The parameters are derived in the following paragraphs.

When a firm S has the advantage over its foreign counterparts, in addition to setting up high-cost-plants, it considers whether it is profitable to operate a low-cost-plant in the host country through acquisition or by joint-venturing. If a firm S acquires a local firm, the profit of that low-cost-plant is:

$$\pi^{R^*} = p_t x_l^I - (A^* + C + R + B_t x_l^I)w \ ,$$

or by using the equilibrium price (3.11a) and the value of x_t^I, we have:

$$\pi^{R^*} = [(A^* + C)\beta - (A^* + C + R)]w \ , \qquad (3.26)$$

where the superscript R^* denotes the equilibrium state under acquisition behaviors. Though the marginal cost B_t is obtained by buying a low-cost-plant, the fixed cost is $(A^* + C + R)w$ as the adaptation is costly. An entrepreneur H is willing to sell his or her firm at any positive price as he or she is planning to close the firm. This is logical since under the assumption that all individuals desire higher income and no one cares about each other's income, other things being constant, the entrepreneur H prefers a positive income by selling his assets rather than letting the firm stand idle without any revenue. Therefore, a firm S can take over a firm H if $\pi^{R^*} > 0$. From (3.26), it becomes:

$$\beta > \frac{A^* + C + R}{A^* + C} = 1 + \frac{R}{A^* + C} \ . \qquad (3.27)$$

If (3.27) is fulfilled, it is possible for a firm S to acquire a firm H.

On the other hand, a joint venture has the profit rate as:

$$\pi^J = p_t x_l^I - (A^* + C + J + B_t x_l^I)w \ ,$$

or

$$\pi^J = [(A^* + C)\beta - (A^* + C + J + B_t x_t^J)]w \ , \tag{3.28}$$

by using (3.11a) and the equilibrium value, x_t^J. The superscript J means the equilibrium state under joint-venturing. As the joint venture can share the firm-specific knowledge from the parent S and the plant-specific input from parent H, A^* is included in the production function and Fw (the firm-specific cost) is saved. Since an entrepreneur H maintains his or her position only if the earning is not less than w, the firm S has the incentive to form a joint venture if the profit rate of a low-cost-plant is at least the same as the wage rate: $\pi^J \geq w$. From (3.28), this means:

$$\beta \geq \frac{A^* + C + J + 1}{A^* + C} = 1 + \frac{J+1}{A^* + C} \ . \tag{3.29}$$

Equation (3.29) is the necessary condition that a firm S is willing to form a joint venture with a firm H.

Because firms S compete with each other in searching for partners in joint ventures or targets for acquisition, the profits will totally go to the firms H (or the former firms H whatever case is applied). From the viewpoint of firms H (or former firms H), the highest bid is desirable. A joint venture is preferred over acquisition if $\pi^J > \pi^{R^*}$ and then. If both (3.27) and (3.29) stand, comparing (3.26) and (3.28), we have the condition: a joint venture is preferred if $R > J + 1$ and then (3.29) holds. Reminding that when $\pi^J = \pi^{R^*}$, a joint venture is formed as an entrepreneur prefers to retain operation in a plant. Combining (3.24), the conditions of joint-venturing are $(F + A) > (A^* + C + J)$ and $R \geq J + 1$. The intuition is obvious that when the fixed cost of a firm H (with only one plant) is higher than the fixed cost of a joint venture, and the cost of acquisition is higher than the cooperation cost of joint-venturing plus the wage rate, a firm S will form a joint venture with a firm H. □

Similarly, acquisition is preferred if $\pi^J < \pi^{R*}$ and then $\beta > [1+R/(A^*+C)]$ and $R < J+1$. Combining with (3.24), we have the conditions $(F+A+1) > (A^*+C+R)$ and $R < J+1$. Low-cost-plants in country H will close down if neither $\beta \geq [1+(J+1)/(A^*+C)]$ nor $\beta > [1+R/(A^*+C)]$ holds.

On the other hand, the following propositions describe the conditions that firms H can survive in the market under the invasion of firms S.

Proposition 3.5: If $A > A^*+C$, a firm H may stay in the market to have its low-cost-plant under its total control if $\pi^I \geq w$ or

$$\beta \geq \frac{F+A+1}{A^*+C}, \tag{3.30}$$

unless the firm H is willing to sell all the assets to a firm S or to form a joint venture with a firm S.

Proof:

(3.30) is simply the reverse of (3.24) and the opposite explanation to Proposition 3.2 is applied here. One point to be noted is that if $\beta = [(F+A+1)/(A^*+C)]$, the profit rate of a firm H is equal to the wage rate. Then in this case, firms H stay in the market as acquisition or joint-venturing is not attractive enough. □

Proposition 3.6: If $A > A^* + C$ and $\beta \geq (F+A+1)/(A^*+C)$ (i.e. $\pi^I \geq w$), the necessary conditions for a firm S forming a joint venture with firm H is $F+A > A^*+C+J$ (or $\pi^J > \pi^I$) and $R \geq J$ (or $\pi^J \geq w$).

Proof:

If acquisition is preferred to joint-venturing, (3.26) is the total cost of the acquired low-cost-plant. If joint-venturing is preferred, the total cost of the joint venture is equal to (3.28).

If a firm S is able to acquire a low-cost-plant from a firm H, the acquirer has to pay a compensation to the acquired more than the income of the latter. That is, $\pi^{R^*} > \pi^I$. Using this restriction by comparing (3.25') and (3.26), we have:

$$[(A^*+C)\beta - (A^*+C+R)]w > [(A^*+C)\beta - (F+A)]w \ .$$

After simplifying, it becomes:

$$F+A > A^*+C+R \ . \tag{3.31}$$

For a joint venture to be formed, the profit of the joint venture has to be greater than the low-cost-plant operated by firm H alone so that the income of an entrepreneur H can be covered by the earnings of the joint venture. From (3.25') and (3.28), this restriction implies:

$$[(A^*+C)\beta - (A^*+C+J)]w > [(A^*+C)\beta - (F+A)]w \ .$$

And after simplifying, we have:

$$F + A > A^{*} + C + J \, . \tag{3.32}$$

Comparing the costs, joint-venturing is preferred to acquisition if R>J. The entrepreneurs H prefers joint-venturing even if R=J. In summary, the conditions for preferring joint-venturing are $F+A>A^{*}+C+J$ and $R \geq J$. □

Similarly, acquisition is possible if $F+A>A^{*}+C+R$ and $R<J$. If neither $F+A>A^{*}+C+J$ nor $F+A>A^{*}+C+R$ holds, firms H maintain complete control over their low-cost-plants.

The different cases of the possible forms of ownership in country H can be summarized in Table 3.1. It is helpful to follow the table by explaining the notations intuitively. The fixed cost of a firm-H-plant is denoted by A while $A^{*}+C$ denotes the fixed cost of a firm-S-plant in country H. If A is smaller than $A^{*}+C$, it means that the technological advantages of firms S do not compensate for the cost of adaptation in country H. No firms S can compete with firms H and case (5) includes the situations that no FDI occurs. Conversely, for cases (1) to (4), the technological advantage of a firm S can compensate for the cost of adaption in country H, FDI is possible and all high-cost-plants in country H are operated by firms S.

β reflects the importance of local knowledge ($\beta=(B_h/B_l)^{\theta/(1-\theta)}>1$). The larger is β, the more important is local knowledge, and vice versa. $(F+A+1)$ is related to the firm-specific cost and the total fixed cost of the low-cost-plant of a firm H plus the wage rate. The wage rate is the opportunity cost of an entrepreneur (i.e. "1" in the total fixed labor requirement, $F+A+1$) and then it should be counted. $(F+A+1)/(A^{*}+C)$ compares the costs of a firm H (only operating a low-cost-plant) and the fixed costs of a firm S's high-cost-plant. The larger is $(F+A+1)/(A^*+C)$, the greater is the advantage of a firm S over a firm H, and vice versa. If $\beta<(F+A+1)/(A^*+C)$, it means that the local knowledge is not as important as the technological advantage and then firms H may be driven out of the market.

$1+R/(A^*+C)$ $(=(A^*+C+R)/(A^*+C))$ refers to the comparison between the minimum costs of a acquired low-cost-plant and a new-establishing plant of firm S (low cost) in country H. The bigger is $1+R/(A^*+C)$, the less the advantage of acquisition over a newly set-up plant of a firm S. If $\beta\leq[1+R/(A^*+C)]$, the gain from the local knowledge is not greater than the extra cost of acquisition (and vice versa) and then acquisition is not justified.

$1+(J+1)/(A^*+C)$ $(=(A^*+C+J+1)/(A^*+C))$ refers to the comparison between the minimum costs of a firm S from a joint venture and the cost of a high-cost-plant newly set up by the firm S in country H. The opportunity cost of an entrepreneur H is taken into account and then "1" is included in the numerator. The larger is $1+(J+1)/(A^*+C)$, the less the advantage of joint-venturing over a new set-up plant of a firm S. If $\beta<[1+(J+1)/(A^*+C)]$, the gain from the local knowledge is smaller than the minimum extra cost paid by firm S for the joint-venturing. No joint ventures will be formed in this case.

For case (1), FDI is possible. However, the local knowledge is not as important as the technological knowledge (i.e. $\beta<(F+A+1)/(A^*+C)$) and the advantage of getting local knowledge cannot compensate for either acquisition or joint-venturing. Firms S will only set up high-cost-plants in country H.

A^*+C+R is the fixed cost of an acquired plant and A^*+C+J is the fixed cost of a joint venture. If $F+A>A^*+C+R$, the total fixed costs of a firm H (operating only a low-cost-plant) are larger than the minimum fixed costs of an acquired firm and then acquisition is possible and vice versa. Analogously, if $F+A>A^*+C+J$, the total fixed costs of a firm H are larger than the minimum fixed costs of a joint venture and then joint-venturing is possible, and vice versa.

For case (4), the local knowledge is more important (i.e. $\beta \geq (F+A+1)/(A^*+C)$) and the total fixed costs of a firm H are lower than either the minimum cooperation costs or the minimum acquisition costs (i.e. $F+A \leq A^*+C+R$ and $F+A \leq A^*+C+J$), firms S retain low-cost-plants alone. Both foreign firms and local firms operate their own wholly-owned firms.

Even if the local knowledge is more important than the technological advantage (i.e. $\beta \geq (F+A+1)/(A^*+C)$), if the minimum fixed costs of an acquired plant are smaller than the total fixed costs of a firm H (i.e. $F+A>A^*+C+R$) and the adaptation cost of that acquired plant is lower than the cooperation cost of a joint venture (i.e. $R<J$), acquisition is possible. This is the second part of case (2).

Although the local knowledge is not as important as the technical advantage of firms S (i.e. $\beta<(F+A+1)/(A^*+C)$), if the benefit from the local knowledge is larger than the extra cost from acquisition (i.e. $\beta>[1+R/(A^*+C)]$ and accordingly, $(F+A+1)>(A^*+C+R)$) and the adaption cost is lower than that of joint-venturing plus the wage rate (i.e. $R<J+1$), acquisition is possible. This is the first part of case (2).

Table 3.1: The Summary of Forms of Ownership in Country H

	Cases	Ownership forms in Country H
(1)	$A>A^{*}+C$, $\beta<[(F+A+1)/(A^{*}+C)]$, $\beta\leq[1+R/(A^{*}+C)]$ & $\beta<[1+(J+1)/(A^{*}+C)]$	Foreign wholly-owned subsidiaries (high-cost-plants only)
(2)	$A>A^{*}+C$, $\beta<[(F+A+1)/(A^{*}+C)]$, $F+A>A^{*}+C+R$ & $R<J+1$	Foreign wholly-owned subsidiaries (high-cost- and low-cost-plants)
	$A>A^{*}+C$, $\beta\geq[(F+A+1)/(A^{*}+C)]$, $F+A>A^{*}+C+R$ & $R<J$	Foreign wholly-owned subsidiaries (high-cost- and low-cost-plants)
(3)	$A>A^{*}+C$, $\beta<[(F+A+1)/(A^{*}+C)]$, $F+A>A^{*}+C+J$ & $R\geq J+1$	Foreign wholly-owned subsidiaries, international joint ventures
	$A>A^{*}+C$, $\beta\geq[(F+A+1)/(A^{*}+C)]$, $F+A>A^{*}+C+J$ & $R\geq J$	Foreign wholly-owned subsidiaries, international joint ventures
(4)	$A>A^{*}+C$, $\beta\geq[(F+A+1)/(A^{*}+C)]$, $F+A\leq A^{*}+C+R$ & $F+A\leq A^{*}+C+J$	Foreign wholly-owned subsidiaries, domestic wholly-owned firms
(5)	$A\leq A^{*}+C$	Domestic wholly-owned firms (both high-cost-plants and low-cost-plants)

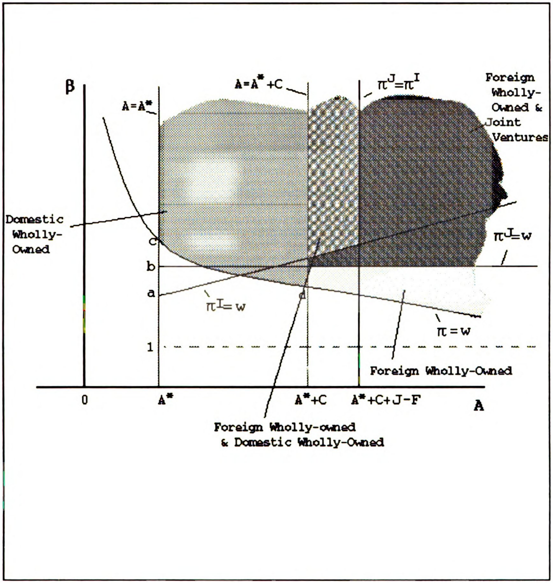

Figure 3.3: An Example of the distribution of Ownership Forms in Country H with

R>J+1>F-C+1>1 and F+1>J>F

Similarly, when the local knowledge is more important than the technological advantage (i.e. $\beta \geq (F+A+1)/(A^{*}+C)$), if the minimum fixed costs of a joint venture are smaller (i.e. $F+A > A^{*}+C+R$) and joint-venturing derives costs not larger than acquisition (i.e. $R \geq J$), a joint venture may be formed. This is the second part of case (3).

For the cases that the local knowledge is less important (i.e. $\beta < (F+A+1)/(A^{*}+C)$), if the ratio of the cost of a joint venture to a newly established firm-S-plant (high-cost-plant) is smaller than the gain from the local knowledge, $\beta \geq [1+(J+1)/(A^{*}+C)]$ (or accordingly, $(F+A) > (A^{*}+C+J)$) and joint-venturing costs plus the wage rate are not as high as acquisition costs (i.e. $R \geq J+1$), even if the local knowledge is not as important as the technological advantage, joint ventures will be formed. This is the first part of case (3).

It is not possible to cover all cases in a 2-dimensional diagram, but it may be helpful to illustrate an example. Figure 3.3 is the example of $R > J+1 > F\text{-}C+1 > 1$ and $F+1 > J > F$. The first constraint means that joint-venturing is preferred to acquisition (i.e. $R > J+1$). It also refers to the fact that the extra costs of a joint venture are larger than the total fixed costs of a firm H (i.e. $J+C+1 > F+1$). Moreover, the example assumes that $F\text{-}C > 0$, so that the firm-specific cost is larger than the culture-adaptation-cost. Since joint-venturing is preferred to acquisition, the diagram includes only the cases in which low-cost-plants are wholly-owned or transferred to joint ventures. No acquisition appears in this example. The second constraint means that the cost of cooperation is higher than the firm-specific cost but lower than the firm-specific cost plus the opportunity costs of an entrepreneur H (i.e. the wage rate).

The diagram shows the relationship between β and A. Going up along the vertical line (i.e. β is larger), the local knowledge becomes more important and then firms H are more likely to operate low-cost-plants more efficiently than firms S operating high-cost-plants. While going to the right along the horizontal line (i.e. A is larger), the technological advantage of firms S are larger (as A^* is assumed fixed and then is further smaller than A) and then firms S are more likely to operate high-cost-plants more efficiently than firms H operating high-cost-plants. It is clear that on the whole, FDI is more likely if moving to rightward; joint-venturing is more likely if moving upward.

Since the technology of country S is more advanced than country H, A^* is smaller than A, which is assumed at the beginning of this chapter. The feasible values therefore are only on the right hand side of the vertical line $A=A^*$.

If $A \leq A^*+C$, no FDI can enter country H. So left of the vertical line of $A=A^*+C$ and right of $A=A^*$ is an area of only exporting and then all plants in country H are wholly owned by the local firms. On the right hand side of $A=A^*+C$, the foreign firms are able to invest in country H.

The line $\pi^I=w$ (or $\beta=[(F+A+1)/(A^*+C)]$, corresponding to (3.24)) is upward sloping as it is positively related to A. It is denoted as $\pi^I=w$ since this line represents that the profit of a firm H is equal to the wage rate. Below the line (i.e. $\pi^I<w$) but right of line $A=A^*+C$, the domestic firms leave the market unless firms S cooperate with them. Above the line $\pi^I=w$ (i.e. $\pi^I>w$), firms H survive under foreign entries.

The line $\pi^J=w$ (or $\beta=[1+(J+1)/(A^*+C)]$, corresponding to (3.29)) is horizontal as it is independent from A. Along the line, the profit of a joint venture is equal to the wage rate, the opportunity cost of an entrepreneur H. Below the line (i.e. $\pi^J < w$) but right of line $A = A^* + C$, the investing firms will only set up high-cost-plants since the profit of a joint venture cannot compensate for the opportunity cost of an entrepreneur H. Thus, for the area below the horizontal line, the joint ventures are not profitable and so the area represents all foreign wholly-owned high-cost-plants only.

Above the line $\pi^J = w$ (i.e. $\pi^J > w$), joint venturing is possible. Though firms H cannot survive below line $\pi^I = w$, firms S find it valuable to cooperate with local low-cost-plants for the area above line $\pi^J = w$ but below $\pi^I = w$. Thus the area between the two lines includes foreign wholly-owned subsidiaries (high-cost-plants) and joint ventures.

The line $\pi^J = \pi^I$ (or $F + A = A^* + C + J$) is vertical as it is not dependent on β. The vertical line is on the right hand side of line $A = A^* + C$ because $J > F$ in this example (recall that $J + 1 > F - C + 1$). On the right hand side of the vertical line $\pi^J = \pi^I$ (i.e. $\pi^J > \pi^I$), the joint ventures are more efficient even if there are extra costs of cooperation and cultural adaptation. For the area above line $\pi^I = w$, firms H can survive. However, firms S are able to pay the entrepreneurs H even more than what firms H can earn themselves and then joint-venturing is possible. The area right of the vertical line $\pi^J = \pi^I$ but above line $\pi^I = w$ includes both foreign wholly-owned subsidiaries (high-cost-plants) and joint ventures.

On the other hand, on the left hand side of $\pi^J = \pi^I$ (i.e. $\pi^J < \pi^I$) but right of $A = A^* + C$, the joint ventures are not as efficient as firms H in operating low-cost-plants and joint ventures do not appear. We already know earlier that above the line $\pi^J = w$, the domestic firms can survive under foreign entries. It follows that the area between the two vertical lines (i.e. $A=A^*+C$ and $\pi^J=\pi^I$) but above line $\pi^I=w$ includes both foreign wholly-owned subsidiaries (high-cost-plants only) and domestic wholly-owned firms (each firm H operates only one low-cost-plant).

The intersecting point of the upward sloping $\pi^I=w$ and $A=A^*$ $((F+A^*+1)/(A^*+C)$, point a) is below the intersecting point of $\pi^J=w$ and $A=A^*$ $((1+(J+1)/(A^*+C)$, point b) as $J+C>F+1$ from the second constraint of this example. It can be seen that as this example considered is $F-C+1>1$, both intersecting points with $A=A^*$ are above $\beta=1$.

Recall that π is the autarky profit rate of a firm H. From the restriction for ensuring $\pi \geq w$ in the autarky economy, we have to add the comparison between (3.16) and w $(\pi=(\pi_\ell-Fw)\geq w)$ in the diagram. To reorganize the inequality, it becomes:

$$A \geq \frac{F+1}{\beta-1}.$$

The curve $\pi=w$ (i.e. $A=[(F+1)/(\beta-1)]$) is downward sloping as A is negatively related to β (but not linearly). Since $B_h>B_\ell$, it must be $\beta>1$. So the curve $\pi=w$ has the lower bound of $\beta=1$. On the other hand, $A=0$ is the left bound of the curve as A must not be negative. All the feasible values must be higher than the curve. The intersecting point of $\pi=w$ cutting $A=A^*$ is $(F+A^*+1)/A^*$ (point c) and the intersecting point cutting the line $A=A^*+C$ is $(F+A^*+1)/(A^*+C)$ (point d) which is below the intersecting points of both lines $\pi^I=w$ and $\pi^J=w$ cutting at $A=A^*+C$.

There is also an additional restriction to ensure that $M>N$.[10] We assume that L is very large compared to all other variables; subsequently this upper bound is far above.

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[10]The restriction corresponds to condition (28) of the working paper.

The restriction is not shown for simplification.

3.6 Coexistence Of International Joint Ventures And Foreign Wholly-Owned Subsidiaries In The Host Country

As the main interest of this thesis is comparing international joint ventures and foreign wholly-owned subsidiaries, we concentrate on case (3) in Table 3.1.[11] From Figure 3.3 which is a case in which joint-venturing is more efficient than acquisition, it can be noticed that coexistence of foreign wholly-owned subsidiaries and international joint ventures is at the right upper corner. This means that if A is larger (especially compared with A^*) or β is larger, other things being equal, the possibility of the appearance of both international joint ventures and foreign wholly-owned subsidiaries is higher. The reason is simple: if the technology gap between the two countries is larger (the difference between A and A^* is larger) and the value of local knowledge is higher (β is larger), the foreign firms find it easier to invade country H. However, the gain of local knowledge is also larger. It is, therefore, more likely for firms S to operate their wholly-owned high-cost-plants in addition to cooperating with firms H in operating low-cost-plants.

It can be shown that the price elasticity of any variety is the same as a closed economy. The prices and outputs can be found from the assumption of profit maximization and utility maximization and the fact of equal demand functions and same marginal costs for all varieties. The price and output of each variety are as follows:

[11]The other cases are described in the working paper.

$$p_h^J = \frac{B_h}{\theta} w^J, \quad p_l^J = \frac{B_l}{\theta} w^J, \quad p_h^{J*} = \frac{B_h}{\theta} w^{J*}, \quad p_l^{J*} = \frac{B_l}{\theta} w^{J*},$$

$$x_h^J = \frac{\theta}{1-\theta}\frac{A^*+C}{B_h}, \quad x_l^J = \frac{\theta}{1-\theta}\frac{A^*+C}{B_l}\beta,$$

$$x_h^{J*} = \frac{\theta}{1-\theta}\frac{A^*}{B_h}, \quad x_l^{J*} = \frac{\theta}{1-\theta}\frac{A^*}{B_l}\beta,$$

where the superscript J denotes the equilibrium value under joint ventures.

The full employment condition in country H becomes:

$$\begin{aligned} L &= \sum_{i=1}^{N}(A^*+C+J+B_l x_i) + \sum_{j=N+1}^{M^J}(A^*+C+B_h x_j) \\ &= N(J+B_l x_l^J - B_h x_h^J) + M^J(A^*+C+B_h x_h^J), \end{aligned} \tag{3.33}$$

where M^J is the equilibrium number of varieties of good X produced in country H. It implies that the low-cost-plants are joint ventures with each firm H providing lower marginal cost (B_l). But a firm S provides firm-specific knowledge and then the fixed cost of a low-cost-plant is A^*+C. In addition to the cooperation cost J, the total fixed cost of a joint venture is A^*+C+J. The high-cost-plants are wholly-owned by firms S, so the local knowledge is absent (then the marginal cost of each plant is B_h) while the fixed cost is A^*+C.

Substituting the value of x_l^J and x_h^J into (3.33) and using a simple calculation, the number of varieties is:

$$M^J = \frac{(1-\theta)(L-NJ)}{A^*+C} + \theta N(1-\beta)$$

Since under FDI all plants are more efficient than those in a closed economy, M^J should be greater than M^A (M^A means the number of varieties produced in a closed economy).

3.7 Extensions And Discussions

(a) Internalization

The model assumes implicitly that a firm can expand to any size. However, when a firm gets bigger, the management problem becomes more complicated, and then it may be inefficient for a firm exceeding a certain size. If the firm-specific cost is set as a positive function to the number of plants operated, the internalization matters can be included in horizontal integration.

(b) Two-way FDI

The model only allows one-way FDI, facing the same difficulty as the K-M-H model. However, if the model includes two sectors so that one country has the technology advantage on one sector and the other country has the advantage on the other sector, two-way FDI is possible. The extension can explain the cross-investment between two developed countries as long as the countries do not have equal technology levels in all production processes.

(c) Transport Costs

All foreign subsidiaries have been assumed to produce varieties different from the source country. This may be the main characteristic different from the K-M-H model due to the different assumptions of the transferability of the firm-specific knowledge. One reason is that the increasing returns to scale lead to higher efficiency in producing the same variety in only one place. But it is possible to include a case such that a similar variety is produced in both countries. If the transport cost is included so that exporting may not be worthwhile, the same variety can be produced in both countries.

(d) Three Forms of Ownership in the Host Country

Different production costs of the same products in a country may be the critical assumption for the result of coexistence of foreign wholly-owned subsidiaries and joint ventures within an industry. It has been assumed that there are only two kinds of plants different in production costs in a country. The result is that at most two forms of ownership can appear in the host country at the same time (as listed in Table 3.1). It is logical to extend the model to include three types of plants with different production costs. The conjecture is that in such an extension, three forms of ownership can coexist in a host country: foreign wholly-owned subsidiaries, domestic wholly-owned subsidiaries and international joint ventures.

(e) Collusion

A rather strict assumption is that all the firms in the same country cannot cooperate together to become a monopoly or to form a cartel. If the firms combine together to form a monopoly, in addition to the saving of firm-specific costs, the monopoly power can make each owner earn more, and then there is an incentive for the firms to merge. One possible reason to prevent such a monopoly is that the cooperation cost between any two firms is higher than the firm-specific cost. A cartel may not be efficient as: the free-rider problem is an obstacle and the anti-trust law is another explanation for no cartels arising. Moreover, if the punishment of the other firms is so inefficiently that it does not cause a firm to lose enough from cheating within a cartel, collusion will not be successful. Therefore, the assumption of no cooperation between local firms may have some grounds.

3.8 Concluding Remarks

This chapter combines the analysis of the recent trade literature about applying increasing returns in trade models and the FDI literature on emphasizing transaction costs for multinational enterprises to elaborate the decision of a multinational enterprise to set up wholly-owned subsidiaries or joint ventures in a developing country. A multinational enterprise (or a potential multinational enterprise) will choose the entry mode in a foreign country based on the extent of gains from advanced technology compared to the costs of investment in a foreign country.

Forming a joint venture is a choice as long as the cooperation cost can be covered by the joint contribution from the parent firms. It has been shown that even if there are no impediments of trade and no taxes imposed, both international joint ventures and foreign wholly-owned enterprises can coexist in a developing country if the market is large enough to support two types of plants in the developing country and the cooperation cost can be covered. The other possibilities are totally foreign subsidiaries, totally domestic firms, coexistence of domestic wholly-owned firms and foreign wholly-owned subsidiaries.

In this model of differentiated products, the critical assumption is that the local knowledge is not transferable so there are only a limited number of varieties produced at a lower cost. The implication is that when foreign wholly-owned subsidiaries and international joint ventures coexist in an industry, the production functions within the industry are not homogeneous.

Although the basic model seems limited by strict assumptions, extensions can be applied to expand the explanatory power. One limitation of this chapter is that only one-way FDI is allowed. However, two-way FDI may be extended in a two-sector model in which one country has the technological advantage in one sector, and the other country has the advantage in another sector. In conjecture, a two-way interindustry FDI results though it is still not certain in two-way intra-industry FDI which may require a more complicated market structure.

Although this chapter focuses on the investment from a developed country in a developing country, the results can be applied to the FDI between two developed countries. This is because in the real world, no two developed countries have the same technology levels in all industries. One country may have the technological advantage in industry A while the other has the advantage in industry B. An example is the automobile industries of the United States and Japan which both are developed countries. There has been evidence that the cost of a Japanese car was lower than the same class of an American car.[12] In fact Japanese automobile firms set up both wholly-owned subsidiaries and joint ventures in the United States. The entry modes are similar to those in this chapter. However, the Japanese investment in the automobile industry may be mainly due to the jump-over of trade impediments. Whether the theory of this chapter applies to these facts remains inconclusive. Some research may be done in this direction.

When the firms have greater marketing power and they carry out strategic behaviors, for example, the results will not be so clear-cut. Moreover, this chapter is only based on the static analysis. The learning process and technology growth problems are ignored in the static situation. The learning and growth matters are very important in the decision making of a multinational enterprise and so the results will be much more complicated under a dynamic process. Further investigation of dynamic analysis and strategic behaviors is the next job in perfecting the research direction.

[12]Dixit (1988) shows some estimated costs of the Japanese cars and American cars in the early 1980s.

Chapter 4

Welfare Analysis Of Foreign Direct Investment Under Spillover Effects

4.1 Introduction

This chapter uses a very simple model to look into the welfare effects of the host country when FDI leads to technological imitation. The conclusion is not single direction: FDI may or may not be beneficial to the host country but the indications for the welfare effects can be seen from the imitation rate, the technological gaps and preferences.

Technology and management skills may spill over to sectors without foreign investment because the management skills are usually common to many industries and better technology can raise efficiency of the whole society. Therefore, there are positive externalities on interindustry spillovers apart from the more direct intra-industry spillover effects. Not only are the intra-industry spillovers positive when tested empirically[1], but there is also evidence of beneficial interindustry spillovers[2] in the real world.

The developing countries usually find it difficult to catch up with the developed country. The requirement of better education of workers and the existence of cultural differences, for example, may slow down the learning process. Also the technology

[1]For example, there are empirical works of Blomström and Persson (1983), Globerman (1979), Jaffe (1986), Levin and Reiss (1988), and Spence (1984).

[2]See Bernstein (1988), Bernstein and Nadiri (1988), Scherer (1984) and Schmookler (1966).

transfer is costly[3] or the transfer is imperfect to the host country.[4]

This paper assumes that both intra-industry spillovers and interindustry spillovers are possible. The technology transfer is reflected by lowering the costs of the host country. But technology transfer is not perfect, so the host country cannot lower the cost to the level of the source country. It is further assumed that the spillover effects appear exogenously for simplification.

The basic set-up in this chapter is different from chapter 3. A monopoly may arise in the investing sector so that local profits are lost to the foreigners. On the other side, however, efficiencies of local industries are raised by FDI. Even the non-investing sector has improved productivity due to interindustry spillover effects. It is hard to say whether FDI is good for the host country or not.

A policy evaluation in this model is that governmental intervention in FDI may be justified because intervention may increase the domestic welfare. Furthermore, compared to a complete ban of FDI, minimum local ownership requirements - all foreign firms operating locally must at least include a certain share of local ownership, which is common in developing countries - should be a better policy.

4.2 The Model

A two-country two-sector model is used instead of the two-country one-sector model in the previous chapter. Country S is still the developed country, and it is also the source

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[3]Teece(1977) concludes that there are costs in transferring technology.

[4]Imitation is assumed perfect in some literature. One example is Segerstrom (1991).

country. Country H is the host country. It is also assumed that both countries have the same size and the same endowment, particularly both have labor forces of size L units of labor. The two sectors are called sector X and sector Y. Labor is the only physical input used in producing good X and good Y. Good X is tradable while good Y is non-tradable and is consumed only by the people in the respective country.[5] Moreover, FDI is only possible in sector X. Both goods are homogeneous rather than differentiated. However, sector Y is perfectly competitive while sector X is occupied by one domestic firm or one foreign firm or both. The only forms of FDI are establishment of a foreign wholly-owned subsidiary or setting up of an international joint venture. All consumers are the laborers who earn their own income, and the number of consumers is equal to the number of workers. The profit(s) earned by the firm(s) in sector X is(are) distributed equally to all individuals with the same nationality.

The reason why good Y is non-tradable and the production is isolated from FDI is owing to controlling the effects of interindustry spillovers. Moreover, the algebra complexities can be reduced for cleaner results by concentrating FDI on only 1 sector.

Country H

At first, country H is considered. The production of good X is determined by the number of workers, the technology and management inputs (i.e. the firm-specific assets) and the local knowledge. Let X be the amount of output of good X in country H. As before, a minimum amount of the firm-specific inputs, F, is sufficient for any level of

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[5]Good Y may be referred to certain local services so that basically the foreigners do not consume the services and trading is not possible.

output of good X within a firm. The production of firm-specific assets is subject to constant returns to scale and furthermore, each unit of the firm-specific assets is produced by 1 unit of labor, i.e. $F=L_F$ where L_F is the total labor required in producing firm-specific inputs.

The cost function of good X is similar to that in Chapter 3: it is subject to increasing returns to scale while the marginal product is constant. As before, A is the coefficient of the fixed cost and B_l and B_h denote the coefficients of the marginal cost with or without local knowledge respectively. However, as good X is homogeneous in this model, only one plant is necessary and the plant must obtain local knowledge. If no good X is produced, it is assumed that no fixed cost is necessary. Thus, the labor required in a plant (L_P, excluding the production of firm-specific assets) is:

$$\begin{aligned} L_P &= A + B_l X\,, \qquad && X > 0\,, \\ &= 0\,, && X = 0\,. \end{aligned}$$

Adding L_F and L_P together, the total labor required in sector X (L_X) is equal to the employment of the monopoly (firm H):

$$\begin{aligned} L_X &= F + A + B_l X\,, \qquad && X > 0\,, \\ &= 0\,, && X = 0\,. \end{aligned} \tag{4.1}$$

Under the assumption of perfect mobility of labor where all the workers are identical, the wage rate, w, is the same for all workers. The total cost of the monopoly becomes:

$$\begin{aligned} TC_X &= L_X w = (F + A + B_l X) w\,, \qquad && X > 0\,, \\ &= 0\,, && X = 0\,. \end{aligned}$$

The production of good Y, unlike good X, is under constant returns to scale, and then the labor required is:

$$L_Y = CY , \tag{4.2}$$

where C is a constant; L_Y is the labor used in sector Y.

Due to the fact that labor is perfectly mobile, the society is fully employed and so $L = L_X + L_Y$. The production of good Y and good X is restricted by the full employment condition. Using (4.1) and (4.2), Good Y has the following relationship with good X:

$$\begin{aligned} Y &= \frac{L-(F+A+B_l X)}{C}, \qquad \text{if } X > 0 , \\ &= \frac{L}{C}, \qquad\qquad\qquad\quad \text{if } X = 0 . \end{aligned} \tag{4.3}$$

The price of good Y is equal to the constant multiplied by the wage rate (average cost). To take good Y as the numeraire, we have:

$$1 = Cw . \tag{4.4}$$

It is assumed that the utility of an individual j is in form of a Cobb-Douglas function as follows:

$$U^j = c_{xj}^{\alpha} c_{yj}^{1-\alpha}, \qquad 0 < \alpha < 1 , \tag{4.5}$$

where c_{xj} is the consumption of good X and c_{yj} is the consumption of good Y by the individual j.

The monopoly in sector X is owned by all the consumers who have equal shares in the firm, but the decision making of the firm is independent from the shareholders.[6] Therefore, the income of a typical consumer includes both wages and the share of profits. As each individual owns 1 unit of labor, w is the wage income each worker earns. Let P be the price of X. The total profit functions are:

$$\begin{aligned} \Pi_X &= PX-(F+A+B_l X)w\ , \quad && \text{if } X>0\ , \\ &= 0\ , && \text{if } X=0\ . \end{aligned} \tag{4.6}$$

Each consumer, i.e. each shareholder, has the share of profits:

$$\pi = \frac{\Pi_X}{L} \ .$$

As all individuals are identical, the income of every consumer is:

$$I^j = w + \pi \ .$$

Then each individual has the following income constraint:

$$w+\pi \geq Pc_{xj}+c_{yj} \ . \tag{4.7}$$

Country S

The main difference between the two countries is that the technology level in producing either good is higher in country S. It is assumed that only the marginal product (of either good) is higher in country S. All the other factors such as endowments and

[6]This assumption may not be reasonable as a rational person will try to affect the decisions of the firm to maximize one's own utility. The assumption of the independent decision making is useful in projecting the decision making in the real world. A more reasonable assumption may be the division of ownership of the firm from the laborers. However, it will only provide the same intuition results but with more complicated algebras.

consumer preferences are equal in the two countries. The different variables are represented in asterisks. In sector X, the employment and the total cost functions ($X^* > 0$) are:

$$L_X^* = F + A + B_l^* X^* \ ,$$

$$TC_X^* = L_X^* w^* \ , \qquad where \ \ B_l^* < B_l \ .$$

But it should be noted that in the absence of local knowledge, the marginal product of country S may or may not be higher than the marginal product of country H which has the local knowledge, i.e. B_l may or may not be larger than B_h^*. This means that the local knowledge may be efficient enough to cover the disadvantage in the technology level. As the marginal costs are different in the two countries, the variables (in physical terms or money terms) in sector X are different from country H.

The labor employed and the price of good Y are:

$$L_Y^* = C^* Y^* \ ,$$

$$P_Y^* = C^* w^* \ , \qquad where \ \ C^* < C \ .$$

P_Y^* is the price of good Y in country S. Since the prices of good Y in both countries may not be the same, P_Y^* may not be equal to 1. This is not important for the autarky condition, but in open economies, the prices of good Y in both countries should be compared as the firms in sector X evaluate the profit rates in terms of the price of good Y in their own countries. We will see the importance in Proposition 4.4.

For the demand side, the utility function of a typical individual is:

$$U^{j*} = c_{xj}^{*\alpha} c_{yj}^{*1-\alpha} .$$

The profit functions and income of a consumer ($X^* > 0$) are:

$$\Pi_X^* = P_X^* X^* - (F + A + B_l^* X^*) w^* ,$$

$$\pi^* = \frac{\Pi_X^*}{L} ,$$

$$I^{j*} = w^* + \pi^* .$$

4.3 Closed Economies

At first, we look into the closed economy of country H. It is assumed that all identical consumers maximize their utility functions, and the firms maximize the profits. From the demand side, consumer j maximizes his utility (equation (4.5)) subject to the income constraint (equation (4.7)). We can write it down as below:

$$\textit{Max} \quad U^j = c_{xj}^{\alpha} c_{yj}^{1-\alpha}$$

$$\textit{Subject to} \quad w + \pi \geq P c_{xj} + c_{Yj} .$$

Since no saving is allowed in this static situation, all incomes are exchanged for the goods and then the inequality can be taken to be equality within the income constraint. It is assumed that in equilibrium, both goods supplied are positive. Let λ be the Lagrange Multiplier, then from the first order condition (with respect to the consumption of good) and the total amount of all individual consumption on good X, the price of good X has the relationship as:

$$P = \frac{\alpha}{\lambda}\left(\frac{Y}{X}\right)^{1-\alpha} \quad (4.8a)$$

And the price of good Y has the relationship as:

$$1 = \frac{1-\alpha}{\lambda}\left(\frac{X}{Y}\right)^{\alpha} \quad (4.8b)$$

Combining (4.8a) and (4.8b), the inverse demand function can be expressed as:

$$P = \frac{\alpha}{1-\alpha}\left(\frac{Y}{X}\right) \quad (4.9)$$

Since the decision of the monopoly is independent from the shareholders, the profit maximization condition is reached by having the marginal revenue (MR) equal to the marginal cost (MC). Using the first order condition of the first derivative of the total profit (4.6) with respective to X, we have:

$$P(1-\frac{1}{\varepsilon}) = B_l w$$

where ε is the elasticity of demand for good X. It is well-known that the elasticity of good X, ε, is equal to: $\varepsilon=1/(1-\alpha)$. Then the profit maximizing price is:

$$P = \frac{B_l w}{\alpha} \quad (4.10)$$

From (4.4), the wage rate becomes:

$$w = \frac{1}{C} \quad (4.11)$$

and then we can get the profit maximizing price as:

$$P^A = \frac{B_l}{\alpha C} \quad \text{(4.10')}$$

Substituting (4.9) into (4.10'), we can get good X in terms of good Y (Y>0):

$$X = \frac{\alpha^2}{1-\alpha}\frac{C}{B_l}Y \quad \text{(4.12)}$$

Using the full employment condition, we have:

$$\begin{aligned} L &= L_X + L_Y \\ &= F + A + \frac{1-\alpha+\alpha^2}{1-\alpha}CY \end{aligned}$$

Therefore we can solve the equilibrium quantity of good Y as:

$$Y^A = \frac{1-\alpha}{1-\alpha+\alpha^2}\frac{L-(F+A)}{C} \quad \text{(4.13)}$$

Substituting (4.13) into (4.12), we have equilibrium good X as:

$$X^A = \frac{\alpha^2}{1-\alpha+\alpha^2}\frac{L-(F+A)}{B_l} \quad \text{(4.14)}$$

where the superscript A represents the equilibrium level in the autarky economy.

From (4.6) and (4.14), the total equilibrium profit (x>0) is as below:

$$\Pi^A = \frac{\alpha(1-\alpha)L-(F+A)}{(1-\alpha+\alpha^2)C} \quad \text{(4.15)}$$

And we have the equilibrium national income as:

$$I^A = \Pi^A + Lw = \frac{L-(F+A)}{(1-\alpha+\alpha^2)C}.$$

By assuming that no individual's utility function is affected by others, the social welfare function is the sum of all consumers. Since all individuals are identical, and the social welfare function is assumed to be additive with each one has equal weight, the welfare is equal to L multiplied by a typical individual's utility function:

$$U^A = Lc_x^{A^\alpha}c_y^{A^{1-\alpha}} = X^{A^\alpha}Y^{A^{1-\alpha}}$$
$$= \left(\frac{\alpha^2}{1-\alpha}\frac{C}{B_l}\right)^\alpha \left(\frac{1-\alpha}{1-\alpha+\alpha^2}\frac{L-(F+A)}{C}\right). \tag{4.16}$$

The equilibrium condition of country H can be shown in Figure 4.1. (4.3) is the production possibility frontier. From that equation, Y=L/C if X=0 and X=[L-(F+A)]/B_l if Y=0. The production possibility frontier is line PP except at point a which is broken. This is because if production of good X is zero, the production of good Y is L/C (point b) instead of [L-(F+A)]/C (point a). It is derived from (4.3) that PP can be represented by the equation $B_lX+CY=L-(F+A)$, X>0 and Y≥0.

The price ratio is equal to the wage consumption (the consumption financed by wage income only) between sector X and sector Y. Suppose that the price ratio, P, is higher than the wage consumption ratio of good X on good Y. This means that firm H finds it profitable to hire more workers to produce good X, and then P will be lowered. The reverse is true if P is lower than the wage distribution ratio. In equilibrium, P is equal to the wage distribution ratio; therefore, WW, the wage constraint, has a slope of $-P^A$.

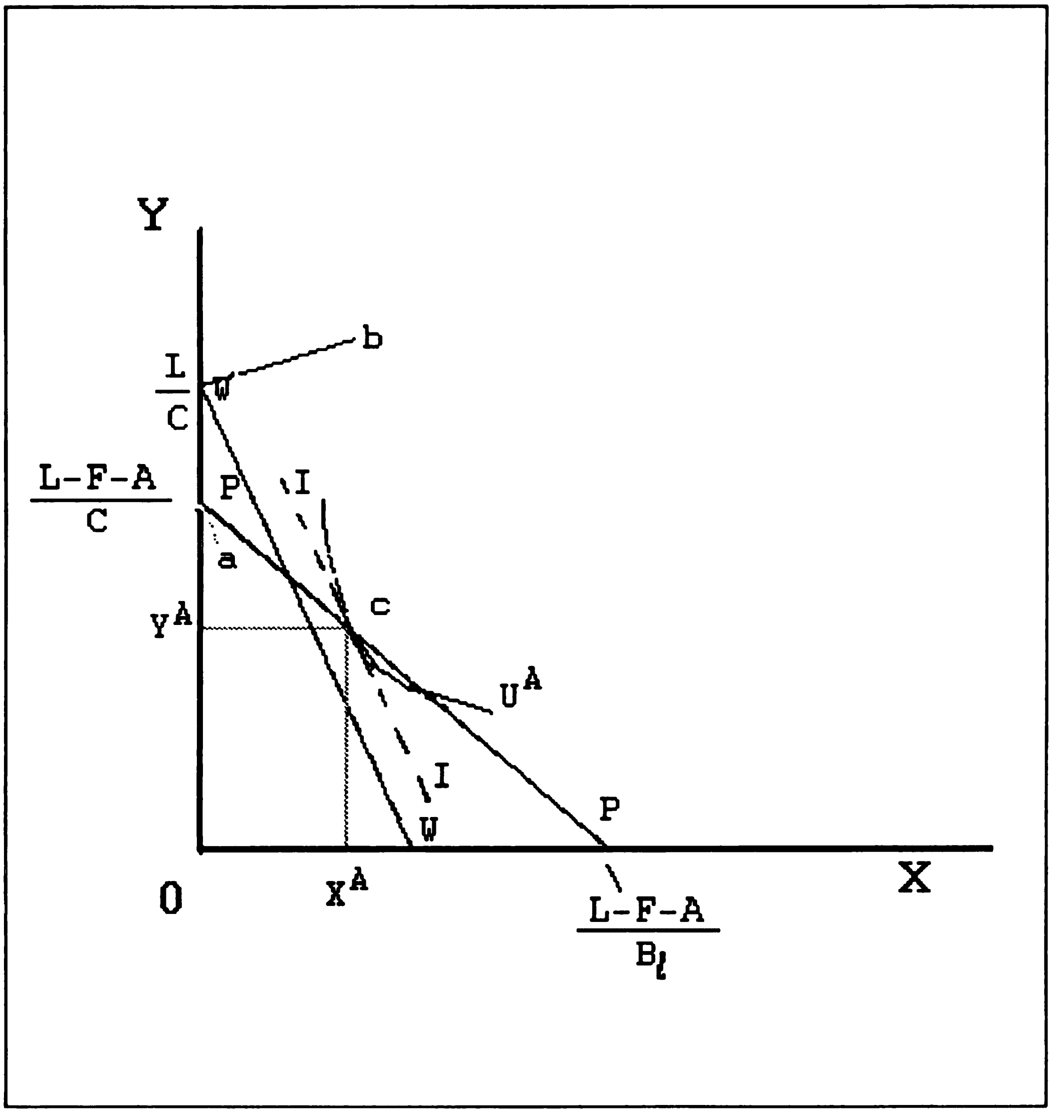

Figure 4.1: Equilibrium Condition of Country H in a Closed Economy

As noted above, $X=[L-(F+A)]/B_l$ if $Y=0$. From the total profit (4.6) and the price-wage relation (4.10), we can get the ratio of the total wage income to the total income for distributing good X when $Y=0$. The relationship is:

$$\frac{Lw}{\Pi_X+Lw} = \frac{\alpha L}{L-(F+A)},$$

where Lw is the total wage income. Therefore, the distribution of good X to wage income when $Y=0$ is:

$$\frac{Lw}{\Pi_X+Lw}X = \frac{\alpha L}{B_l}.$$

Accordingly, for WW, $X=\alpha L/B_l$ when $Y=0$. On the other hand, when $X=0$, no profits are earned and so all good Y is distributed to the wage income. It is easily seen that the other intercept of WW is $Y=L/C$ when $X=0$ from (4.3). WW can be represented by an equation $B_lX+\alpha CY=\alpha L$. WW is steeper than PP as the slope of PP is $-B_l/C$ while the slope of WW is equal to $-B_l/\alpha C$ (recall that $0<\alpha<1$).

Intuitively, existence of profits in sector X but not in sector Y explains the different slopes. If more resources (i.e. labor) are used in sector X, the proportion of wages to national income is lower as more profits are taken by the monopoly. Conversely, if more labor is hired in sector Y, the proportion of wages is higher. If no good X is produced, all national income comprises only wages; then on the Y-axis, WW must touch point b. If all products produced are good X, the difference between the national income and total wages is the largest as shown on the horizontal line.

The income constraint is the sum of the incomes of all individuals, i.e. the income constraint is equal to L multiplied by I^j. The income constraint, II, also has the slope of -P^A, parallel to WW. This is because in equilibrium, each individual has the share of profit of Π^A/L in addition to the wage rate. Each individual takes the profit share as exogenous wealth. The difference between II and WW is Π^A horizontally, so II is parallel to WW.

From both assumptions of full employment and maximization of utility, the social welfare function, U^A, must touch PP curve. On the other hand, since the consumers distribute their consumptions of both goods depending on the price ratio, the slope of the utility curve is equal to the slope of the price ratio, i.e. U^A is tangent to II. Therefore, U^A is tangent to II by cutting PP at point c. It can be seen that the efficiency of production is not maximized. This is because good X is not produced at the most efficient point ($P \neq MC$) and then the economy cannot reach the first best position though all the resources are used.

The situations in the closed economy of country S are similar to those in country H with the appropriate asterisks added to the equations. Since the technology level is higher in country S, the production level (and then the consumption level) of either good is higher than country H. It is obvious by comparing B_ℓ and B_ℓ^*, or C and C^*. A similar diagram (not shown) as Figure 4.1 can be used for country S.

4.4 One-Sided Investment From The Developed Country To The Developing Country

In the world with one tradable good with the same endowments in both countries and immobile labor across countries, if a monopoly is operating in either country, it is possible to trade between the countries[7]. For the sake of isolating the welfare effects of the developing country under FDI, it is assumed that trade is banned between the countries, and country S even prohibits any foreign investment. The only way for the two countries to have contacts is through investments from country S to country H. Therefore, country S must be the source country while country H is the host country.[8] It is also assumed that only the sector-X-firm in country S (firm S) has the incentive to invest in country H. A rationale for no firms investing in sector Y may be due to the fact that the costs generated from investing to sector Y are too high and then the firms are discouraged to invest in that sector.

In addition to the advantage of advanced technology, firm S can save the costs of management and technology (F is saved) in operating one more plant abroad. The problem is that firm S loses the advantage of local knowledge in the foreign country, and then the fixed cost of the foreign subsidiary will be higher (the coefficient of the variable cost is B_h^* instead of B_ℓ^*).

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[7]Brander (1981) provides a model to explain the intra-industry trade in a homogeneous good. He proves that when there is increasing returns to scale under Cournot competition, a low cost firm may not drive out a high cost firm.

[8]The assumptions may seem too artificial, but the assumptions can be further justified by taking transport costs into consideration. If transport costs are higher than the investment costs (e.g. the loss of advantage of local knowledge), a firm will substitute exports by direct production in the foreign country. In this case, it is not necessary to maintain trade.

It is also possible to justify one-sided investments. If the loss of the local knowledge advantage is too large for the high-cost firm but the loss of local knowledge advantage can be covered by the low-cost firm, only one-sided FDI appears.

To make the model be simpler, the above non-trade one-sided investment situation is taken for granted. This extreme case can be used to evaluate the effect of FDI on the host country in a most unfavorable situation. If the host country is better off in this case, it is suggested that FDI be welcomed. However, if the host country loses, FDI should be treated more cautiously though it does not suggest that FDI must be evil to the host country in general cases.

If a wholly-owned subsidiary is established, the labor hired by a subsidiary S (the subsidiary of firm S) in country H is $L_X^S = A + B_h^* X^S$. Forming a joint venture with the local firm can reduce the marginal costs by utilizing the local knowledge of the local firm. As discussed in Chapter 3, cooperation costs arise within the joint venture. Firm S thus compares the effects from both the positive side and the negative side to decide whether to set up a wholly-owned subsidiary, to cooperate with the local firm to form a joint-venture, or simply to cancel the investment plan. It is assumed that an extra cost, J, results from joint-venturing. That is, for a joint venture, the labor hired becomes:

$$L_X^J = A + J + B_l^* X^J ,$$

where L_X^J is the labor hired by the joint venture and X^J is the output of the joint venture.

Though acquisition is a possible behavior, we will not analyze this kind of activity in this chapter by concentrating attention on comparing a newly established wholly-owned subsidiary and a joint venture. To justify this simplification, we can assume that the takeover cost is too high for a firm to buy out an existing plant.

Under the effects of FDI, country H not only improves the efficiency in sector X where the technology is directly transferred but also raises the efficiency of sector Y due to the spillover effects. However, the imitation or the technology transfer is not perfect, so the production cost is reduced to a level between the original cost and the lowest level in country S. For simplification but not loss of generality, the technology transfer rate is assumed to be the same for both sectors. The rate is γ, $0<\gamma<1$. The percentage of reduction in the marginal cost of sector X (τ_x) and the average cost of sector Y (δ_y) are:

Sector X:

$$\tau_x = \frac{\gamma(B_l - B_l^*)}{B_l}, \qquad 0 < \tau_x < \frac{B_l - B_l^*}{B_l};$$

Sector Y:

$$\delta_y = \frac{\gamma(C - C^*)}{C}, \qquad 0 < \delta_y < \frac{C - C^*}{C}.$$

The equations above guarantee that the technology level in country H may not be higher than country S. If the cost gap is larger, the learning speed is faster under the same value of γ. The technology transfer is only possible under FDI since there is no other way for country H to contact country S. This is not a critical assumption. Even if there is technology transfer without FDI, as long as the transfer rate is lower than that of FDI, the basic result is applied. What is really important is the assumption of faster transfer rate under FDI[9]. This assumption is reasonable as FDI allows the local people to have better chance to learn the advanced technology or management skills.

By adopting technology transfers, if firm H (the sector-X-firm based in county H) survives under competition, the labor hired by the local firm in sector X becomes:

$$\begin{aligned} L_X^H &= F + A + [(1-\tau_x)B_l]X^H \\ &= F + A + [(1-\gamma)B_l + \gamma B_l^*]X^H . \end{aligned} \tag{4.17}$$

where the superscript H denotes the labor used or output produced by firm H. If there is FDI, the labor hired in sector Y is:

[9]It is assumed that the technology transfer is free from any cost. There are discussions about the costs of transferring technology. One example is Wang and Blomström (1992).

$$L_Y = [(1-\delta_y)C]Y \qquad (4.18)$$
$$= [(1-\gamma)C+\gamma C^*]Y \, ,$$

The entry mode of firm S depends on three considerations: the first is whether or not the total cost of the subsidiary with the loss of advantage of local knowledge is higher than the total cost of firm H (under technology transfer); the second is that is it profitable for firm S to cooperate with the local firm; the third is what the strategies of the two firms are. In this model, the strategy is assumed to be Cournot-Nash Competition.

Cournot-Nash Equilibrium

Suppose that firm S enters country H to set up a wholly-owned subsidiary and firm H competes with the foreign challenger independently. Thus there are two firms operating in the host country. Let

$$B_\tau = (1-\tau_x)B_l$$
$$= (1-\gamma)B_l + \gamma B_l^* \, ,$$

and

$$C_\delta = (1-\delta_y)C$$
$$= (1-\gamma)C + \gamma C^* \, .$$

Good Y in country H remains to be the numeraire. Firm H maximizes its profits by selling products X^H, i.e.

$$Max \;\; \Pi^H = PX^H - (F+A+B_\tau X^H)w \, . \qquad (4.19)$$

From the first order condition of the profit with respect to X^H, we have:

$$P\left(1-\frac{1}{\eta_H}\right) = B_\tau w \quad , \tag{4.20}$$

where η_H is the price elasticity facing firm H.

Similarly, the foreign subsidiary, subsidiary S, maximizes the profits in country H. The profits earned will be used to purchase good X in country H and then the purchased good X will be sent back to country S. It is assumed that the consumers in country S take the amount of good X coming abroad as exogenous and then the price elasticity of good X remains ε (both in home and abroad). Let X^S be the sales of good X by subsidiary S, the profit maximization of subsidiary S is:

$$Max \ \ \Pi^S = PX^S - (A + B_h^* X^S)w \ . \tag{4.21}$$

Subsidiary S saves the costs of producing firm-specific assets but the local advantage is lost by investing in country S. From the first derivative of Π^S with respect to X^S, the following equilibrium point can be reached:

$$P\left(1-\frac{1}{\eta_S}\right) = B_h^* w \quad , \tag{4.22}$$

where η_S is the price elasticity facing subsidiary S.

Let σ_H and σ_S be the market shares of firm H and subsidiary S respectively. It is clear that $\sigma_H+\sigma_S=1$. Let X^I be the total sales (or total demand) of good X in country H, i.e. $X^I=X^H+X^S$. Then the relationship between the price elasticity and the market share of firm H is:

$$\eta_H = -\frac{\partial X^H}{\partial P}\frac{P}{X^H} = -\frac{\frac{\partial X^I}{\partial P}}{\frac{\partial X^I}{\partial X^H}}\frac{P}{X^I}\frac{X^I}{X^H}$$

$$= \frac{\varepsilon}{\sigma_H}\,, \tag{4.23}$$

since by Cournot conjecture, $\partial X^I/\partial X^H=1$.[10]

Similar to firm H, the relationship between the price elasticity of firm F and the market share can be written as:

$$\eta_S = \frac{\varepsilon}{\sigma_S}\,. \tag{4.24}$$

Substituting (4.23) into (4.20) and (4.24) into (4.22) respectively and using the fact that $\varepsilon=1/(1-\alpha)$, the price of X can be written in two different ways:

$$P = \frac{B_\tau w}{1-\sigma_H+\sigma_H\alpha}\,, \tag{4.25a}$$

or

$$P = \frac{B_k^* w}{1-\sigma_S+\sigma_S\alpha}\,. \tag{4.25b}$$

Combining (4.25a) and (4.25b) together, we have:

[10]The duopoly equilibrium follows the derivation in Markusen (1981).

$$\frac{B_h^*}{B_\tau} = \frac{1-\sigma_S+\sigma_S\alpha}{1-\sigma_H+\sigma_H\alpha} .$$

Using the fact that $\sigma_H+\sigma_S=1$, after some rearrangement, the market shares are as follows:

$$\sigma_S = \frac{1}{1-\alpha}\left(\frac{B_\tau-\alpha B_h^*}{B_\tau+B_h^*}\right), \tag{4.26}$$

and

$$\sigma_H = \frac{1}{1-\alpha}\left(\frac{B_h^*-\alpha B_\tau}{B_h^*+B_\tau}\right). \tag{4.27}$$

Sector Y is still perfectly competitive. As good Y is the numeraire, under the effects of spillovers, we have the wage rate similar to (4.11):

$$w^I = \frac{1}{C_\delta} . \tag{4.28}$$

where the superscript I denotes the equilibrium value under FDI. Accordingly, the equilibrium price of good X in country H is:

$$p^I = \frac{B_h^*+B_\tau}{(1+\alpha)C_\delta} . \tag{4.25'}$$

From the consumption decisions of consumers, the inverse demand function of good X (recalled that good Y is the numeraire) can be reached as (4.9). Substituting (4.25') into

(4.9), the following relationship between demand for good X and good Y of country H consumers can be found:

$$Y^{I} = \frac{1-\alpha}{\alpha(1+\alpha)} \frac{B_h^{*}+B_\tau}{C_\delta} X_C^{H} \qquad (4.29)$$

where X_C^H is the country-H-consumers' demand for good X.

Since the consumers use all income on consumption. The total income is equal to the total expenditure on both good X and good Y in country H:

$$\Pi^{H}+wL = P^{I}X_C^{H}+Y^{I}\ . \qquad (4.30)$$

Substituting the profit function (i.e. (4.19)) and (4.29) into (4.30), we have:

$$X_C^{H} = \frac{\alpha(B_h^{*}-\alpha B_\tau)}{B_h^{*}+B_\tau} X^{H} + \frac{\alpha(1+\alpha)(L-F-A)}{B_h^{*}+B_\tau}\ . \qquad (4.31)$$

On the other hand, subsidiary S uses all the profits to exchange for good X in country H. The total profit of subsidiary S is equal to the total expenditure on good X, i.e.:

$$\Pi^{S} = P^{I}X_C^{S}\ , \qquad (4.32)$$

where X_C^S is the country-S-demand for good X in country H. Substituting (4.21) and (4.32), the relationship between X^S and X_C^S becomes:

$$X_C^{S} = \frac{B_\tau-\alpha B_h^{*}}{B_h^{*}+B_\tau} X^{S} - \frac{(1+\alpha)A}{B_h^{*}+B_\tau}\ . \qquad (4.33)$$

In equilibrium, the supply of good X is equal to the demand for good X, i.e.

$$X_C^S + X_C^H = X^S + X^H , \tag{4.34}$$

since $X^I = X^S + X^H$. Substituting (4.31) and (4.33) into (4.34), the following relationship between the quantities of producing good X by the subsidiary S and firm H becomes:

$$X^S = \frac{\alpha(L-F-A)-A}{B_h^*} - \frac{(B_h^*+B_\tau)-\alpha(B_h^*-\alpha B_\tau)}{(1+\alpha)B_h^*} X^H \tag{4.35}$$

Using the fact that $X_C^H = \sigma_H X^I$ and substituting (4.31) and (4.35) into it, we solve X^H:

$$X^H = \frac{\alpha^2(1+\alpha)}{(1+\alpha^2)(\alpha B_\tau - B_h^*)}(L-F-A) - \frac{1+\alpha}{(1+\alpha^2)(B_\tau - \alpha B_h^*)}A \tag{4.36}$$

Substituting (4.35) into (4.36), we can solve X^S:

$$X^S = \frac{\alpha(1+\alpha)}{(1+\alpha^2)(B_h^* - \alpha B_\tau)}(L-F-A) + \frac{1+\alpha^3}{(1+\alpha^2)(B_\tau - \alpha B_h^*)}A \tag{4.37}$$

Substituting (4.31) into (4.36), we can solve X_C^H:

$$X_C^H = \frac{\alpha(1+\alpha)}{(1+\alpha^2)(B_h^* + B_\tau)}(L-F-A) - \frac{\alpha(1+\alpha)(B_h^* - \alpha B_\tau)}{(1+\alpha^2)(B_\tau - \alpha B_h^*)(B_h^* + B_\tau)}A \tag{4.38}$$

X_C^S is solved by substituting (4.33) into (4.37):

$$X_C^S = \frac{\alpha(1+\alpha)(B_\tau - \alpha B_h^*)}{(1+\alpha^2)(B_h^* - \alpha B_\tau)(B_h^* + B_\tau)}(L-F-A) - \frac{\alpha(1+\alpha)}{(1+\alpha^2)(B_h^* + B_\tau)}A \quad .$$

Y^I can be solved by substituting (4.29) into (4.38):

$$Y^I = \frac{1-\alpha}{(1+\alpha^2)C_\delta}(L-F-A) - \frac{(1-\alpha)(B_h^* - \alpha B_\tau)}{(1+\alpha^2)(B_\tau - \alpha B_h^*)C_\delta}A \quad . \qquad (4.39)$$

(We can also get the results by using $X^S=\sigma_S X^I$.)

One interesting point of the difference between Y^I and X^I is that C_δ does not affect any part of good X while Y^I is affected by all exogenous variables. The reason is that the production of good Y is determined by the spillover effects so the equilibrium amount of good Y is determined by B_τ in addition to the other variables. Conversely, X^I need not depend on C_δ.

Proposition 4.1: Firm H will be driven out of the market if $\Pi^H<0$, or

$$\frac{\alpha^2 L + F}{A} < \frac{(1-\alpha)(B_h^* + B_\tau)}{\alpha B_h^* - B_\tau} \quad ;$$

unless a joint venture is set up.

Proof:

Firm H will not stay in the market if it makes negative profits under Cournot-Nash competition. That is, if the Cournot-Nash equilibrium leads to losses, firm H will leave the market and then $\sigma_H=0$. The condition for firm H to leave the market is $\Pi^H<0$, i.e.:

$$P^I X^H < (F + A + B_\tau X^H) w \ . \tag{4.40}$$

Substituting (4.37) into inequality (4.40), we have the following condition:

$$\frac{\alpha^2 L + F}{A} < \frac{(1-\alpha)(B_h^* + B_\tau)}{\alpha B_h^* - B_\tau} \ . \tag{4.41}$$

□

Proposition 4.2: Firm S is kept out from country H if $\Pi^S < 0$, or

$$\frac{L - F}{A} < \frac{(1+\alpha)(B_h^* - B_\tau)}{B_\tau - \alpha B_h^*} \ ;$$

unless a joint venture is formed.

Proof:

If firm H can maintain its monopoly status, this means that subsidiary S will make negative profit under Cournot-Nash competition and then $\sigma_S = 0$. The situation for firm S staying outside the market of country H is $\Pi^S < 0$, i.e.:

$$P^I X^S < (A + B_h^* X^S) w \ . \tag{4.42}$$

(4.42) shows that even if the investor sells all the outputs produced in the host country, the costs of production in that country cannot be covered. Substituting (4.37) into inequality (4.42), the following condition is obtained:

$$\frac{L-F}{A} < \frac{(1+\alpha)(B_h^* - B_\tau)}{B_\tau - \alpha B_h^*} \quad (4.43)$$

□

It is assumed in Cournot-Nash competition that the rivals do not cooperate with each other, so we have the following result:

Proposition 4.3: If $\Pi^S \geq 0$ and $\Pi^H \geq 0$, or both (4.41) and (4.43) do not hold, a duopoly of a local firm and a foreign firm will appear in country H.

Under Cournot-Nash competition, if both firm H and subsidiary S operate in the market, no joint ventures are formed as any kind of collusion is assumed to be excluded. However, if a monopoly stays in the market, the incumbent considers whether or not to cooperate with the potential rival for getting greater profits.

It is clear that appearance of a monopoly or duopolistic competition depends on all the exogenous variables: the preference of good X (α), the imitation rate (γ), the extent of loss of local knowledge (B_h^*-B_ℓ^*), the coefficients of the marginal costs with local knowledge (B_ℓ and B_ℓ^*), the fixed costs (F and A) and the size of the labor force (L).

Proposition 4.4: If $\Pi^H < 0$ or (4.41) holds, an international joint venture is formed in country H if the quantity of good X purchased by firm S under a joint venture is larger than that under a wholly-owned subsidiary, or:

$$J < [\alpha(1-\alpha)L - A]\frac{B_h^* - B_l^*}{B_h^*} \quad ;$$

otherwise, only a foreign wholly-owned subsidiary exists in country H.

Proof:

If subsidiary S can push firm H out of the market, it will decide whether or not to accept firm H as a partner for contributing the local knowledge. Suppose that firm S decides to run the business on its own. The consumers in country H retain only the wages. A typical consumer (of country H) maximizes his utility level subject to the budget constraint with only the wage rate on the left-hand side:

$$Max \quad U^j = (c_{xj}^w)^\alpha c_{yj}^{1-\alpha}$$

$$Subject\ to \quad w = Pc_{xj}^w + c_{yj} \ ,$$

where c_{xj}^w is the consumption of good X by consumer j. It can be shown that the price elasticity is also the standard ε. From the first order conditions of the utility maximization condition, we can get the relationships of the prices in terms of good X and good Y similar to (4.8a) and (4.8b). Then the inverse demand function is similar to (4.9):

$$P^O = \frac{\alpha}{1-\alpha}\frac{Y^O}{X_C^{HO}} \ , \qquad (4.44)$$

where the superscript O denotes the equilibrium values under the foreign monopoly. H_C^{HO} is the country-H-consumers' demand for good X and Y^O is the total demand for good Y (in country H).

On the other hand, from (4.22) and (4.24) and using the wage rate (equation (4.28)), since $\eta_S=\varepsilon$ and $\sigma_S=1$, we have the equilibrium price as:

$$P^O = \frac{B_h^*}{\alpha C_\delta} , \tag{4.45}$$

Since all the profit of subsidiary S is used to purchase good X in country H, we have:

$$P^O X_C^{SO} = \Pi^O = P^O X^O - (A + B_h^* X^O) w^O ,$$

where $w^O = w^I$. It can be simplified into:

$$X_C^{SO} = (1-\alpha) X^O - \frac{\alpha A}{B_h^*} . \tag{4.46}$$

On the other hand, combining (4.44) and (4.45), the total demand for good X in country H has the following relationship with good Y:

$$X_C^{HO} = \frac{\alpha^2}{1-\alpha} \frac{C_\delta}{B_h^*} Y^O . \tag{4.47}$$

All the country-H-consumers earn only wages and the wage incomes are used to exchange for good X and good Y. We have:

$$w^O L = P^O X_C^{HO} + Y^O .$$

Therefore, Y^O is solved as:

$$Y^O = \frac{(1-\alpha) L}{C_\delta} . \tag{4.48}$$

Substituting (4.48) into (4.47), we can get the solution of X_C^{HO}:

$$X_C^{HO} = \frac{\alpha^2 L}{B_h^*} \quad (4.49)$$

Using the fact that $X^O = X_C^{SO} + X_C^{HO}$ and substituting (4.46) and (4.49) into it, we solve X^O as:

$$X^O = \frac{\alpha L - A}{B_h^*} \quad (4.50)$$

Substituting (4.50) into (4.46), we have:

$$X_C^{SO} = \frac{\alpha(1-\alpha)L - A}{B_h^*} \quad (4.51)$$

Next we consider the situation in which a joint venture is formed. Suppose that all profits are taken by firm S. This case is used to compare the total profit rate of a potential joint venture with the profit rate of a wholly-owned subsidiary. Let the superscript J denote the variables under a joint venture. The decision of the foreign-dominated joint venture is:

$$Max\ \Pi^J = P^J X^J - (A + J + B_l^* X^J) w^J .$$

where the notations correspond to those used in the analysis above. The equilibrium price is as follows:

$$P^J = \frac{B_l^*}{\alpha C_b} .$$

It is straight forward to get the equilibrium variables. The quantity of good Y is:

$$Y^J = \frac{(1-\alpha)L}{C_\delta};$$

the total local consumption of good X is:

$$X_C^{HJ} = \frac{\alpha^2 L}{B_l^*};$$

the total output of good X:

$$X^J = \frac{\alpha L - A - J}{B_l^*};$$

and the purchase of good X by firm S in country H is:

$$X_C^{SJ} = \frac{\alpha(1-\alpha)L - A - J}{B_l^*} \quad \textbf{(4.52)}$$

Since the profit of firm S will be distributed to the consumers in country S, the firm cares about the profit of subsidiary S in term of P_Y^* instead of P^O or P^J and so the quantity of good X exchanged in country H are considered rather than the "surface" profit in terms of P^O or P^J. Firm S will consider joining with firm H if and only if X_C^{SJ} (equation (4.52)) is larger than X_C^{SO} (equation (4.51)) if assuming that firm S avoiding negotiation when the potential profit is not greater:

$$X_C^{SJ} - X_C^{SO} = \frac{[\alpha(1-\alpha)L - A](B_h^* - B_l^*) - JB_h^*}{B_h^* B_l^*} > 0.$$

To rearrange the order, we have the following condition for firm S willing to form a joint venture:

$$J \leq [\alpha(1-\alpha)L-A]\frac{B_h^* - B_l^*}{B_h^*} \quad (4.53)$$

If (4.53) does not hold, firm S decides to operate the business on its own. □

Proposition 4.5: If $\Pi^S < 0$ or (4.43) holds, an international joint venture is possible if the profit of firm H under joint-venturing is greater than that under operating a monopoly alone, or:

$$J < [\alpha(1-\alpha)L-A] - \frac{C_S}{C}[\alpha(1-\alpha)L-F-A] \; ;$$

otherwise, no FDI exists.

Proof:

The equilibrium values when firm H remains the monopoly are the same as those under a closed economy. On the other hand, suppose that a joint venture is formed under the dominance of firm H. It is more convenient to consider the case that all the profit is kept by firm H. The maximum profit of the potential joint venture is compared with that of a wholly-owned subsidiary H. The decision of a joint venture is:

$$Max \;\; \Pi^D = PX^D - (A+J+B_l^* X^D)w \; ,$$

where the superscript D is used to identify the key variables under the local firm-dominated joint venture. The equilibrium price is:

$$P^D = \frac{B_l^*}{\alpha C_\delta}.$$

Then the output of good Y can be solved as:

$$Y^D = \frac{1-\alpha}{1-\alpha+\alpha^2}\frac{L-A-J}{C_\delta},$$

and the total consumption of good X in country H is:

$$X^D = \frac{\alpha^2}{1-\alpha+\alpha^2}\frac{L-A-J}{B_l^*}.$$

The maximized profit becomes:

$$\Pi^D = \frac{\alpha(1-\alpha)L-A-J}{(1-\alpha+\alpha^2)C_\delta}. \tag{4.54}$$

Firm H is willing to join firm S to form a joint venture if the following condition is fulfilled by assuming that firm H prefers no change if a larger profit is not earned:

$$\Pi^D - \Pi^A > 0 .$$

Comparing (4.54) and (4.15), a joint venture is possible if:

$$J < [\alpha(1-\alpha)L-A] - \frac{C_\delta}{C}[\alpha(1-\alpha)L-F-A]. \tag{4.55}$$

□

4.5 Evaluation Of The Host Country's Welfare Under FDI

Case 4.1: Only a foreign wholly-owned subsidiary is set up

If the cooperation costs are very high so that firm S only makes a lower profit from a joint venture, firm S will operate a subsidiary under its complete control. As good Y in country H is only consumed by the citizens of the respective country, the investing firm takes only good X from country H. The transfer of technology and management from the headquarters to the subsidiary is a kind of invisible trade, but no money exchange is involved.

The equilibrium demands for good X and good Y by country H have been shown in (4.48) and (4.49) respectively. From the two equations, the social welfare function of country H is:

$$\begin{aligned} U^O &= X_C^{HO^\alpha} Y_C^{O^{1-\alpha}} \\ &= \left(\frac{\alpha^2}{1-\alpha}\frac{C_\delta}{B_h^*}\right)^\alpha \left[\frac{(1-\alpha)L}{C_\delta}\right] . \end{aligned} \tag{4.56}$$

To determine whether the welfare of the host country is higher or lower, we can directly compare U^O and U^A. Since we are only interested in the sign of U^O-U^A, it is equivalent to compare $\ln U^O$ and $\ln U^A$. Taking logarithms of (4.16) and (4.56), the difference of the transformed values is:

$$\ln U^O - \ln U^A = \ln[(1-\alpha+\alpha^2)B_l^\alpha C^{1-\alpha}L] - \ln[B_h^{*\alpha} C_\delta{}^{1-\alpha}(L-F-A)] .$$

Though $C_\delta < C$ and $(L\text{-}F\text{-}A) < L$, it is not certain which one of B_h^* and B_ℓ is larger, and furthermore, $(1-\alpha+\alpha^2) > 1$. The welfare may or may not be higher under the displacement of domestic monopoly by foreign monopoly.

However, from the first derivatives shown in Appendix 4A, there are some indications for the effects of different exogenous variables. If γ is larger, B_h^* is smaller, B_ℓ is larger, C is larger, C^* is smaller, F+A is larger or L is smaller, the possibility of $U^O > U^A$ is higher. The reason is quite straight forward: if the imitation rate (i.e. γ) is higher, it means that the improvement in sector Y is more significant and then the loss of profits to firm S is more likely to be covered; if the cost gap in sector Y, (i.e. $C-C^*$ is larger), the improvement in good Y is larger and then it is more likely to be compensated for the profit loss in sector X; if the production cost of the foreign investor lowers a lot (B_h^* is smaller or B_ℓ is larger), the overall rise in efficiency is higher, and then the loss of profits is also more likely to be compensated for; if the fixed cost of sector X (i.e. F+A) is higher, the saving of the cost due to FDI has more positive effects on efficiency too; if the population (i.e. L) is smaller, the technological improvement per capita can be used better. Let us assume that $B_h^*-B_\ell^*=B_h-B_\ell$, i.e. the advantage of local knowledge is the same in both countries. An additional indication is that smaller $B_h^*-B_\ell^*$ makes $U^O > U^A$ more likely. That is, if the local knowledge is less important, the possibility of improvement in welfare is higher.

The effects of α (the preference on good X) are more complicated. There is no simple trend which we can see from the first derivative. However, if the spillover effect is smaller, the benefit of the local knowledge is less important or the cost gap between the two countries in sector X is bigger, the higher preference in good X is more likely to lead to higher welfare. Conversely, if the spillover effect is larger, or the local knowledge is more important, or the cost gap is smaller, then the higher preference in good Y is more likely to lead to higher welfare. The reason is obvious: if the improvement is greater in sector Y, the people preferring good Y are more likely to be better off as the spillover effect is reflected in sector Y only (sector X is dominated by a foreign firm). On the other hand, if the improvement in sector X is greater (i.e. the local knowledge is not so important or the cost gap is huge), it benefits those preferring good X.

Comparing P^O and P^A (the price in autarky economy, (4.10')), the difference is:

$$P^O - P^A = \frac{(B_h^* - B_l)C + \gamma(C - C^*)B_l}{\alpha C_\delta}.$$

The denominator and the second term of the numerator are positive, but the first term of the numerator may be either positive or negative. The price of good X may or may not be lower under the invasion of the foreign firm. If the local knowledge affects the costs more (B_h^*-B_l^* is larger), the imitation of advanced technology is faster (γ is closer to 1) or the cost gap(s) between the two countries is (are) closer (B_l-B_l^* or C-C^* is smaller), the probability of $P^O > P^A$ is larger. Conversely, if (B_h^*-B_l^*) is smaller, γ is closer to 0, B_l-B_l^* or C-C^* is bigger, P^O is more probably lower than P^A.

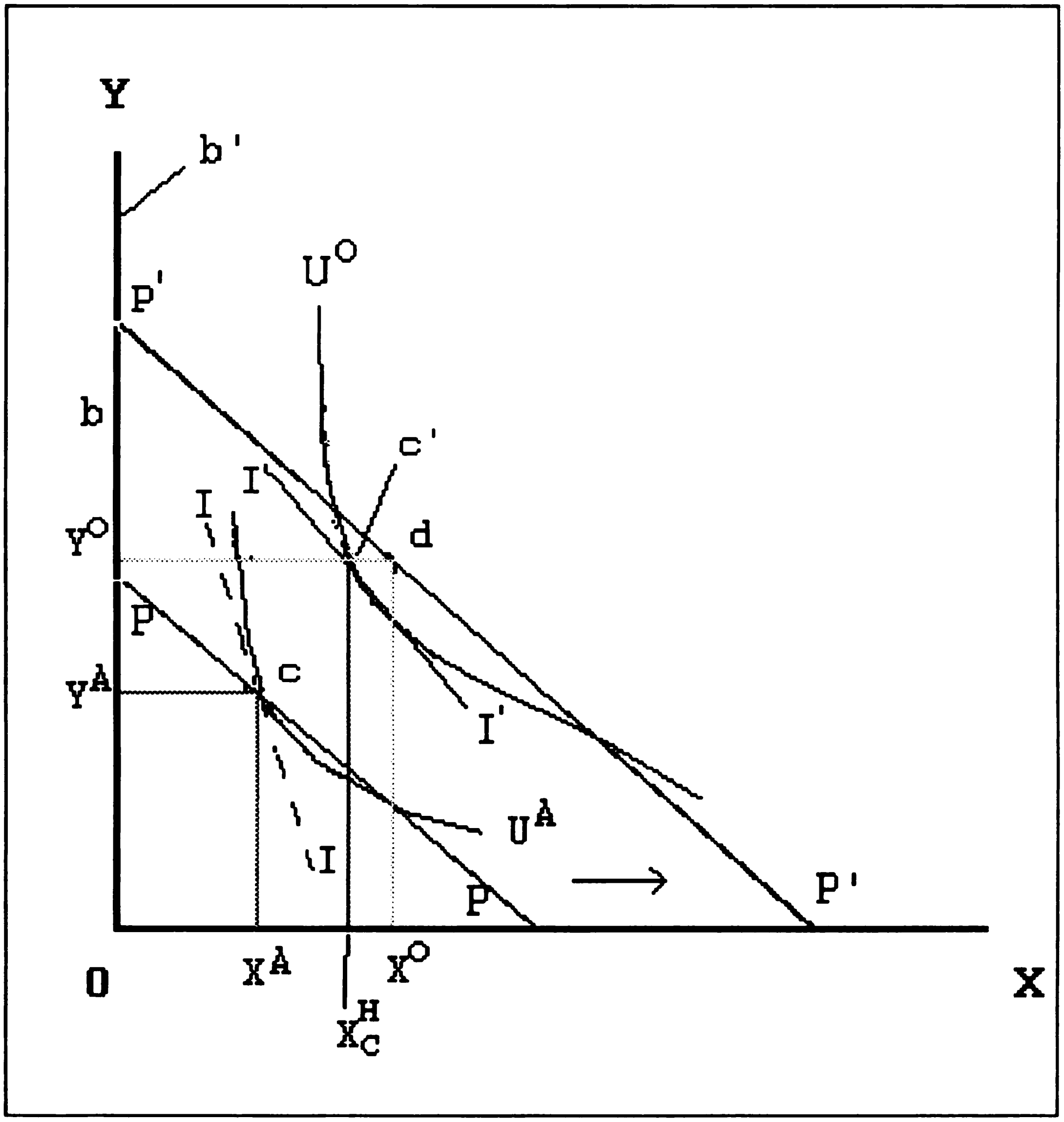

Figure 4.2: An Example of Welfare Improvement in Country H with the Displacement of the Domestic Monopoly by a Foreign Monopoly in Sector X

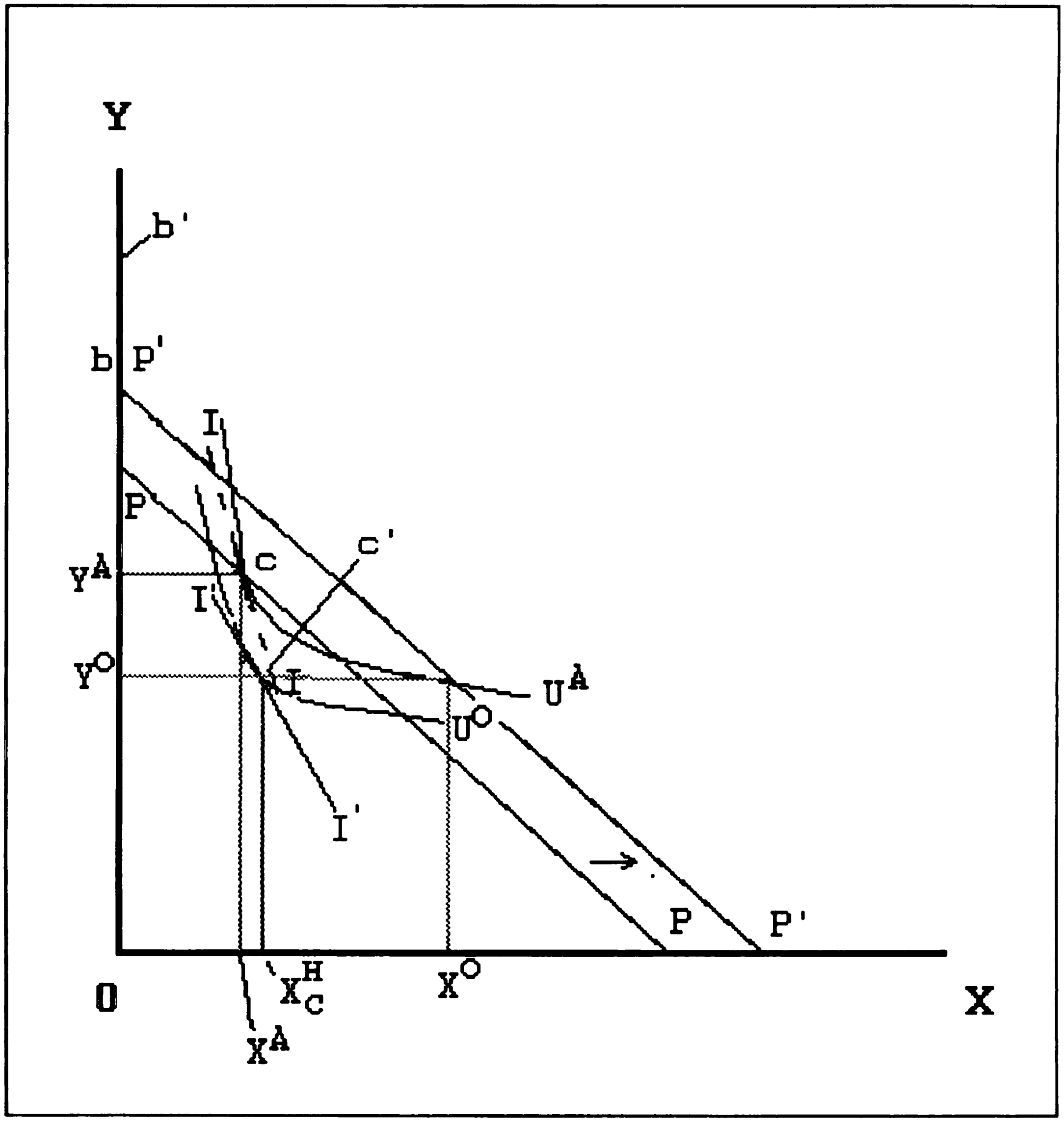

Figure 4.3: An Example of Immiserizing Country H with the Displacement of the Domestic Monopoly by a Foreign Monopoly in Sector X

If $P^O > P^A$, due to the fact that the social utility function is convex to the origin, $Y^O > Y^A$ is the necessary condition while $X^O > X^A$ is the sufficient condition for country H to be better off under FDI. The intuition is that if the price of good X is higher, the domestic consumption will shift to good Y. Therefore, for the whole country to be better off the consumption of good Y must be greater. However, if the consumption of good X is larger even if the price is higher, it implies that both goods are consumed more and so country H must be better off. The reverse reason applies to the case of lower price of good X. If $P^O < P^A$, $X^O > X^A$ is the necessary condition while $Y^O > Y^A$ is the sufficient condition for country H to be better off. If $P^O = P^A$, the consumption of both goods have to be larger to make country H better off.

Figure 4.2 and Figure 4.3 show the example of $P^O < P^A$. Subsidiary S must be more efficient than firm H as the marginal cost (even if there is a loss in local knowledge) is lower. The production possibility frontier of country H shifts outward (from PP to P'P') due to the spillovers and investments from country S. The x-intercept of P'P' is $(L-A)/B_h^*$ instead of $(L-F-A)/B_\ell$ (of PP). The new production possibility frontier is P'P' except at the point that no good X is produced. The broken point is $(L-A)/C_\delta$ at the vertical line. The production of good Y when good X is zero is at point b' (L/C_δ) which must be higher than point b (equal to L/C, the autarky output of good Y by using all labor). The equation of P'P' is $B_h^*X + C_\delta Y = L-A$, $Y \geq 0$, $X > 0$. It should be noted that P'P' may or may not be parallel to PP as it depends on the values of B_h^*/C_δ and B_ℓ/C.

Figure 4.2 shows a case in which country H is better off in the open economy. The social welfare function of country H is U^O which is tangent to the price ratio P^O (I'I') at point c'. The summation of the country-H-demand for good X and country-S-demand for good X (in country H) is marked at point d. It is possible that U^O is higher than the autarky utility level U^A (tangent to PP at point c) as shown in Figure 4.2.

From Figure 4.3, it is the case that country H is immiserizing from opening the market to foreign investors when $P^O < P^A$. It is shown as a case that $Y^O < Y^A$ (the sufficient condition is not fulfilled) though $X^O > X^A$ (the necessary condition is fulfilled). The social welfare U^O is lower than the autarky utility U^A.

The analysis of the cases of $P^O > P^A$ is straight forward; therefore, those cases are not discussed. The major difference from Figures 4.2 and 4.3 is that the slope of P^O should be steeper than P^A rather than that shown in the graphs.

All the workers in country S can surely get more good X than a closed economy. By assuming that firm F maximizes profits in its home country while taking good X taken from country H as given, it is easily seen that the equilibrium price ratio and outputs are the same as those under a closed economy; therefore, the total consumption of good X is larger while the consumption of good Y remains the same. The welfare of country S must be higher than that under the autarky economy.

Case 4.2: A joint venture is established with firm S possessing greater bargaining power.

The multinational corporation may cooperate with the local firm only if the profit under complete control is not higher than that under a joint venture. Since the setting-up of a joint venture will lead to higher efficiency in sector X (compared with the wholly-owned subsidiary of firm S) while the transfer effects to sector Y remain the same, the production possibility frontier of country H may shift out if the combination of technology advantage of firm S and the advantage of local knowledge of firm H can cover the cooperation costs.

Whether country H is better off or worse off under the open economy is similar to case 4.1. However, since the original firm H may make some profits in this case, country H is in a better position to improve the welfare.

Case 4.3: Firm H remains as a monopoly in its own country

The same as a closed economy.

Case 4.4: A joint venture is formed under firm H's domination

Though firm H can maintain as a monopoly, if the cooperation costs are not so high that the joint venture earns more profits than the sole venture of firm H, it is possible for the two firms to join together. The main difference from case 4.2 is that firm H has the larger bargaining power, and then the profits earned by firm H are not less than autarky. Therefore, in addition to the benefits from spillovers, country H must be better off while country S may also improve its welfare by getting some profits (if any) from the joint venture.

Case 4.5: A duopoly occurs in the host country

If the difference between the cost functions of the two firms is not large, it is possible for the two firms to coexist in the host country.

The welfare of country H comes out directly by using (4.39) and (4.40):

$$\begin{aligned} U^{I} &= X_C^{H^{\alpha}} Y^{I^{1-\alpha}} \\ &= \left[\frac{\alpha(1+\alpha)}{1-\alpha}\frac{C_\delta}{B_h^* + B_\tau}\right]^{\alpha}\left[\frac{1-\alpha}{1+\alpha^2}\left(\frac{L-F-A}{C_\delta} - \frac{B_h^* - \alpha B_\tau}{B_\tau - \alpha B_h^*}\frac{A}{C_\delta}\right)\right] . \end{aligned} \tag{4.57}$$

As the sign of U^I-U^A is equal to the sign of lnU^I-lnU^A, the difference in welfare can be compared by using the logarithms of (4.16) and (4.57):

$$\ln U^{I} - \ln U^{A} =$$

$$\alpha \ln\left(\frac{1+\alpha}{\alpha}\frac{C_\delta}{C}\frac{B_l}{B_h^* + B_\tau}\right) + \ln\left[\frac{1-\alpha+\alpha^2}{1+\alpha^2}\frac{C}{C_\delta}\left(1 - \frac{B_h^* - \alpha B_\tau}{B_\tau - \alpha B_h^*}\frac{A}{L-F-A}\right)\right] .$$

The sign is not certain so that it is not sure whether country H will be better off or worse off. Even worse than case 4.1, there are no indications on the exogenous variables except C and C^*. The first derivatives with respect to various exogenous variables are shown in Appendix 4B. The only indication we have is that the larger the cost gap is in sector Y (i.e. C-C^*), the larger is the likelihood of $U^I > U^A$. The intuition is that since no profits in sector Y are taken by foreigners, all the efficiency improvement of sector Y is reserved for country H.

Comparing the price ratio under duopolistic competition (4.25') with that of the autarky (i.e. (4.10')), we have:

$$P^I - P^A = \frac{\alpha c(\gamma B_l^* + B_h^*) - [(1-\gamma)C + (1+\alpha)\gamma C^*]B_l}{\alpha(1+\alpha)CC_\delta}.$$

Since the first term of the numerator is positive while the second term is negative, P^I may or may not be higher than P^A.

Similar to the analysis in case 4.1, if $P^I > P^A$, $Y^I > Y^A$ is the necessary condition for country H to be better off while $X^I > X^A$ is the sufficient condition. If $P^I < P^A$, $X^I > X^A$ is the necessary condition for country H to be better off while $Y^I > Y^A$ is the sufficient condition. If $P^I = P^A$, in order for country H to be better off, consumption in both goods must be larger.

4.6 Policy Of Minimum Ownership Requirements

Suppose country H restricts FDI by requiring that any firm operating in that country must be at least 50% owned by the local owners.

Case 4.1: Only a foreign wholly-owned subsidiary is set up if there is no intervention

The foreign firm will set up a wholly-owned subsidiary if there are no government restrictions. Restrictions on the local ownership may lower overall economic performance of country H more than the free market since the mandatory joint-venturing may lead to higher costs. Whether the country is better off or not depends on how much efficiency is lost and how much the profit is shared by the local partner. Firm H has no threat to be driven out of the market again as firm S cannot enter country H without firm H's cooperation. As firm H will not cooperate with firm S if firm H cannot receive a share at least the same as its monopolistic status, country H may not be worse than a closed economy.

On the other hand, if firm S chooses not to invest in country H due to the high cooperation costs, country H may lose the chance to improve its efficiency. If firm S does not enter country H at all, the opportunity of the technology transfer is foregone.

So country H may or may not be as good as no restrictions though the policy guarantees not worse than a closed economy.

Case 4.2: A joint venture is established with firm S possessing greater bargaining power if there is no government intervention

The multinational enterprise prefers to join with the local firm even if no restrictions are imposed. Under the policy, firm S cannot enter country H without the cooperation of firm H. Firm H will try to protect its own benefits by asking for at least the profit rate under a closed economy. The welfare of country H is likely to be higher since the local firm gets potentially greater profits than within a closed economy. Moreover, imposing restrictions is preferred to no restrictions as firm H stands on an upperhand position in bargaining with the foreign investor.

Case 4.3: Firm H remains as a monopoly in its own country

It is firm H who rejects the foreign partner by avoiding the high cooperation costs. Therefore, the ownership restriction is not bound.

Case 4.4: A joint-venture is formed under firm H's domination

Again, the policy of minimum ownership requirement has no effects on the firm behavior. Firm H has already had the greater bargaining power in joint-venturing.

Case 4.5: A potential duopoly will occur if there is no intervention

If the firms are allowed to compete with each other, the firms will not cooperate with one another. However, a duopoly does not exist as firm S is not allowed to operate its business alone. As we have analyzed before, country H may or may not be better off under the competition. The policy does not have any clear result on welfare. One certain point is that since firm H has the stronger bargaining power in this new order, country H may not be worse than the autarky economy.

The risk is that if the cooperation cost between the two firms is very high and firm S is not willing to enter the market from the very beginning, country H may lose the chance of technology transfer.

It is indicated that the policy of minimum local ownership requirements may be worse than no intervention in case 4.1 and case 4.5 though it will not be worse than the autarky economy. There are risks that the foreign investor may be banned from entering the host country, and then the local enterprises may lose the chance to learn advanced skills.

If the foreign firm tends to cooperate with the local firm even if there is no intervention, regulations can back up the local firm in getting a greater share under joint-venturing. Therefore, the host country must be better off in case 4.2 under the policy.

If the local firm has strong competitive power to keep the foreign rival outside the local market as in case 4.3 or to bargain effectively (case 4.4), country H will be indifferent to whether or not the policy is enforced.

4.7 Concluding Remarks

A model of two sectors is used in this chapter. Only the sector with increasing returns to scale is allowed to have FDI. Moreover, FDI has been assumed to be one-sided: from the advanced country to the developing country. The existence of cost gaps between the two countries is assumed and so apart from the ownership of firm-specific knowledge, the technology advantage calls for multinational enterprises.

If a subsidiary is set up by a multinational enterprise in a developing country, it can be seen that the welfare of the host country may or may not be higher. In the case that the foreign firm sets up a wholly-owned subsidiary in the host country, influences on welfare can be seen from the exogenous variables. If the imitation rate of the host country is higher, or the local knowledge is less important, or the cost gaps between the two countries are larger, or the fixed cost is larger, FDI is more likely to increase the welfare of the host country. Moreover, if the foreign firm raises the efficiency of one good higher than the other good and if the people in that country are inclined to consume that favorable good, the host country is also more likely to be better off.

The same imitation rate under joint-venturing has been assumed in the model. Compared with the foreign monopolistic case, for the joint-venturing case, the host country stands on a better position if the spillover effects are the same in both sectors, although the welfare effect is still not certain.

For the duopoly case, the welfare effect is also not clear. The only indication is that the larger the cost gap is in the non-traded sector, the higher is likelihood that welfare will improve.

The government restriction of local ownership on FDI may or may not be justified. If the multinational enterprise prefers sole-venturing (which is the case the government aims to control), the welfare may be lower than when there are no restrictions on ownership. This is because when cooperation between the investing firm and the local firm is difficult, the investor will cancel the investment plan, and then the host country may lose the chance of technology transfer. Even if the foreign investors stay in the local market, efficiency is lower so country H may not be better than free foreign investments. However, if the foreign investor prefers local partnership, the restriction strengthens the bargaining power of the local partner and then the local welfare is higher provided that the imitation rate under FDI is higher than that under absence of FDI.

One merit of the policy on minimum local ownership is that it guarantees that local welfare is at least the same as a closed economy provided the local company has the larger bargaining power with the foreign investor. The host country has the chance to learn advanced technology while the loss of profits can be avoided. This policy is a better strategy than total prohibition of FDI.

As no clear-cut welfare changes are concluded, whether FDI should be welcomed or not is not easy to say simply by theories. Empirical tests such as the effects of FDI on the growth rates will provide a better understanding of the welfare effects.

It should be pointed out that the analysis in this chapter should be treated more carefully. For example, in the dynamic world, the strategies of the firms will be much more complicated and the results may be different. Moreover, this chapter only includes two countries. A third country may affect the investment decisions of a multinational enterprise as the firm has more choices, and the competition is more severe in a world with more countries. The assumption of equal rate of technology transfer for both a wholly-owned subsidiary or a joint venture may be too simple. For example, if the multinational enterprise is not willing to reveal its advanced technology to a joint venture, joint-venturing may not be as attractive to the host country as suggested in this chapter. Lastly, this chapter does not include factor transfers which are also important in the welfare analysis. Therefore, this chapter can provide some indications to the government policies on local ownership requirement but not conclusive.

Appendix 4A: The First Derivatives for Case 4.1

This appendix shows the first derivatives of exogenous variables on the difference between $\ln U^O$ and $\ln U^A$.

Let $Z^O = \ln U^O - \ln U^A$.

(4A.1)

$$\frac{\partial Z^O}{\partial \gamma} = (1-\alpha)\frac{C-C^*}{C_8} > 0$$

The larger is γ, the higher the probability of $Z^O > 0$. This predicts that the higher is the imitation rate, the more likely is the welfare to be increased.

(4A.2)

$$\frac{\partial Z^O}{\partial B_h^*} = -\frac{\alpha}{B_h^*} < 0$$

B_h^* has the negative effects on Z^O.

(4A.3)

$$\frac{\partial Z^O}{\partial B_l} = \frac{\alpha}{B_l} > 0$$

B_l has the positive effects on Z^O. If the advantage of local knowledge is the same in both countries, i.e. $B_h^*-B_l^*=B_h-B_l$, the smaller is the advantage of local knowledge, the higher is the probability of Z^O to be greater than 0. Moreover, if $B_l-B_l^*$ (the cost gap) is bigger, the more possible is it for Z^O to be positive.

(4A.4)

$$\frac{\partial Z^O}{\partial C} = (1-\alpha)\frac{\gamma C^*}{CC_\delta} > 0$$

Larger C has a positive effect on Z^O.

(4A.5)

$$\frac{\partial Z^O}{\partial C^*} = -\frac{(1-\alpha)\gamma}{C_\gamma} < 0$$

The smaller is C^*, the more likely is $Z^O>0$. Combining (4A.4) and (4A.5) together, if the cost gap in sector Y ($C-C^*$) is larger, welfare is more likely to be improved.

(4A.6)

$$\frac{\partial Z^O}{\partial(F+A)} = 1 > 0 .$$

The larger F+A is, the higher the probability that $Z^O>0$.

(4A.7)

$$\frac{\partial Z^O}{\partial L} = \frac{1}{L} - \frac{1}{L-F-A} < 0 .$$

The larger is L, the more likely is $Z^O<0$.

(4A.8)

$$\frac{\partial Z^O}{\partial \alpha} = \ln\left(\frac{C_\delta B_l}{CB_h^*}\right) + \frac{2\alpha-1}{1-\alpha+\alpha^2} .$$

The effects of α are not certain. However,

$$if \ \ln\left(\frac{C_\delta B_l}{CB_h^*}\right) > 0 , \ \wedge \ \alpha \geq 0.5 \ \rightarrow \ \frac{\partial Z^O}{\partial \alpha} > 0 .$$

Since $C_\delta<C$, this implies that $B_l>B_h^*$. Though it is still not certain what the effect is when $\alpha<0.5$, this indicates that the larger is B_l over B_h^* or the smaller is the difference between C and C_δ, a larger α will lead to higher likelihood that $Z^O>0$. That is, the smaller is the cost gap, the more important is the local knowledge, or the slower is the imitation rate in sector Y, higher preference in good X makes it more likely for welfare to be improved.

On the other hand,

$$if \ \ln\left(\frac{C_\delta B_l}{CB_h^*}\right) \leq 0 \quad \wedge \quad \alpha < 0.5 \quad \rightarrow \quad \frac{\partial Z^O}{\partial \alpha} < 0 \ , \qquad .$$

This indicates that the smaller B_l over B_h^* is or B_l is smaller than B_h^*, or the larger the difference between C and C_δ is, a smaller α will lead to better chance for Z^I to be positive.

Appendix 4B: The First Derivatives for Case 4.5

Let $Z^I = \ln U^I - \ln U^A$; and

$$\Delta = (B_\tau - \alpha B_h^*)(L-F-A) - (B_h^* - \alpha B_\tau)A \ .$$

(4B.1)

$$\frac{\partial Z^I}{\partial \gamma} = \alpha\frac{C^* - C}{C_\delta} + \alpha\frac{B_l - B_l^*}{B_h^* + B_\tau} - \frac{(L-F-A-\alpha A)(B_l - B_l^*)}{\Delta} + \frac{B_l - B_l^*}{B_\tau - \alpha B_h^*} + \frac{C - C^*}{C_\delta} \ .$$

$$< 0 \qquad > 0 \qquad ? \qquad ? \qquad > 0$$

It is not certain what the effect of changes of γ on Z^I is.

(4B.2)

$$\frac{\partial Z^I}{\partial B_h^*} = -\frac{\alpha}{B_h^* + B_\tau} - \frac{\alpha(L-F-A) + A}{\Delta} + \frac{\alpha}{B_\tau - \alpha B_h^*} \ .$$

$$< 0 \qquad ? \qquad ?$$

The effect of B_h^* is also not certain.

(4B.3)

$$\frac{\partial Z^I}{\partial B_l} = \frac{\alpha}{B_l} - \frac{\alpha(1-\gamma)}{B_h^* + B_\tau} + \frac{(1-\gamma)(L-F-A+\alpha A)}{\Delta} - \frac{1-\gamma}{B_\tau - \alpha B_h^*}.$$

$$> 0 \qquad < 0 \qquad ? \qquad ?$$

The change of B_l also does not indicate certain results.

(4B.4)

$$\frac{\partial Z^I}{\partial B_l^*} = -\frac{\alpha\gamma}{B_h^* + B_\tau} + \frac{\gamma(L-F-A+\alpha A)}{\Delta} - \frac{\gamma}{B_\tau - \alpha B_h^*}.$$

$$< 0 \qquad ? \qquad ?$$

The change of B_l^* does not have certain indication either.

(4B.5)

$$\frac{\partial Z^I}{\partial C} = (1-\alpha)\frac{\gamma C^*}{C C_\delta} > 0.$$

The larger is C, the more likely is $Z^I > 0$.

(4B.6)

$$\frac{\partial Z^I}{\partial C^*} = -(1-\alpha)\frac{\gamma}{C_\delta} < 0.$$

The smaller is C^*, the more probably is $Z^I > 0$. Therefore, if $C-C^*$ is larger, the host country is more likely better off under duopolistic competition.

(4B.7)

$$\frac{\partial Z^I}{\partial L} = \frac{B_\tau - \alpha B_h^*}{\Delta} - \frac{1}{L-F-A} \; .$$

$$\qquad ? \qquad\qquad < 0$$

The change of L has no certain effects on Z^I.

(4B.8)

$$\frac{\partial Z^I}{\partial \alpha} = \ln\left(\frac{1+\alpha}{\alpha}\frac{C_\delta}{C}\frac{B_l}{B_\tau + B_h^*}\right) + \frac{\alpha}{1+\alpha} - 1 - \frac{1-2\alpha}{1-\alpha+\alpha^2}$$

$$> 0 \qquad\qquad > 0 \quad < 0 \qquad\qquad ?$$

$$- \frac{B_h^*(L-F-A) - B_\tau A}{\Delta} - \frac{2\alpha}{1+\alpha^2} + \frac{B_h^*}{B_\tau - \alpha B_h^*} \; .$$

$$? \qquad\qquad < 0 \qquad\qquad ?$$

The effects of α are uncertain.

Chapter 5

The Duration Times Of International Joint Ventures And Foreign Wholly-Owned Subsidiaries

5.1 Introduction

A firm investing in a foreign country faces some difficulties since the environment is different from the home country. Some examples of the difficulties include cultural differences and different laws. A multinational firm can choose between setting up a new plant, acquiring an existing local firm, forming a joint venture with a local firm, licensing, or giving up the plan to enter a foreign market (maybe exporting to or no participation in the foreign market at all).

A firm may prefer to control a subsidiary to avoid complications in decision-making and the leakage of technological knowledge to the other firms. Negotiations with other partners are time-consuming and thus reduce efficiency. The probability of the loss of the technological advantage to other firms affects the profit rate in the future, so a firm tries to avoid these possibilities. However, establishing new plants or acquiring an existing plant may require a lot of investment. If the multinational firm is not familiar with a foreign market, the firm has to bear risks when investing in a project. The multinational firm may be able to reduce risks by cooperating with a foreign firm when entering the foreign market. Furthermore, the local knowledge explained in Chapter 3 is also an important factor in joint-venturing. After a plant is established in a certain location, the plant will develop better knowledge in producing a good. This knowledge includes information about the local markets (labor and product) and the connection to the local enterprises which provide services to the plant. It is costly for late comers to acquire the same knowledge; therefore, it is reasonable for a multinational firm to choose joint-venturing as a form of entering a new market.

Generally speaking, the parent firms of a joint venture utilize each others' strengths. Over time, as the parent firms learn more from each other, the benefit of the joint venture decreases. Particularly, in the case of an international joint venture, the foreign firm gets experience in the local market through a joint venture and the local firm learns the advanced technology or management from the foreign partner. After accumulating the knowledge from the partner(s), the marginal benefit of the joint venture to either partner becomes smaller and smaller. On the other hand, although the parents will understand each other better over time, the cooperation costs between different parents may remain the same or fall slightly as each parent maximizes its own benefits which may be conflicts to the partner(s); in addition, the diversified goals of the parents are not easily reconciled or compromised. Eventually the benefit to one (or more) of the partners may be lower than the cooperation cost, and, at this point, it is very easy for the joint venture to break down even though it may still be profitable. On average, it is hypothesized that an international joint venture has a shorter life span than a foreign wholly-owned subsidiary. The main purpose of this chapter is to test whether joint ventures between foreign countries and U.S. firms have shorter life spans than wholly-owned subsidiaries.

Though the discussions on the instability of joint ventures are not new topics, there is no formal theory on this concept. Moreover, there have been only a few empirical papers on the duration time (also called survival time) of joint ventures. Franko (1970) is one of the pioneers in this area. Later, Kogut (1988) and Geringer and Hebert (1991) also worked on the instability rates of joint ventures (i.e. the proportion of liquidation or sellout to the number of joint ventures). These papers relied on questionnaires from the managers of the related firms and emphasized what characteristics of a joint venture would affect the instability rate.

The aforementioned papers take the instability of joint ventures for granted. Gomes-Casseres (1987) was the first to compare the duration time of joint ventures and wholly-owned subsidiaries of the MNEs. His data came from the Harvard Multinational Enterprise Project which comprises a sample of about 5,000 subsidiaries of 180 large U.S. MNEs. He compared the data of instability rates between international joint ventures and U.S. wholly-owned subsidiaries up to 1975, and he found that though the liquidation of joint ventures is not very different from wholly-owned subsidiaries, the sellout rate of joint-ventures (to one of the partners or outsiders) is higher than wholly-owned subsidiaries. On the whole, the instability rate of joint ventures is about 30% while that of wholly-owned subsidiaries is only about 15%. The main reason should be due to the higher sell-out rate rather than the liquidation rate.

Chowdhury (1992) extends the research to compare the performance of international joint ventures and foreign wholly-owned subsidiaries. He broke down the instability rates

between joint ventures and wholly-owned subsidiaries into several periods instead of the lump-sum data of Gomes-Casseres. His findings suggest that the average longevity of both international joint ventures and wholly-owned subsidiaries had consistently declined from 1951 to 1975. That is, the entry year of a U.S. affiliate in other countries does not affect the instability rate a lot. It also shows that U.S. foreign wholly-owned subsidiaries have lower instability rates.

Gomes-Casseres and Chowdhury directly compare the instability rate up to 1975 and conclude that joint ventures are more unstable. One problem of these two papers is that the authors only describe the data instead of testing the instability rate among the different kinds of affiliates. Though their work is appreciated enough, the evidence does not seem very convincing. Moreover, the two papers only studied U.S. FDI. There has been no work for FDI in the United States.

This chapter is based on more recent data (during the period between 1980 and 1991) to compare the stability of international joint ventures and foreign wholly-owned subsidiaries by using duration models to test the results rather than simply describing the results. Furthermore, both data sets of U.S. FDI and FDI in the United States are used. This approach can provide a better overall picture comparing the life spans of the joint ventures and wholly-owned subsidiaries, and analyzing whether the longevity of joint ventures associated with U.S. investment abroad or foreign investment in U.S. differ.

5.2 Sources and Data Collection

The records of the transactions of FDI in the United States and U.S. FDI are collected from *Mergers and Acquisitions* which provides information about new transactions between firms. However, the transactions include acquisitions or joint ventures only while no new plants are recorded in that journal. The transactions covered in this chapter are drawn from the Summer 1980 to Spring 1981 issues (4 issues included); the transactions mainly started in 1980 though a few transactions became effective in late 1979.

The list in the journal includes not only FDI but also transactions between U.S. firms in the United States, so not all records are relevant to the purposes of this chapter. Only the transactions related to FDI in the United States and U.S. FDI are used. For joint ventures, only the cooperation between a foreign firm and a U.S. firm in the United States or the cooperation between a U.S. firm and a local firm in a foreign country are counted.

One problem with the recorded transactions in *Mergers and Acquisitions* is that "failure" cases of the partnerships are unreported. It is necessary to depend on other sources in order to follow the life span of a wholly-owned subsidiary or a joint venture. *Moody's Manuals* and *Who Owns Whom* are used to keep track of each transaction. The former has better records of the firms but may not record the full list of the subsidiaries. The latter includes a better list of the subsidiaries of MNEs but no changes in the ownership of subsidiaries are recorded explicitly. Both of these sources are cross-referenced to build the most complete data set possible. If a transaction from *Mergers and Acquisitions* cannot be followed in *Moody's Manuals* or *Who Owns Whom*, the case is dropped from the data set.

The latest sources available were published in mid-1992, so the record of a subsidiary or a joint venture is assumed to be up to December 31, 1991. If a case is still recorded in the 1992 publications, it is taken to be a censored case up to that date. If there is a case reported that the subsidiary or the joint venture is terminated - it was sold out, closed, or the status was changed from a joint venture to a wholly-owned subsidiary or reverse - then the transaction is taken to have ended.

Assume that the change of the ownership of the whole parent firm is not due to the performance of the targeted affiliate.[1] If a foreign parent firm investing in the United States is acquired by another firm which is not based in the United States, the subsidiary (or joint venture) is treated as still alive. If the parent itself is acquired by a firm based in the United States, the subsidiary is taken as terminated. The rationale is that if the parent firm is acquired by another foreign firm, there is no reason to believe the acquisition is due to the affiliate while the affiliate is still a foreign affiliate in the United States. More important, since the new parent firm and the original firm may be under special negotiation which the outsiders cannot identify. It may not be appropriate to take these cases as the termination of the targeted affiliates. If the foreign parent firm is acquired by a U.S. firm, it is clear that the affiliate is no longer a foreign affiliate. Although the acquisition is not due to the affiliate, it is ridiculous to count the affiliate as a "foreign firm". Similarly, the same standard is applied to the U.S. firms investing in other countries. That is, if a U.S. parent firm is acquired by a foreign firm, the subsidiary (or joint venture) is treated as terminated. If a U.S. parent firm is acquired by another U.S. firm and the subsidiary is not sold out, the affiliate is treated as survived.

[1]It may not be a true situation; however, the reverse assumption that the change of ownership of the whole parent firm is due to the performance of the targeted affiliate also has problems.

This standard of this paragraph may be controversial, but since there are only 13 cases belonged to this situation, the results should not be much different no matter what is the standard.

However, if a wholly-owned subsidiary or a joint venture is sold to another parent firm, the subsidiary (or joint venture) is taken to be terminated. This is different from the transaction of the whole parent firm since if only the subsidiary or the joint venture is sold out, the management may be much different than the change of ownership of the whole parent firm. A more important point is that if a affiliate is sold to another firm, it means that the original parent should be beneficial from the new transaction. Though the subsidiary itself is still alive, this means that the transaction is certainly a case of instability.

5.3 The Proportional Hazards Model

Since the purpose of this chapter is to compare the duration time of international joint ventures and wholly-owned subsidiaries, a duration model will be applied. In order to include a variable to distinguish joint ventures from wholly-owned subsidiaries, explanatory variables - at least a dummy variable indicating joint ventures or not - must be included in the model; the proportional hazards model is a most convenient model to use.[2] The summary of proportional hazards model in this section mainly follows

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[2]Cox (1972) was the first to present the proportional hazards model. It was originally based on strictly continuous data. Kalbfleisch and Prentice (1973) extend the model to grouped data. Sometimes, the precision of the measurement of data is not good: The data are not distributed along a continuous line, and some data have the same length of duration time (the data are tied). In this case, grouped data appear. Kalbfleisch and Prentice prove that the proportional hazards model is still valid in grouped data. As duration models have become more well-known, some text books such as Kalbfleisch and Prentice (1980)

Kalbfleisch and Prentice (1980 Ch.1, Ch.4 and Ch.5) and Cox and Oakes (1984 Ch.2, Ch.7) while Chung et al. (1991) is also a reference.

A duration model deals with modelling data in which each individual terminates the targeted activities at a point of time when an event occurs. Such an event is usually referred to as a failure though the event may not lead to the individual itself disappearing. For example, a "failure" may be the performance of a certain task in a learning experiment in psychology, or a change in residence in a demographic study, or promotion of people in a business survey. A specific distribution of the duration time of the data is usually assumed. If factors affecting the duration time of an event are tested, explanatory variables are used. When explanatory variables are included in the model, matters become more complicated; however, the proportional hazards model allows us to use a simple method to test whether the duration time is affected by the variables. There are various applications of the proportional hazards model in clinical and criminological analyses. Some examples of the former include the studies of heart transplants[3] and medical treatment effects[4]. The examples related to criminology are studies of duration

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and Cox and Oakes (1984) provide good descriptions of the model. Chung et al. (1991) gives the most updated summary of the duration models.

[3]Examples are Crowled and Hu (1977) and Lagakos (1980). Crowled and Hu use some independent variables to test the lifetimes of the patients after heart transplants. The independent variables include personal characteristics such as age and previous surgery history and the degree to which donor and recipient (of the heart) are mismatched for tissue type. Lagakos further uses graphical analyses of the relation between heart transplants and the independent variables. The graphs were drawn according to the ranking of the residual scores which were calculated from the data.

[4]An example is Kay (1977) which compares Prednisone treatment and placebo tablets against cirrhosis (a liver disease). The other independent variables include age, sex, daily alcohol consumption, the activity of the cirrhosis and the absence/presence of ascites.

time of recidivism of ex-offenders after release from prisons[5] and the effectiveness of supervision after sentencing[6].

It is helpful to briefly explain the proportional hazards model. Suppose that we are considering a homogeneous population of individuals each of which has a "failure time". That is, we deal with the distribution of a non-negative random variable, T, which has a distribution function:

$$F_T(t) = Pr(T<t) ,$$

where t denotes time. It means that T refers to the "failure time". The distribution function $F_T(t)$ refers to the probability of the "failure" up to T. The survivor function is:

$$S_T(t) = 1 - F_T(t) = Pr(T \geq t) . \tag{5.1}$$

The function reflects the probability of surviving at time t. In other words, at time t, an individual with "failure time" T has the probability of $S_T(t)$ to "survive". Assuming that T is continuous, the distribution has a probability density function which is equal to the negative value of the differentiation of (5.1):

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[5]Barton and Turnbull (1981) study the factors affecting the ex-offender's postrelease performance. The 2 groups of male offenders from Cheshine and Somers correctional institutions are compared. The other independent variables include age, drug use and monthly income. Schmidt and Witte (1988) use the data of released people of the North Carolina Department of Correction to study recidivism. The independent variables include age, time served in prison, previous incarceration, rule violations in prison, education, race, sex, alcohol consumption, drug used. marital status, supervision methods and nature of crimes. Chung et al. (1991) provides a survey on the quantitative literature of applying duration models to analyze the time until recidivism.

[6]Rhodes (1986) compares two competing events: completing supervision without misconduct and being removed from supervision because of misconduct. The other independent variables include age, sex, race, marital status, education and prior criminal records.

$$f_T(t) = -S_T'(t) = \lim_{\Delta t \to 0^+} \frac{Pr(t \le T < t + \Delta t)}{\Delta t} \tag{5.2}$$

where Δt denotes the change in t. Accordingly, we may use another expression for the survivor function:

$$S_T(t) = \int_t^{\infty} f_T(u)du .$$

A useful expression is the hazard function:

$$h_T(t) = \lim_{\Delta t \to 0^+} \frac{Pr(t \le T < t + \Delta t \mid t \le T)}{\Delta t} . \tag{5.3}$$

It means that given an individual with "failure time" T surviving up to time t, the hazard function is the probability that the individual "fails" at t. In other words, if an individual has survived up to the present period, the hazard function reflects the probability that the individual "fails" at present. By the definition of conditional probability, we have (after omitting the suffix T):

$$h(t) = \frac{f(t)}{S(t)} . \tag{5.4}$$

Substituting (5.2) into the hazard function (5.4), it becomes:

$$h(t) = \frac{-S'(t)}{S(t)} = -\frac{dS(t)}{S(t)dt} \quad (5.5)$$
$$= -\frac{d\ln S(t)}{dt},$$

by using the fact that

$$\frac{dS(t)}{S(t)} = d\ln S(t).$$

Integrating (5.5) and using S(0)=1, we obtain:

$$S(t) = \exp\left(-\int_0^t h(u)du\right). \quad (5.6)$$

The hazard model discussed so far does not allow explanatory variables. Cox (1972) introduced a hazard rate with explanatory variables, namely:

$$h(t;x,\beta) = h_o(t)e^{x'\beta}, \quad (5.7)$$

where β is a $P\times 1$ vector of unknown parameters and **x** is a matrix of variables describing N individuals: $[\mathbf{x}_1, \mathbf{x}_2, \ldots, \mathbf{x}_i, \ldots, \mathbf{x}_N]$ in which $\mathbf{x}_i$ is a Px1 vector, i=1,...N, and $h_o(t)$ is called a baseline hazard which is an unknown function giving the hazard function for the conditions $\mathbf{x}=\mathbf{0}$.

The Risk Set $R(t_i)$ reflects that all the individuals "survive" at least up to time t_i, so $R(t_i)$ includes all the individuals which "fail" at t_i and all the survivors at t_i. The conditional probability that individual i fails at t_i given the Risk Set $R(t_i)$ (completing the time at t_i) is:

$$\frac{h(t_i;x_i,\beta)}{\sum_{k\in R(t_i)} h(t_i;x_k,\beta)} = \frac{e^{x_i'\beta}}{\sum_{k\in R(t_i)} e^{x_k'\beta}} \quad (5.8)$$

Because of the multiplicative assumption (5.7) which at time t $h_o(t)$ is the same at both the numerator and denominator, the baseline hazard function $h_o(t)$ is cancelled. The conditional probability (5.8) is convenient because it is not affected by the distribution of the baseline hazard function, so the difficulty of determining the distribution is avoided.

Usually, the observed duration time of some individuals may be tied at the same point (the data are grouped). That is, it may be observed that more than one individual has the same duration time. Suppose that there are given J observations (t_j,x_{jm}), $j=1, \ldots, J$, $m=1, \ldots, M_j, \ldots, M_J$; and

$$t_1 < t_2 < \ldots < t_J .$$

The observations are tied so that at time t_j, the number of individuals is M_j. The total number of the individuals is $\Sigma^J{}_{j=1}\, M_j$, all of which have "failure" time up to t_J.

If the sample is censored at t_J so that there are M_{J+1} individuals surviving at t_J which is the last point of observation, the number of the total individuals is $\Sigma^{J+1}{}_{j=1}\, M_j=N$. When the sample contains grouped data and is censored at the right side (i.e. all individuals are observed from the beginning but not all individuals are observed "failure"), the partial likelihood of the conditional probability functions of all the individuals can be constructed as:

$$L = \prod_{j=1}^{J} \frac{e^{q_j'\beta}}{\left(\sum_{k\epsilon R(t_j)} e^{x_k'\beta}\right)^{M_j}}, \tag{5.9}$$

where

$$q_j = \sum_{m=1}^{M_j} x_{jm} .$$

The partial likelihood is simple but the usual large-sample properties of maximum likelihood estimates are applied: the estimates are consistent and asymptotically normally distributed with asymptotic covariance matrix estimated consistently by the inverse of the matrix of second partial derivatives of the log likelihood function.[7] The maximum likelihood can be found by using iterations. The details of the iteration method are in Appendix 5A.

5.4 The Estimated Model

At first, the model used in this paper is based on the proportional hazards model which has been discussed in the previous section. Since the main purpose is not the distribution of the duration time of the affiliates but the effects of joint ventures or subsidiaries on the instability rate, explanatory variables are used. In particular, the explanatory variables which we used are represented by the vectors of **x**. $\mathbf{x}_i'\beta$ of individual i is as follows:

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[7]Refer to the discussion of Cox (1975). Cox shows that the partial likelihood is simpler than the full likelihood as for examples, only the parameters of interest are involved and the nuisance parameters are excluded.

$$x_i'\beta = \beta_1 JV_i + \beta_2 SALES_i + \beta_3 HI_i + \beta_4 CI_i + \beta_5 INDUSTRY_i + \beta_6 DEVELOP_i ,$$

where β_k, k=1,...,6, are the coefficients to be estimated. The variables include:

(1) JV, the dummy variable for firm types (1=joint venture, 0=wholly-owned subsidiary);

(2) SALES, the total sales (in term of millions US$) of the parent firm of the source country (a proxy of the size of the investing firms). For a joint venture, only the total sale of the investing firm (relative to the host country) is counted;

(3) HI and CI, the dummy variables for the form of integration (HI=1 if horizontal integration, 0 if vertical integration or conglomerate integration; CI=1 if conglomerate integration, 0 if vertical integration or horizontal integration). The forms of integration can be divided in the following way: horizontal integration is denoted by HI=1 and CI=0; conglomerate integration is denoted by HI=0 and CI=1; and vertical integration is represented by HI=0 and CI=0;

(4) INDUSTRY, the dummy variable of industrial classification of the investment (1 if service sector, 0 if manufacturing or mining sectors); and,

(5) DEVELOP, the dummy variable for controlling whether an investing firm is based in a developing country or not (if the host country is the United States) or whether the host country is a developing country or not (if the investing firm is based in the United States). (1 if developing country, 0 if developed country.)[8]

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[8]The developed countries include Australia, Belgium, Canada, Denmark, Federal Germany, Finland, France, Japan, Ireland, Italy, Netherlands, New Zealand, Norway, Spain, Sweden, Switzerland and United Kingdom. The developing countries include Brazil, China, Hong Kong, Hungry, Korea, Mexico, Monaco, Philippines, Portugal, Sharjah, Saudi Arabia, Singapore, Venezuela and Yugoslavia.

Three regressions are run, one for each data set:

Sample (a): U.S. direct investment in other countries;

Sample (b): FDI in the United States;

Sample (c): Sum of the data sets (a) and (b).

For sample (c) above, an additional dummy variable is used to control for the possible difference in samples (a) or (b): US=1 if U.S. FDI, 0 if FDI in the United States.

JV is the main variable we want to test in this model. Because the hypothesis is that a joint venture is expected to be more unstable, the coefficient of JV, β_1, should be positive. That is, a positive JV coefficient implies a higher instability rate for joint ventures and a positive relationship between earlier failure times and joint ventures as opposed to wholly-owned subsidiaries.

SALES is the proxy for the size of an investing parent. Theoretically, the larger the firm, the deeper the pocket and the higher risk it can bear. Thus a larger firm may allow the subsidiary (or affiliated joint venture) to operate for a longer time, other things being constant. Thus β_2 should be negative which implies that a larger parent tends to have lower instability rates for subsidiaries or joint ventures. Though it may be predicted that a larger firm prefers to control subsidiaries so that the parent firm's size may be positively correlated with the choice of wholly-owned subsidiaries, there is no evidence to support this prediction.[9]

Theoretically, the form of expansion (horizontal, vertical or conglomerate integration)

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[9]Blomström and Zejan (1991) suggest the positive relationship between the choice of a wholly-owned subsidiary and the size of a parent; however, the empirical results from their paper do not support this prediction.

of a firm has no clear-cut relationship to the duration time. The form of expansion may depend more on the location-specific advantage of a host country.[10] Experience is also important to a firm and then a firm tends to expand horizontally or vertically to deepen its experience within an industry. Conglomerate integration is related to the investment into a field in which the investing parent firm has less experience. If less experience is positively correlated with less stability, then CI should have a positive relationship with the instability rate. However, we have no good reasons to predict the duration time of horizontal integration in contrast to vertical integration. Whether a firm chooses to expand horizontally or vertically depends on the location-specific advantage and there are no general rules about which one will lead to "long-life" affiliates.

As a practical matter, it is difficult to identify the form of integration. A MNE usually has many different kinds of businesses. For the purposes of this paper, we have devised the following way to distinguish between different forms of integration. If the business of the new subsidiary or the joint venture is similar to that of the parent firm, horizontal integration is assumed; if the parent firm is operating a business which is upstream or downstream of the subsidiary or the joint venture, it is taken as vertical integration; otherwise, it is counted as conglomerate integration.

Next, we consider the variable DEVELOP. Sometimes, a firm based in a developed country investing in a developing country may not be strictly concentrating on the profit rate of the single project. It may treat the investment as a long term project for collecting

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[10]The concept of location-specific advantage is explained in section 2.1 of Chapter 2.

information about the foreign market.[11] However, political conditions in developing countries may be less stable, and this political instability may shorten the duration of a subsidiary or a joint venture. Another matter is that the developing countries usually prefer local participation in foreign investment projects, partly from the viewpoint of political independence. A developing country may require foreign firms to have at least a minimum share of local ownerships. Even if a developing country does not mandate local ownership, a MNE may voluntarily find a local partner to avoid political problems later. Thus, an investing firm will tend to set up joint ventures in a developing country though it might prefer wholly-owned subsidiaries if there were no political considerations. Therefore it is hypothesized that this variable is positively related to JV; given this, we should check for the presence of multicollinearity before including it.

The dummy variable INDUSTRY is simply used to see whether the type of business (service or manufacturing) affects the duration time. There is no clear-cut indication about the sign of the coefficient.

[11]Of course, this factor may also be applied to a developed country. The difference is that a U.S. firm (for example) is presumed to know a developed country much better than a developing country (e.g. the legal system in a host developed country is closer to the source country), so that a U.S. firm should find the profit rate in a developed-country-venture more important.

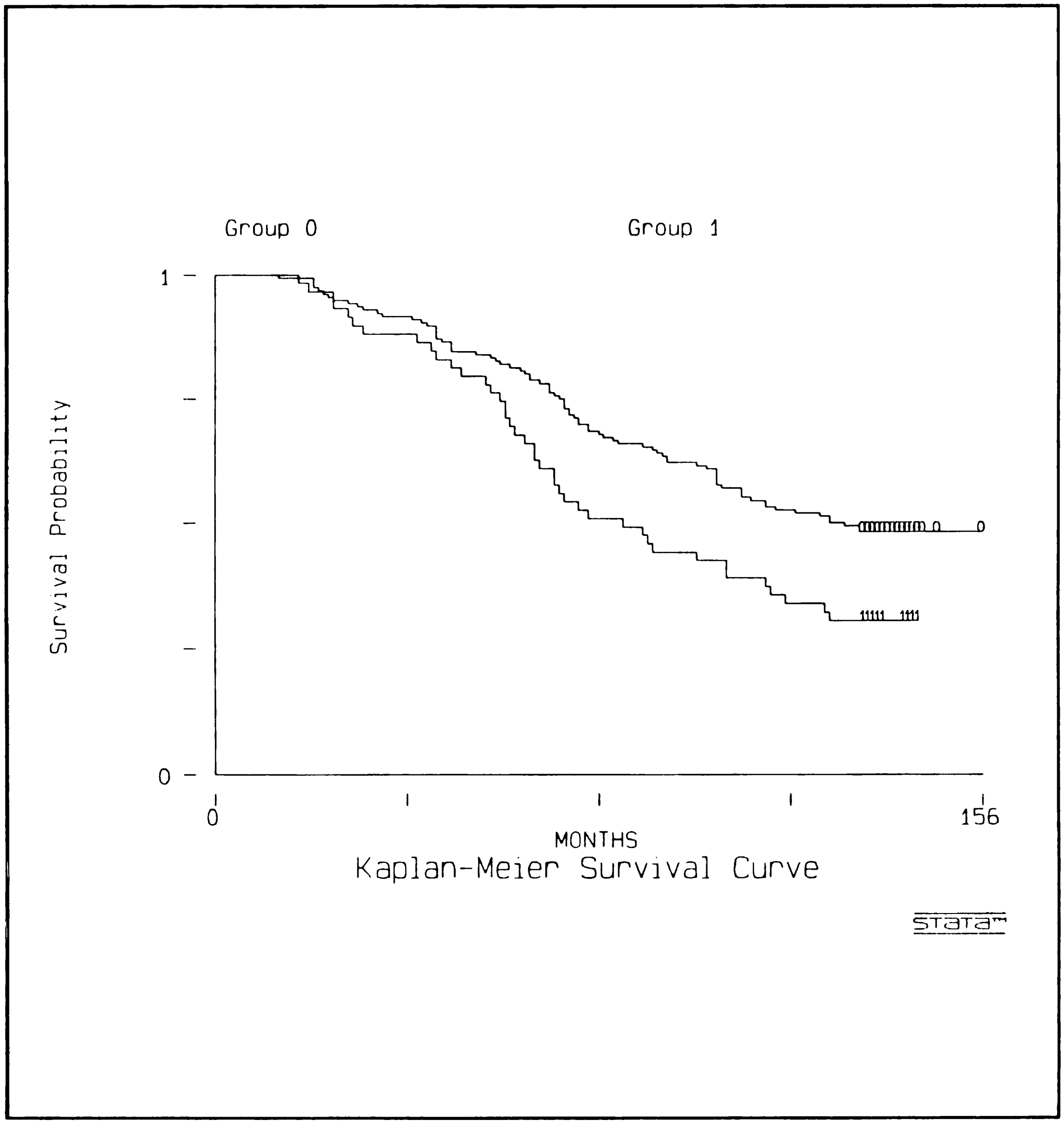

Figure 5.1: The Kaplan-Meier Survivor Functions of Foreign Wholly-Owned Subsidiaries (Group 0) and International Joint Ventures (Group 1)

One obvious variable which is likely to affect the duration time and which is missed from this list is the profit rate of a subsidiary or a joint venture. It is clear that the profit rate will be negatively correlated with the instability rate. Unfortunately, there are no profit data on the individual subsidiaries from the sources mentioned in section 5.2. The only data on net income (the total income minus taxes) available are the aggregate values for parent firms. We do not include this variable in the model as we cannot distinguish the profit rate from the other subsidiaries within a parent firm. Even if we could get the data for individual subsidiaries, the matter of transfer pricing might make the data biased.

From the four issues between Summer 1980 and Spring 1981 of *Mergers and Acquisitions*, there are 278 transactions which are related to the international joint ventures or foreign subsidiaries; however, only 215 cases have the records of duration time, 99 of which are FDI in the United States and 116 of which are U.S. direct investment in other countries. The duration time variable for all subsidiaries or joint ventures is in terms of months. The cases are summarized in Appendix 5B.

5.5 Results

At first, it may be helpful to compare the survivor functions of the foreign wholly-owned subsidiaries and international joint ventures without consideration of other explanatory variables. Sample (c) is divided into two parts: one includes joint ventures, and the other includes wholly-owned subsidiaries. Using Kaplan-Meier survivor function estimates for the two parts respectively, we can plot the two survivor functions in Figure 5.1. (A brief description of Kaplan-Meier is given in Appendix 5C.) It should be noted that the sample is censored when the duration time is longer than or equal to 132 months. So the survivor functions become flat after that point. The difference of the functions is that the survival probability (i.e. the survivor function) of the international joint ventures (denoted by group 1) are lower than that of the foreign wholly-owned subsidiaries (denoted by group 0). Graphically it can be seen that, on the whole, joint ventures have a smaller survivor function.

As we discussed in the previous section, some variables may be correlated with each other, so before running the model we check for the presence of multicollinearity. From Table 5.1, we can see that the correlations between the independent variables are not close. The closest relationship is between JV and DEVELOP (0.4204) as expected since developing countries usually require local participation in foreign subsidiaries,[12] thus we need not worry about the problem of multicollinearity in the model.

Table 5.1: Correlations between the Independent Variables (Sample (c))

(individuals=193)

	JV	SALES	HI	CI	INDUSTRY	DEVELOP	US
JV	1.0000						
SALES	0.0496	1.0000					
HI	0.0246	-0.1632	1.0000				
CI	-0.1737	0.0584	-0.5584	1.0000			
INDUSTRY	0.0407	-0.1092	0.1163	-0.1208	1.0000		
DEVELOP	0.4204	-0.0271	0.1238	-0.1816	0.0002	1.0000	
US	0.2832	-0.1548	0.1230	-0.1760	-0.0075	0.3281	1.0000

[12]HI and CI are also highly correlated. This is not a problem, however, because the 2 dummy variables are combined to represent the forms of integration, and then vertical integration is zero in both variables. The negative correlation is due to the lower proportion of vertical integration in the sample.

First, we run the model for U.S. direct investment in other countries (sample (a)), and the results appear in Table 5.2.

Table 5.2: U.S. FDI (Sample (a))

Individuals = 110
$chi^2(6)$ = 17.44
Prob > chi^2 = 0.0078

Log Likelihood = -265.10316

	Coefficients	Std. Err.	t	P>|t|
JV	1.24314	0.32027	3.881	0.000
SALES	-0.00006	0.00005	-1.261	0.210
HI	0.17358	0.31787	0.546	0.586
CI	0.94691	0.41359	2.289	0.024
INDUSTRY	-0.04732	0.27352	-0.173	0.863
DEVELOP	-0.73246	0.34167	-2.144	0.034

Note: t: Student-t test statistic
P>|t|: Significant level

From Table 5.2, it can be seen that the signs of the coefficients are generally consistent with our predictions. The signs are positive for JV, HI and CI but negative for SALES, INDUSTRY and DEVELOP. The chi-square test suggests that at least one explanatory variable is significant. As the coefficient of JV is positive and highly significant, it supports the theory that joint ventures are more unstable than wholly-owned subsidiaries for U.S. direct investment in other countries. Another significant variable is CI which also has a positive sign. It implies that conglomerate integration is more unstable than horizontal integration or vertical integration. Though HI has a positive coefficient too, it is not significant.

Apart from the fact that JV and CI are significant, DEVELOP is also significant at the 5% level. Its negative sign implies that the projects of U.S. FDI in developing countries tend to be more stable, as predicted earlier. The degree of correlation found between JV and DEVELOP suggests that U.S. firms are more likely to form joint ventures in developing countries.

The coefficient on SALES is small and negative, and the coefficient on INDUSTRY is also very small in absolute value; both variables are insignificant at the 5% level. Our hypothesis that the size of a parent may be correlated with more stable affiliates is not supported by the data.

Six observations of SALES are missing and then Table 5.2 does not include the complete data set. If only the significant variables (JV, CI and DEVELOP) are included in the model, the results are similar.[13]

Next, we test the results of the sub-sample of FDI in the United States (sample (b)). These results can be compared with sample (a) in order to find out whether the instability of joint ventures is unique to U.S. affiliates or not. In sample (b), there is only 1 foreign firm investing in the United States which is based in a developing country, so it is not possible for us to test the effects of DEVELOP. The results appear in Table 5.3.

The signs of the coefficients are the same as the previous results: positive for JV, HI and CI, negative for SALES and INDUSTRY. However, JV and CI are not significant

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[13]The coefficients of JV, CI and DEVELOP are 1.0516, 0.7405 and -0.6308 respectively. The t-values for JV and CI are 3.433 and 2.162 respectively while the probabilities greater than the absolute t-values are 0.000 and 0.033 respectively. The t-value and probability for DEVELOP is -1.919 and 0.057 respectively. Though the significance levels are not as high as those in table 1, the results are similar.

and the absolute values of the coefficients are much smaller than in sample (a). The only significant variable is INDUSTRY and the negative sign suggests that FDI in the United States may last longer when it occurs in the service sector. One possible explanation is that the United States has a comparative advantage in services, so only the stronger foreign firms can compete in the United States and accordingly, the affiliates are last longer. This may be an interesting topic for future research.

Table 5.3: FDI in the United States (Sample (b))

Individuals = 83
$chi^2(5)$ = 8.41
Prob > chi^2 = 0.1351

Log Likelihood = -176.32368

	Coefficients	Std. Err.	t	P>|t|
JV	0.32327	0.41874	0.772	0.442
SALES	-0.00001	0.00003	-0.418	0.677
HI	0.29646	0.41222	0.719	0.474
CI	0.52367	0.41539	1.261	0.211
INDUSTRY	-0.81511	0.38912	-2.095	0.039

Quite a few observations are missing for SALES. If we retain only the variables JV and INDUSTRY and the model is re-estimated using the entire data set, we find that although the significance level of JV is improved and the absolute value is larger, it is still insignificant at the 5% (or 10%) level.[14] One possible reason is that the sample only

[14]A total of 99 cases are used. The coefficient of JV is 0.4632 and the t-value is 1.326. The probability greater than the absolute t-value is 0.188. For INDUSTRY, the coefficient is -0.6371 and the t-value is -2.110. The probability greater than the absolute t-value is 0.037.

includes 13 cases of international joint ventures in the United States, and then the standard error may be larger. The group test (chi-square test) is not as good as sample (b) and so it is possible that none of the independent variables are significant.

Finally, we ran the model using the combined sample (sample (c)); the results are shown in Table 5.4. The signs of the coefficients are also the same as in the previous estimations. Moreover, the chi-square test also suggests that at least one independent variable is significant. The coefficients of JV and CI are positive and significant while that of DEVELOP is negative and insignificant at the 5% level. The sign on the dummy variable, US, distinguishing between FDI in the United States or U.S. direct investment abroad is positive but not significant. Overall, international joint ventures appear to be more unstable and conglomerate integration tends to have shorter duration time. DEVELOP is negatively significant at the 10% level suggesting that FDI related to developing countries tends to last longer, though the evidence is not very strong. None of the other coefficients are significant, and then the results are not strong enough to support the prediction of signs.

There are some data missing in Table 5.4 (also due to SALES). If we make use of all the data by including only the significant variables, i.e. only JV and CI are included in the model, the absolute values of the coefficients are smaller but still significant.[15]

[15]215 cases are used. The coefficient and t-value of JV are 0.5787 and 2.961 respectively. The probability greater than the absolute t-value is 0.003. The values of CI are 0.5397 and 0.2101 respectively and the probability is 0.011. Since all the data are used, and other variables are dropped, it is not surprising to find slightly different values. The results still support the theory that joint ventures and conglomerate plants are more unstable.

Table 5.4: Combined Data Set (Sample (c)) Results

Individuals = 193
$chi^2(7)$ = 18.95
Prob > chi^2 = 0.0083

Log Likelihood = -516.97271

	Coefficients	Std. Err.	t	P>|t|
JV	0.83624	0.22786	3.670	0.000
SALES	-0.00002	0.00003	-0.604	0.546
HI	0.25483	0.25131	1.014	0.312
CI	0.67345	0.28695	2.347	0.020
INDUSTRY	-0.27374	0.21819	-1.255	0.211
DEVELOP	-0.57021	0.32020	-1.781	0.077
US	0.13481	0.21431	0.629	0.530

5.6 Test of the Appropriation of the Proportional Hazards Model

It is not clear whether the proportional hazards model is appropriate or not. A simple method can be used to check the adequacy of the model[16], that is, whether the log-linear assumption of the model (equation (5.7)) is appropriate or not.

From (5.6), taking the exponential to both sides and applying the results to the baseline hazard:

$$-\int_0^T h_o(t)dt = \ln S_o(T) \qquad (5.10)$$

where S_o is the baseline survivor function. Substitute (5.10) into the integration of (5.7),

[16] Chung et al. (1991), pp.79-80.

it becomes:

$$\int_0^T h(t;x,\beta)dt = -\ln S_o(T)e^{x'\beta} \tag{5.11}$$

Let

$$v = -\ln\int_0^T h(t;x,\beta)dt \tag{5.12}$$

Taking logarithm of (5.11) and then we have:

$$-v = \ln\{-\ln[S_o(T)]\} + x'\beta$$

Given the survival time t according to the proportional hazards model, a transformation of t is used:

$$z = -\ln\{-\ln[S_o(T)]\} ,$$

It is clear that **v** is the difference between **z** and **x'β**, and then

$$z = x'\beta + v$$

is a linear regression model.

Though we do not know the distribution of the baseline hazard function, it is possible to estimate the distribution of the "residuals", v. It can be shown that v has the extreme-value distribution with the distribution function F(v):

$$F(v) = \exp[-\exp(-v)] . \tag{5.13}$$

The general idea behind the extreme-value distribution is that if an individual with the "failure" time at T has the survivor function S(T;x,β), then S(T;x,β) is assumed to be uniformly distributed. From (5.12), we have:

$$v = -\ln\int_0^T h(t;x,\beta)dt = -\ln\{-\ln[S(T;x,\beta)]\}$$

The distribution of v is obtained accordingly.[17] Since there are some data censored after T > 132, the "residuals" are either censored or uncensored.

Once β and the baseline survivor function are estimated, we can calculate the estimated "residuals" as

$$\hat{v}_i = -\ln\{-\ln[\hat{S}_o(t_i)]\} - x_i'\hat{\beta} \ . \tag{5.14}$$

Comparing the distribution of the estimated "residuals" (5.14) with the extreme-value distribution (i.e. 5.13), we can check the adequacy of the proportional hazards model.

It is convenient to use Kolomogorov-Smirnov one-sample test to examine the hypothesis that the actual distribution of the "residuals" is equal to the extreme-value distribution. The basic idea is very simple: to find out the largest difference between the actual and hypothesized distribution functions and then to determine whether it is acceptable that the distributions are the same.[18] Let

$$K_v = \sup_{-\infty<\infty} |F(\hat{v}) - F(v)|$$

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[17] This result is extended from the idea of Cox and Oakes (1984), pp.88-89.

[18] Please refer to Chapter 6 of Conover (1971).

If the null hypothesis is false, then estimates of $F(\hat{v})$, the distribution function of $\hat{v}$ will tend to near the true distribution instead of F(v) and consequently K_v is large; so it is reasonable to believe that if K_v is large, the null hypothesis is rejected.

For the sample (c), we find that the greatest positive value of the difference K_v is 0.0244 and the greatest negative value is -0.2938. The probability of accepting the null hypothesis is 0.000. Therefore, using Kolomogorov-Smirnov test, we find the hypothesis that the "residuals" have an extreme-value distribution is rejected, so the log-linear assumption of the proportional hazards model is not appropriate. The similar results can be got by testing the other samples.

5.7 Parametric Models

Although the log-linear assumption of the survival time distribution in the proportional hazards model is not appropriate in estimating the hazard function (or the survivor function), the empirical results are still valuable. It is because our main interest is the comparison between wholly-owned subsidiaries and international joint ventures rather than the exact distribution of the "failure" time. Though the magnitude of the estimated coefficients of the explanatory variables is not unbiased, the significance levels may probably be still useful. We use other models to estimate β's to check whether the results are significantly different from proportional hazards model. The exponential distribution and Weibull distribution are chosen for convenience.[19]

Exponential Distribution

The exponential distribution[20] has the density function:

$$f(t) = \theta e^{-\theta t},$$

and the survivor function as

$$S(t) = e^{-\theta t},$$

where it is required that $\theta > 0$. Its mean is $1/\theta$ and its variance is $1/\theta^2$. To allow explanatory variables to enter into a survival model, a convenient choice is[21]:

$$\frac{1}{\theta} = \exp(x_i'\beta)$$

Clearly this implies $\theta = \exp(-x_i'\beta)$. Suppose that the sample consists of N cases of which n have failed before the last observed period, so that N-(n+1) are censored. Let the observed failure times for the affiliates be denoted t_i (i=1,2,...,n), and the censored times for the "survivors" after the last observed period be denoted t^c_i (i=n+1,...,N). Assuming

[19]Proportional hazards model has an advantage over the two parametric models from the viewpoint that the former does not depend on the exact hazard functions (of survivor functions) while the latter two depend on the assumptions of the distributions. The parametric models are applied here to compare the results of the proportional hazards model.

[20]The exponential model follows Chung et al. (1991), pp.71-73.

[21]A more obvious possibility to let θ vary over observations as a function of explanatory variables is $(1/\theta) = x_i'\beta$ which is in a linear regression; however, this is an inconvenient choice because θ (and $1/\theta$) must be positive, and then restricting $x_i'\beta > 0$ for all i is a bothersome set of restrictions to impose.

that the individual outcomes are independent from each other, the likelihood function becomes:

$$L(\beta) = \prod_{i=1}^{n} \theta \exp(-\theta t_i) \prod_{i=n+1}^{N} \exp(-\theta t_i^c)$$
$$= \prod_{i=1}^{n} \exp(-x_i'\beta)\exp[-\exp(-x_i'\beta)t_i] \prod_{i=n+1}^{N} \exp[-\exp(-x_i'\beta)t_i^c] \ .$$

The likelihood is then maximized and the estimates for β can be obtained from the iterative method.

Table 5.5 shows the results of the whole sample (sample (c)) estimated under the exponential model.

Table 5.5 Exponential Model - Combined Data (Sample (c))

Individuals = 193
Model $chi^2(7)$ = 18.090
Prob > chi^2 = 0.0116
Log Likelihood = -213.442

	Coefficients	Std. Err.	t	P>|t|
JV	-0.75182	0.22660	-3.318	0.001
SALES	0.00002	0.00003	0.633	0.528
HI	-0.24633	0.25148	-0.980	0.329
CI	-0.65367	0.28688	-2.279	0.024
INDUSTRY	0.24788	0.21737	1.140	0.256
DEVELOP	0.48232	0.31753	1.519	0.130
US	-0.09642	0.21431	-0.450	0.653
constant	5.55609	0.27577	20.148	0.000

A survivor function is decreasing as it reflects the survival ratio of the data while a hazard function is increasing. Since the likelihood is based on the survivor function rather than the hazard function, the signs of the coefficients are expected to be opposite of the proportional hazards model. A positive coefficient means that an increase in the corresponding element in the explanatory variables raises the mean time of the duration of an affiliate in foreign countries, and vice versa for a negative coefficient. As noted in Table 5.5, all the signs are opposite to Table 5.4 as expected. Particularly, the signs of the coefficients of JV and CI are negative and significant, which support the conclusions of the proportional hazards model. The chi-square test also support the fact that at least one independent variable is significant. This indicates that joint venturing and conglomerate integration tend to reduce the life span of an affiliate.

Running the exponential model for sample (a) and sample (b), the signs of the coefficients further support the proportional hazards model findings. The coefficients of JV and CI are also negative and significant at the 5% level for the sample of U.S. direct investment in other countries (sample (a)) while the coefficient of DEVELOP is positive but only significant at the 10% level. On the other hand, the sign of the coefficient of INDUSTRY is positive and significant at the 5% level for the sample of FDI in the United States (sample (b)). If only JV and INDUSTRY are included in sample (b), INDUSTRY is significant at the 10% level. The foreign affiliates at the service sectors in the U.S. also have a larger mean life span.

Weibull Distribution

The other parametric model that can be used is Weibull distribution[22]. Let $y=\ln(t)$ and the density function of y is:

$$y = \sigma^{-1} f(w) \ ,$$

where $w=(y-x'\beta)/\sigma$ and σ is the standard deviation of y. A Weibull regression model is given by:

$$f(w) = \exp(w - e^{w})$$

The Weibull distribution is a generalization of the exponential. If $\sigma=1$, the hazard rate is constant and the Weibull distribution is the same as the exponential distribution. A Weibull distribution has an increasing hazard rate if $\sigma>1$ and a decreasing hazard rate if $\sigma<1$. Therefore, a Weibull distribution can avoid the restriction of an exponential distribution where the hazard rate must be constant. However the Weibull distribution is monotonic such that the hazard rate is increasing, decreasing or constant but it cannot be increasing at first and then decreasing later or vice versa.

The likelihood function for a sample with censored data for case i, $i=n+1,\ldots,N$, is:

[22]The Weibull model follows Kalbfleisch and Prentice (1980), pp.54-55.

$$L(\beta,\sigma) = \prod_{i=1}^{n} \sigma^{-1} f(w_i) \prod_{i=n+1}^{N} S(w_i)$$

$$= \prod_{i=1}^{n} \sigma^{-1} \exp\left[\frac{y_i - x_i'\beta}{\sigma} - \exp\left(\frac{y_i - x_i'\beta}{\sigma}\right)\right] \prod_{i=n+1}^{N} \left\{-\exp\left[-\exp\left(\frac{y_i - x_i'\beta}{\sigma}\right)\right]\right\},$$

where $S(w_i) = \int_w^\infty f(u)du$. An iterative method is required to obtain the maximum likelihood estimates.

Table 5.6: Weibull Model - Combined Data (Sample (c))

		Individuals	= 193
σ	= 0.614	Model chi²(6)	= 21.089
Std Err(σ)	= 0.049	Prob > chi²	= 0.0036
Log Likelihood	= -200.107		

	Coefficients	Std. Err.	t	P>|t|
JV	-0.54044	0.13918	-3.883	0.000
SALES	0.00001	0.00002	0.781	0.436
HI	-0.16149	0.15419	-1.047	0.296
CI	-0.44423	0.17564	-2.529	0.012
INDUSTRY	0.17220	0.13386	1.286	0.200
DEVELOP	0.36592	0.19667	1.861	0.064
US	-0.08167	0.13142	-0.621	0.535
constant	5.2628	0.16801	31.325	0.000

(standard errors conditional on σ)

The results of the Weibull model for the overall sample (sample (c)) are shown in Table 5.6. The signs of the coefficients should be the same as the exponential model (or the opposite of the proportional hazards model). The results confirm this prediction. The chi-square test suggests that at least one explanatory variable is significant. Furthermore, JV and CI are also significant at the 5% level in which both JV and CI are negative. The coefficient of DEVELOP is positive though it is only significant at 10% level. The Weibull model suggests that joint ventures tend to terminate earlier and conglomerate integration leads to a shorter duration time. U.S. firms investing in developing countries or foreign firms in the U.S. based in developing countries have a larger mean of the duration time although the evident is not very strong.

It can be checked that if only JV, CI and DEVELOP are included in the model, the coefficients remain significant and have the same signs as in Table 5.6. If the models for sample (a) and sample (b) are run, the results are also consistent with the proportional hazards model: for sample (a) (U.S. investment abroad), JV, CI and DEVELOP are significant and have the same signs as Table 5.6. For sample (b) (foreign investment in the U.S.), INDUSTRY is positive and significant, i.e. foreign firms of services in the U.S. on average have a longer duration time.

To use the Kolomogorov-Smirnov test, both the exponential distribution and the Weibull distribution are rejected; therefore, all three models used in this chapter are not appropriate to describe the hazard function. However as the signs are consistent in the three models, it is suggested that joint ventures should have a shorter duration time than the wholly-owned subsidiaries. Although the true distribution of the survivor function is unknown, it is reasonable to believe that the average duration time of joint ventures is shorter than that of the wholly-owned subsidiaries.

5.8 Concluding Remarks

The hypothesis in this chapter is that international joint ventures should have shorter duration times than wholly-owned subsidiaries. The cooperation costs between partners of a joint venture remain stable over time as it is assumed that the conflicts between different firms are not easy to solve. However, the benefits from the joint venture decrease as the partners gather more and more knowledge from the other partner over time. After applying different models (the proportional hazards model, the exponential model and the Weibull model) to compare new international joint ventures and foreign acquisitions between the end of 1979 and the end of 1991, the hypothesis is not rejected with a sample of U.S. direct investment in other countries. This result is consistent to previous studies; however, the evidence on the relative stability of foreign wholly-owned subsidiaries compared with international joint ventures in the United States is not strong enough to support this theory. A possible reason is that there is a lack of data in international joint ventures in the United States and then the standard error is larger.

We also found, for the U.S. direct investment abroad, conglomerate integration tends to have a shorter duration time. This may be due to the fact that under conglomerate integration, parent firms tend to have less experience in the new business of the affiliates, and it is easier for such affiliates to fail. However, it should be cautious that FDI in the United States does not support this prediction.

The results also suggest that U.S. subsidiaries or joint ventures in developing countries have, on average, longer duration times than those in developed countries. This may be due to a higher ratio of joint ventures in developing countries; also U.S. firms may tolerate poorer performance of affiliates in developing countries since long run profit may be more important in such cases. As there is only one case of a firm based in a developing country with an investment in the U.S., the results between U.S. investment abroad and foreign investment in the United States cannot be compared.

A result for the sub-sample of FDI in the United States is that the foreign affiliates in the service sectors have longer duration time in the United States. The reason is not clear and further research on this matter should be done before any conclusion can be made.

For the overall sample, the results suggest that instability among joint ventures and conglomerate integration is larger. While it cannot tell us that the two sub-samples perform differently (the dummy variable US is not significant at the 5% level), we can say that the prediction of instability of joint ventures is not contradicted by the results. We cannot conclude, however, that joint ventures are less stable irrespective of whether they are associated with U.S. investment abroad or foreign investment in the U.S. since our evidence on FDI in the United States is rather limited.

The results of this study should be taken cautiously as the true distribution of the survivor function is unknown. However, as we do not care about the distribution of the duration time, the problem is not very big. After running different models, we have similar results from all the tests, At least we can say that the observations are consistent with the predictions of shorter duration time of joint ventures when compared to wholly-owned subsidiaries for U.S. FDI.

A limitation in the sample is that the change of ownership of a subsidiary or a joint venture is not distinguished from "real failure". That is, the reason for the termination of an affiliate is not included in the data set. We cannot distinguish between the shut-down of a plant and the sale. As our main interest is the overall instability rate of international joint ventures instead of the types of termination, so this problem should not be important to our results.

Appendix 5A: Maximum Likelihood of the Proportional Hazards Model

The maximum likelihood of the proportional hazards model can be solved by using Newton-Raphson method. Taking logarithm of the likelihood function (5.9), we have:

$$\log L = \sum_{j=1}^{J} q_j' \beta - \sum_{j=1}^{J} M_j \log z_j \quad \text{(5A.1)}$$,

where

$$z_j = \sum_{k \in R(t_j)} e^{x_k' \beta}$$.

The first derivative of (5A.1) with respect to β is:

$$\frac{\partial \log L}{\partial \beta} = \sum_{j=1}^{J} q_j - \sum_{j=1}^{J} \frac{M_j}{z_j} y_j \quad \text{(5A.2)}$$,

where

$$y_j = \sum_{k \in R(t_j)} e^{x_k'\beta} x_k \quad .$$

And the second derivative is:

$$\frac{\partial^2 \log L}{\partial \boldsymbol{\beta} \partial \boldsymbol{\beta}'} = \frac{M_j}{z_j}\left(\frac{1}{z_j} y_j y_j' - v_j\right) , \qquad \textbf{(5A.3)}$$

where

$$v_j = \sum_{k \in R(t_j)} e^{x_k'\beta} x_k' x_k \quad .$$

By using the results of the first and second derivatives (equations (5A.2) and (5A.3)), the Newton-Raphson method can be used to obtain the maximum likelihood of β after n+1 iterations:

$$\hat{\boldsymbol{\beta}}_{n+1} = \hat{\boldsymbol{\beta}}_n - \left(\frac{\partial^2 \log L}{\partial \hat{\boldsymbol{\beta}}_n \partial \hat{\boldsymbol{\beta}}_n'}\right)^{-1} \frac{\partial \log L}{\partial \hat{\boldsymbol{\beta}}_n} \quad .$$

The initial values of $\hat{\boldsymbol{\beta}}$, $\hat{\boldsymbol{\beta}}_0$, can be any values though the usual choices are OLS

estimates or zeros. We adopt the values of $\hat{\boldsymbol{\beta}}_{n+1}$ when $\hat{\boldsymbol{\beta}}_{n+1}$ is consistent to $\hat{\boldsymbol{\beta}}_n$.

Appendix 5B: Summary of the Data Set

CASE	MONTHS[a]	DIED[b]	JV	SALES[c] (m. US$)	HI	CI	INDUSTRY	DEVELOP	US
1	134	0	0	4899	0	0	1	0	0
2	87	1	0	903	0	1	0	0	0
3	83	1	1	1973	1	0	0	1	1
4	137	0	0	2185	0	1	0	0	0
5	63	1	1	.	1	0	0	0	0
6	133	0	0	280	0	0	1	0	1
7	29	1	0	318	1	0	1	0	0
8	56	1	0	.	0	0	0	0	0
9	74	1	0	726	0	1	0	0	1
10	102	1	0	1692	1	0	0	0	0
11	112	1	1	2115	0	1	0	0	0
12	133	0	0	420	1	0	0	0	1
13	156	0	0	111	1	0	1	0	1
14	45	1	0	.	1	0	1	0	0
15	136	0	1	522	0	0	0	1	1
16	104	1	1	288	0	1	1	1	1
17	76	1	1	72	0	0	1	0	1
18	71	1	0	3013	0	1	1	0	1
19	139	0	0	749	0	0	1	0	0
20	69	1	0	179615	0	0	1	0	0
21	135	0	0	5000	1	0	1	0	0
22	141	0	0	6754	1	0	1	0	0
23	72	1	0	104	1	0	1	0	1
24	87	1	1	478	0	1	1	0	0
25	71	1	1	554	1	0	0	1	1
26	48	1	0	1122	0	0	1	0	1
27	20	1	0	4392	1	0	0	0	0
28	57	1	0	700	1	0	0	0	0
29	125	1	0	18	1	0	0	1	1
30	131	1	0	263	1	0	0	0	1

CASE	MONTHS[a]	DIED[b]	JV	SALES[c] (m. US$)	HI	CI	INDUSTRY	DEVELOP	US
31	137	0	0	193	0	1	0	0	0
32	89	1	1	409	1	0	1	0	1
33	107	1	0	8935	0	1	0	0	1
34	143	0	0	84	1	0	0	0	1
35	81	1	0	6561	1	0	0	0	0
36	125	1	1	6474	0	0	1	1	1
37	143	0	1	819	1	0	1	0	0
38	133	0	0	420	1	0	0	0	1
39	56	1	1	4515	1	0	0	1	1
40	139	0	0	1434	0	1	0	0	1
41	142	0	0	1110	0	1	0	0	0
42	123	1	0	.	0	0	1	0	0
43	142	0	1	6622	1	0	0	1	1
44	135	0	1	1792	1	0	1	1	1
45	143	0	0	4599	0	0	0	0	1
46	128	1	0	494	0	0	0	0	0
47	114	1	0	898	1	0	0	0	1
48	63	1	0	1583	0	1	0	0	0
49	147	0	0	13835	0	1	0	0	0
50	139	0	0	1051	0	1	1	0	0
51	142	0	1	3145	1	0	0	1	1
52	135	0	0	7997	0	1	0	0	1
53	141	0	1	190	0	0	1	1	1
54	109	1	0	10772	0	0	0	0	1
55	116	1	1	10	0	1	0	0	0
56	140	0	0	531	1	0	1	0	1
57	143	0	0	509	1	0	1	0	1
58	133	0	0	420	1	0	0	0	1
59	135	0	0	2501	1	0	0	0	0
60	48	1	0	3294	1	0	1	0	0
61	64	1	0	109	1	0	0	0	1
62	133	0	1	1771	1	0	0	1	1

CASE	MONTHS[a]	DIED[b]	JV	SALES[c] (m. US$)	HI	CI	INDUSTRY	DEVELOP	US
63	50	1	1	3145	0	0	0	0	1
64	22	1	0	1023	0	1	0	0	0
65	21	1	0	880	0	1	1	0	1
66	134	0	0	134	1	0	0	0	1
67	131	1	0	263	1	0	0	0	1
68	132	0	0	1022	0	0	0	0	1
69	139	0	0	1898	0	1	1	0	0
70	133	0	0	386	0	0	0	0	1
71	66	1	0	221	1	0	1	0	1
72	141	0	0	2134	0	0	0	0	0
73	132	0	0	3911	1	0	1	0	0
74	135	0	0	1883	1	0	0	0	1
75	24	1	0	354	1	0	0	0	1
76	142	0	0	21513	0	0	0	0	0
77	134	0	0	77	1	0	0	0	1
78	133	0	0	420	1	0	0	0	1
79	136	0	0	9311	0	1	1	0	1
80	107	1	0	1144	1	0	1	0	1
81	132	0	1	50791	1	0	0	1	1
82	132	0	0	447	1	0	0	0	0
83	133	0	0	224	1	0	1	0	0
84	141	0	0	1390	1	0	1	0	0
85	141	0	0	3548	0	0	0	0	1
86	142	0	0	366	1	0	0	0	1
87	107	1	0	1144	1	0	1	0	1
88	69	1	1	1042	1	0	1	0	1
89	132	0	0	2096	1	0	1	0	0
90	60	1	0	7600	1	0	0	0	0
91	74	1	1	66311	1	0	0	1	1
92	82	1	0	330	1	0	0	0	0
93	134	0	1	805	1	0	0	0	1
94	135	0	0	1100	0	0	0	0	0

CASE	MONTHS[a]	DIED[b]	JV	SALES[c] (m. US$)	HI	CI	INDUSTRY	DEVELOP	US
95	137	0	0	56	0	0	0	1	1
96	30	1	1	294	0	1	0	0	0
97	125	1	0	18	1	0	0	1	1
98	89	1	0	1452	1	0	0	0	1
99	138	0	0	1500	1	0	1	0	0
100	74	1	0	1419	1	0	0	0	0
101	61	1	1	295	1	0	0	1	1
102	135	0	0	62	1	0	0	0	0
103	141	0	0	298	0	1	0	0	1
104	68	1	0	328	1	0	0	0	0
105	76	1	0	610	0	0	1	0	0
106	144	0	0	751	0	0	0	0	0
107	72	1	0	881	0	1	0	0	0
108	102	1	0	.	0	1	0	0	0
109	143	0	0	586	0	0	0	0	1
110	24	1	1	848	1	0	1	1	1
111	133	0	0	32	1	0	1	0	0
112	59	1	1	562	1	0	0	0	1
113	138	0	0	21513	1	0	0	0	0
114	118	1	0	934	1	0	0	0	0
115	70	1	1	469	0	0	1	0	1
116	137	0	0	898	1	0	0	1	1
117	17	1	1	21483	0	0	0	0	0
118	76	1	0	216	0	1	0	0	0
119	41	1	1	116	1	0	0	0	1
120	73	1	0	6006	0	1	0	0	0
121	112	1	0	667	0	0	0	0	0
122	30	1	0	5029	1	0	0	0	0
123	141	0	0	270	1	0	1	0	0
124	143	0	1	7869	0	0	1	1	1
125	45	1	0	1052	1	0	1	0	0
126	143	0	1	492	0	0	0	0	0

CASE	MONTHS[a]	DIED[b]	JV	SALES[c] (m. US$)	HI	CI	INDUSTRY	DEVELOP	US
127	135	0	0	203	1	0	1	1	0
128	34	1	0	264	1	0	0	0	0
129	46	1	0	8392	0	0	0	0	1
130	132	0	0	700	1	0	0	0	0
131	134	0	0	2405	0	0	1	0	1
132	24	1	1	1012	1	0	0	0	1
133	138	0	0	100	1	0	0	0	1
134	144	0	0	.	1	0	1	0	0
135	138	0	0	185	0	0	1	0	0
136	43	1	0	4667	0	1	0	0	1
137	62	1	0	104	1	0	1	0	1
138	103	1	0	3662	0	0	0	1	1
139	92	1	0	439	0	0	0	0	0
140	59	1	1	496	0	0	0	0	1
141	48	1	0	5333	0	1	0	0	0
142	70	1	0	3393	0	1	0	0	1
143	65	1	1	12739	0	0	0	0	0
144	23	1	0	2693	0	1	0	0	0
145	102	1	0	194	1	0	1	0	0
146	134	0	0	382	1	0	1	0	1
147	137	0	0	525	0	0	0	0	1
148	88	1	1	738	1	0	0	0	1
149	48	1	1	176	0	0	0	0	1
150	20	1	0	.	1	0	0	0	0
151	132	0	1	12572	0	0	0	0	1
152	68	1	0	.	1	0	0	0	0
153	27	1	1	1946	1	0	0	0	1
154	100	1	0	.	1	0	1	0	0
155	91	1	0	.	0	1	1	0	0
156	102	1	0	14926	0	1	0	0	0
157	19	1	1	2717	0	0	0	1	1
158	58	1	0	1683	1	0	0	1	1

CASE	MONTHS[a]	DIED[b]	JV	SALES[c] (m. US$)	HI	CI	INDUSTRY	DEVELOP	US
159	134	0	0	1324	0	1	0	0	0
160	55	1	1	4170	1	0	0	0	1
161	102	1	0	2500	0	1	0	0	0
162	71	1	0	268	1	0	0	0	1
163	40	1	0	1323	1	0	0	0	1
164	141	0	0	2164	1	0	1	0	0
165	98	1	0	.	0	1	1	0	0
166	141	0	0	.	0	0	0	0	0
167	124	1	1	6474	1	0	1	1	1
168	142	0	1	2829	1	0	0	1	1
169	90	1	0	1082	0	1	0	0	1
170	58	1	1	.	1	0	0	0	0
171	133	0	0	420	1	0	0	0	1
172	133	0	0	420	1	0	0	1	1
173	69	1	1	544	1	0	0	0	1
174	28	1	1	34737	1	0	0	1	1
175	140	0	1	84350	1	0	1	1	1
176	136	0	0	241	0	0	1	0	0
177	60	1	1	1908	1	0	0	1	1
178	135	0	0	7082	1	0	0	0	0
179	53	1	0	503	0	1	0	0	1
180	134	0	1	457	1	0	1	1	1
181	45	1	1	.	0	0	0	0	0
182	33	1	0	23	1	0	0	0	0
183	98	1	1	824	1	0	1	0	1
184	65	1	1	19	0	0	0	0	1
185	45	1	0	397	0	1	1	0	0
186	141	0	0	521	0	1	0	0	1
187	66	1	1	4241	1	0	1	0	1
188	143	0	1	4085	1	0	1	0	1
189	27	1	0	951	0	1	0	0	0
190	64	1	0	59	1	0	1	0	1

CASE	MONTHS[a]	DIED[b]	JV	SALES[c] (m. US$)	HI	CI	INDUSTRY	DEVELOP	US
191	144	0	0	5238	0	0	0	0	0
192	140	0	0	.	0	0	0	0	1
193	71	1	0	141	0	0	0	0	0
194	140	0	0	104	1	0	1	0	1
195	13	1	0	33	0	1	0	0	1
196	140	0	0	2957	1	0	0	0	0
197	143	0	0	221	0	0	0	0	0
198	113	1	1	2100	0	0	1	0	0
199	20	1	0	4392	1	0	0	0	0
200	137	0	0	.	1	0	1	0	0
201	78	1	0	1143	0	1	0	0	0
202	136	0	0	175	0	0	0	0	1
203	134	0	0	166	0	0	0	0	1
204	45	1	0	4159	0	0	1	0	0
205	156	0	0	7428	1	0	0	0	1
206	104	1	1	297	0	0	0	1	1
207	133	0	1	3185	1	0	0	0	0
208	42	1	0	5338	0	1	1	0	1
209	79	1	0	420	1	0	0	0	0
210	141	0	1	.	1	0	0	0	1
211	112	1	0	89	1	0	1	0	1
212	68	1	0	166	1	0	1	0	1
213	92	1	0	1158	0	1	0	0	1
214	135	0	0	2184	0	1	0	0	0
215	44	1	1	1501	0	0	0	0	1

Note: a: MONTHS: Dependent variable. The duration time of the subsidiary or joint venture in term of months up to Dec. 31, 1991;
b: DIED: It denotes whether the plant "failed" at Dec. 31, 1991 or not. DIED=1: failed; DIED=0: survived.
c: If the datum is missed for SALES, "." is put in the item.

Appendix 5C: Kaplan-Meier Estimates

The summary here follows Kalbfleisch and Prentice (1980, pp.6-13) and Cox and Oakes (1984, pp.48-50). If T is a discrete random variable taking observations at $t_1 < t_2 < \ldots < t_J$ with

$$f(t_j) = P(T=t_j)\ , \qquad j = 1, \ldots, J\ ,$$

then the survivor function is:

$$S(t) = \sum_{j|t_j \geq t}^{J} f(t_j)$$
$$= \sum f(t_j) H(t_j - t)\ ,$$

where H(x) is the Heaviside function:

$$H(x) = 0\ , \qquad x < 0$$
$$= 1\ , \qquad x \geq 0.$$

The hazard at t_j is defined as the conditional probability of "failure" at t_j:

$$h_j = P(T=t_j \mid T \geq t_j)$$
$$= \frac{f(t_j)}{S(t_j)}\ , \qquad j = 1,2, \ldots, J\ ,$$

where $S(t_j) = f(t_j) + f(t_{j+1}) + \ldots + f(t_J)$. Corresponding to (5.5), the survivor function is given by:

$$S(t) = \prod_{j|t_j<t}^{J} (1-h_j) \tag{5C.1}$$

To have T≥t it is necessary and sufficient to survive all points before t. Let $f_j=f(t_j)$. In terms of the h_j, f_j may be written in the form:

$$f_1 = h_1 , \quad f_2 = (1-h_1)h_2 , \ \dots ,$$
$$f_j = (1-h_1)(1-h_2)\dots(1-h_{j-1})h_j , \ \dots ,$$
$$f_J = (1-h_1)(1-h_2)\dots(1-h_{J-1})h_J .$$

The constraints of $f_j \geq 0$ and $\sum f_j \leq 1$ imply that $0 \leq h_j \leq 1$.

An estimate of the survivor function is analogous to (5C.1):

$$\hat{S}(t) = \prod_{j|t_j<t}^{J} (1-\hat{h}_j) , \tag{5C.2}$$

where $\hat{h}_j$ are the maximum likelihood estimators of the h_j. The likelihood from N individuals, of which n are uncensored (the failure times are observed) and N-n are censored (the individuals survive at the last observed time, t_J):

$$L = \prod_{i=1}^{n} f_i \prod_{i=n+1}^{N} S(t_i) ,$$

where the two products are taken over uncensored and censored individuals respectively. The log likelihood is:

$$\ln L = \sum_{i=1}^{n} \ln f_i + \sum_{i=n+1}^{N} \ln S(t_i)$$,

where the the conventions from the summations are similar. Since the sample is discrete so that individuals are grouped into J+1 observations in which M_j, j=1,...,J are uncensored and M_{J+1} are censored. From (5C.1) above, we have:

$$f_j = h_j S(t_j) = h_j M_j (1-h_j) ,$$
$$S(t_J) = M_{J+1}(1-h_J) .$$

The total log likelihood is then:

$$\ln L = \sum_{j=1}^{J} \left[M_j \ln h_j + \left(\sum_{k=j}^{J+1} M_k - M_j \right) \ln(1-h_j) \right] .$$

Let

$$N_j = \sum_{k=j}^{J+1} M_k ,$$

which is the number of individuals at risk at a time t_j. The maximum likelihood estimators are the solutions of:

$$\frac{\partial \ln L}{\partial h_j} = \frac{M_j}{h_j} - \frac{N_j - M_j}{1-h_j} = 0$$.

that is,

$$\hat{h}_j = \frac{M_j}{N_j}.$$

The corresponding estimates of the survivor functions are:

$$\hat{S}(t) = \prod_{j:t_j<t}^{J} \left(1 - \frac{M_j}{N_j}\right). \qquad \textbf{(5C.3)}$$

Any term in the product which has $M_j=0$ can be omitted without affecting (5C.3).

$\hat{S}(t)$ is a function of the data only.

LIST OF REFERENCES

Agarwal, J.P., "Intra-LDCs Foreign Direct Investment: a Comparative Analysis of Third World Multinationals", *Developing Economies*, XXIII, Sep. 1985, pp.236-253.

Anderson, Erin and Hubert Gatignon, "Modes of Foreign Entry: A Transaction Cost Analysis and Propositions", *Journal of International Business Studies*, Fall, 1986, pp.1-26.

Barton, Russell R. and Bruce W. Turnbull, "A Failure Rate Regression Model for the Study of Recidivism", *Models in Quantitative Criminology*, by James Alan Fox (ed.), Academic Press, 1981, pp.81-101.

Baumol, William J., "On the Proper Cost Tests for Natural Monopoly in a Multiproduct Industry", *American Economic Review*, 67, no.5, 1977, pp.809-822.

Baumol, William J., Panzar, John C. and Willig, Robert D., "*Contestable Markets and the Theory of Industry Structure*", Harcourt Brace Jovanovich, 1982.

Baxter, Marianne, "Fiscal Policy, Specialization, and Trade in the Two-Sector Model: The Return of Ricardo?", *Journal of Political Economy*, 100, 1992, pp.713-744.

Beamish, Paul W. and John C. Banks, "Equity Joint Ventures and the Theory of the Multinational Enterprise", *Journal of International Business Studies*, Summer, 1987, pp.1-16.

Bernstein, Jeffrey I., "Costs of Production, Intra- and Interindustry R&D Spillovers: Canadian Evidence", *Canadian Economics Association*, May 1988, No. 2, pp.324-347.

Bernstein, Jeffrey I. and M. Ishaq Nadiri, "Interindustry R&D Spillovers, Rates of Returns, and Production in High-Tech Industries", *American Economic Review*, 78, May 1988, pp.429-434.

Blomström, Magnus, *Foreign Investment and Spillovers*, Routledge, 1989.

Blomström, Magnus and Hakan Persson, "Foreign Investment and Spillover Efficiency in an Underdeveloped Economy: Evidence from the Mexican Manufacturing Industry", *World Development*, 11, 1983, pp.493-501.

Blomström, M. & Zejan, M., "Why Do Multinational Firms Seek out Joint Ventures?", *Journal of International Development*, 3, no.1, 1991, pp.53-63.

Boddewyn, J.J., Marsha Baldwin Halbrich and A.C. Perry, "Service Multinationals: Conceptualization, Measurement and Theory", *Journal of International Business Studies*, Fall, 1986, pp.41-57.

Brander, James A., "Intra-industry Trade in Identical Commodities", *Journal of International Economics*, 16, 1981, pp.1-14.

Brander, James A. and Barbara J. Spencer, "Foreign Direct Investment with Unemployment and Endogenous Taxes and Tariffs", *Journal of International Economics*, 22, 1987, pp.257-279.

Cardoso, E. and R. Dornbusch, "Foreign Private Capital Flows", in H. Chenery and T. N. Srinivasan, eds., *Handbook of Development Economics*, North-Holland, 1989.

Caves, Richard E., "International Corporations: The Industrial Economics of Foreign Investment", *Economica*, 38, no.149, February, 1971, pp.1-27.

Cespedes, Frank V., "Control vs. Resources in Channel Design: Distribution Differences in One Industry", *Industrial Marketing Management*, 17, 1988, pp.215-227.

Chan, Raissa and Michael Hoy, "East-West Joint Ventures and Buyback Contracts", *Journal of International Economics*, 30, 1991, pp.331-343.

Chowdhury, Jafor, "Performance of International Joint Ventures and Wholly Owned Foreign Subsidiaries: A Comparative Perspective", *Management International Review*, v. 32, 1992, pp.115-133.

Chung, Ching-Fan, Peter Schmidt and Ann D. Witte, "Survival Analysis: A Survey", *Journal of Quantitative Criminology*, Vol. 7, No. 1, 1991, pp.59-98.

Clarke, Christopher J. & Kieron Brennan, "Joint Ventures - A Key to Strategy", in Jan Gillespie (ed.), *Joint Ventures - A Eurostudy Special Report*, Eurostudy Publishing Company Limited, 1990, pp.1-6.

Conover, W.J., *Practical Nonparametric Statistics*, Jon Wiley & Sons Inc., 1971.

Contractor, F.J. and P. Lorange, " Competition vs. Cooperation: A Benefit/Cost Framework for Choosing Between Fully-Owned Investments and Cooperative Relationships", *Management International Review*, Special Issue 1988, pp.5-18.

Cox, D.R., "Regression Models and Life-Tables", *Journal of the Royal Statistical Society*, Series B, 34, 1972, pp. 187-202.

Cox, D.R., "Partial Likelihood", *Biometrika*, 62, 1975, pp.269-276.

Cox, D.R. and D. Oakes, *Analysis of Survival Data*, Chapman and Hall, 1984.

Crowley, John and Marie Hu, "Covariance Analysis of Heart Transplant Survival Data", *Journal of the American Statistical Association*, V. 72, No. 357, Mar. 1977, pp.27-36.

Darrough,M.N. & Stoughton, N.M., "A Bargaining Approach to Profit Sharing in Joint Ventures", *Journal of Business*, 62, no.2, 1989, pp.237-270.

Das, Sanghamitra, "Externalities, and Technology Transfer through Multinational Corporation", *Journal of International Economics*, 22, 1987, pp.171-182.

Dei, Fumio, "A Note on Multinational Corporations in a Model of Reciprocal Dumping", *Journal of International Economics*, 29, 1990, pp.161-171.

Dixit, Avinash, "Optimal Trade and Industrial Policies for the US Automobile Industry", in Robert C. Feenstra, ed., *Empirical Methods for International Trade*, MIT Press, 1988, pp.141-165.

Dunning, John H., "Trade, Location of Economic Activity and the MNE: A Search for an Eclectic Approach", in B. Ohlin, P. O. Hesselborn & P.M. Wijkman (eds.), *The International Allocation of Economic Activity: Proceedings of a Nobel Symposium Held at Stockholm*, Macmillan, 1977, pp.395-418.

Dunning, John H., "Toward an Eclectic Theory of International Production: Some Empirical Tests", *Journal of International Business Studies*, 11, Spring/Summer 1980, pp.9-31.

Dunning, John H., "The Eclectic Paradigm of International Production: A restatement and Some Possible Extensions", *Journal of International Business Studies*, Spring 1988, pp.1-31.

Ethier, Wilfred J., "The Multinational Firm", *The Quarterly Journal of Economics*, Nov. 1986, pp.805-833.

Ethier, Wilfred J., "Multinational Firms in the Theory of International Trade", University of Pennsylvania Discussion Paper No.30, Aug. 1992.

Ethier,W.J. & Horn,H., "Managerial Control of International Firms and Patterns of Direct Investment", *Journal of International Economics*, 28, 1990, pp.25-45.

Ethier, Wilfred J. and James R. Markusen, "Multinational Firms, Technology Diffusion and Trade", University of Pennsylvania discussion Paper No.26, Aug. 1991.

Findley, Ronald, "Some Aspects of Technology Transfer and Direct Foreign Investment", *American Economic Review*, 68, May 1978, pp.275-279.

Franko, Lawrence G., *Joint Venture Survival in Multinational Corporations*, Praeger, 1971.

Georgantzas, Nicholas C., "MNE Competitiveness: a Scenario-driven Technology Transfer Construct", *Managerial and Decision Economics*, 12, 1991, pp.281-293.

Geringer, J. Michael and Louis Hebert, "Measuring Performance of International Joint Ventures", *Journal of International Business Studies*, Second Quarter 1991, pp.249-263.

Globerman, Steven, "Foreign Direct Investment and 'Spillover' Efficiency Benefits in Canadian Manufacturing Industries", *Canadian Journal of Economics*, XII, Feb. 1979, pp.42-56.

Gomes-Casseres, Benjamin, "Joint Venture Instability: Is It a Problem?", *Columbia Journal of World Business*, Summer 1987, pp.97-102.

Graham, Edward M. & Paul R. Krugman, *Foreign Direct Investment in the United States*, Second Edition, Institute for International Economics, 1991.

Harrigan, Kathryn R. *Strategies for Joint Ventures*, Lexington Books, 1985.

Helpman, Elhanan, "A Simple Theory of International Trade with Multinational Corporations", *Journal of Political Economy*, 92, no.3, 1984, pp.451-471.

Helpman, Elhanan, "Multinational Corporations and Trade Structure", *Review of Economic Studies*, 52, 1985, pp.443-457.

Helpman, Elhanan and Paul Krugman, *Market Structure and Foreign Trade*, MIT Press, 1985.

Hill, Charles W.L. and W. Chan Kim, "Searching for a Dynamic Theory of the Multinational Enterprise: A Transaction Cost Model", *Strategic Management Journal*, 9, 1988, pp.93-104.

Hill, Charles W.L., Peter Hwang and W. Chan Kim, "An Eclectic Theory of the Choice of International Entry Mode", *Strategic Management Journal*, 11, 1990, pp.117-128.

Hillman, Arye L. and Heinrich W. Ursprung, "Multinational Firms, Political Competition, and International Trade Policy", *International Economic Review*, Vol. 34, No. 2, May 1993, pp.347-363.

Horstmann, Ignatius J. and James, R. Markusen, "Strategic Investments and the Development of Multinationals", *International Economic Review*, Vol. 28, No. 1, Feb. 1987a, pp.109-121.

Horstmann, Ignatius J. and James, R. Markusen, "Licensing versus Direct Investment: A Model of Internalization by the Multinational Enterprise", *Canadian Economics Association*, No. 3, Aug. 1987b, pp.464-481.

Horstmann, Ignatius J. and James, R. Markusen, "Firm-specific Assets and the Gains from Direct Foreign Investment", *Economica*, 56, Feb. 1989, pp.41-8.

Hu, Michael Y., Haiyang Chen and Joseph C. Shieh, "Impact of U.S.-China Joint Ventures on Stockholders' Wealth by Degree of International Involvement", *Management International Review*, Vol. 32, 2, 1992, pp.135-148.

Hymer, Stephen H., *The International Operation of National Firms: A Study of Direct Foreign Investment*, MIT Press, 1976.

Hymer, Stephen H., *The multinational Corporation: A Radical Approach*, Cambridge University Press, 1979.

Jaffe, Adam B., "Technology Opportunity and Spillovers of R&D: Evidence from Firms' Patents, Profits, and Market Value", *American Economic Review*, 76, Dec. 1986, pp.984-1001.

Johnson, H. G., "The efficiency and Welfare Implications of the Multinational Corporation", in C.P. Kindleberger (ed.), *The International Corporation: A Symposium*, Chapter 2, MIT Press, 1970, pp.35-56.

Kalbfleisch, J.D. and R.L. Prentice, "Marginal Likelihoods Based on Cox's Regression and Life Model", *Biometrika*, 60, 2, 1973, pp.267-278.

Kalbfleisch, John D. and Ross L. Prentice, *The Statistical Analysis of Failure Time Data*, John Wiley and Sons, 1980.

Kay, R., "Proportional Hazard Regression Models and the Analysis of Censored Survival Data", *Applied Statistics*, 26, No.3, pp.227-237.

Kogut, Bruce, "A Study of the Life Cycle of Joint Ventures", *Management International Review*, Special Issue 1988, pp.39-52.

Kogut, Bruce and Harbir Singh, "The Effect of National Culture on the Choice of Entry Mode", *Journal of International Business Studies*, Fall 1988, pp.411-432.

Krugman, Paul R., "Increasing Returns, Monopolistic Competition, and International Trade", *Journal of International Economics*, 9, 1979, pp.469-479.

Krugman, Paul R., "Scale Economics, Product Differentiation, and the Pattern of Trade", *American Economic Review*, 70, Dec. 1980.

Krugman, Paul R., "The 'New Theories' of International Trade and the Multinational Enterprise", in Charles P. Kindleberger and David B. Audretsch (ed.), *The Multinational Corporation in the 1980s*, MIT Press, 1983, pp.57-73.

Lagakos. S.W., "The Graphical Evaluation of Explanatory Variables in Proportional Hazard Regression Models", *Biometrika*, 68, 1, 1980, pp.93-98.

Levin, Richard C. and Peter C. Reiss, "Cost-Reducing and Demand-Creating R&D with Spillovers", *RAND Journal of Economics*, 19, Winter 1988, pp.538-556.

Levy, Santiago and Nolan, Sean, "Trade and Foreign Investment Policies under Imperfect competition - Lessons for developing countries", *Journal of Development Economics*, 37, 1992, pp.31-62.

Lizondo, J. Saul, "Foreign Direct Investment", in Robert Z. Aliber and Reid W. Click (ed.), Readings in International Business, MIT Press, 1993, pp.85-114.

Magee, S. P. "Information and Multinational Corporations: An Appropriability Theory of Direct Foreign Investment", in J. Bhagwati (ed.), *The New International Economic Order*, MIT Press, PP.317-340.

Mansfield, Edwin and Anthony Romeo, "Technology Transfer to Overseas Subsidiaries by U.S.-Based Firms", *Quarterly Journal of Economics*, Dec. 1980, pp.737-750.

Markusen, James R., "Trade and the Gain from Trade with Imperfect Competition", *Journal of International Economics*, Nov, 1981, pp.531-551.

Markusen, James R., "Multinationals, Multi-Plant Economies, and the Gains from Trade", *Journal of International Economics*, 16, 1984, pp.205-224.

Mohtadi, Namid, "Expropriation of Multinational Firms: The Role of Domestic Market Conditions and Domestic Rivalries", *Economic Inquiry*, XXVIII, Oct. 1990, pp.813-830.

Morck, Randall and Bernard Yeung, "Internalization: An Event Study Test", *Journal of International Economics*, 33, 1992, pp.41-56.

Oman, Charles, *New Forms of International Investment in Developing Countries*, Development Centre of the Organisation for Economic Co-operation and Development, 1984.

Parry, Thomas G., "Internalization as a General Theory of Foreign Direct Investment: A Critique", *Weltwirtschaftliches Archiv*, CXXI, September 1985, pp.564-569.

The People's Republic of China Government, *Almanac of China's Economy, 1987* (Chinese Version), Economic Management Press, 1987.

The People's Republic of China Government, *Almanac of China's Economy, 1988* (Chinese Version), Economic Management Press, 1988.

The People's Republic of China Government, *Almanac of China's Economy, 1990* (Chinese Version), Economic Management Press, 1990.

Pitt-Watson, David, "Why a Joint Venture?", in Jan Gillespie (ed.), *Joint Ventures - A Eurostudy Special Report*, Eurostudy Publishing Company Limited, 1990, pp.7-13.

Rhodes, William, "A Survival Model with Dependent Competing Events and Right-Hand Censoring: Probation and Parole as an Illustration", *Journal of Quantitative Criminology*, Vol. 2, No. 2, 1986.

Rugman, Alan M., "Internalization as a General Theory of Foreign Direct Investment: A Re-Appraisal of the Literature", *Weltwirtschaftliches Archiv*, CXIV, 1980, pp.365-379.

Rugman, Alan M., "The Choice between Trade, Foreign Direct Investment and Licensing", in Alan M. Rugman, *Inside the Multinationals*, Columbia University Press, 1981, pp.53-74.

Rugman, Alan M., "Internalization Is Still a General Theory of Foreign Direct Investment", *Weltwirtschaftliches Archiv*, CXXI, September 1985, pp.571-575.

Schmidt, Peter and Ann Dryden Witte, *Predicting Recidivism Using Survival Models*, Springer-Verlag. 1988.

Schmookler, J. *Invention and Economic Growth*, Harvard University Press, 1966.

Segerstrom, Paul S., "Innovation, Imitation, and Economic Growth", *Journal of Political Economy*, 99, 1991, pp.807-827.

Shepherd, William G., "`Contestability' vs. Competition", *American Economic Review*, 74, 1984, pp.572-587.

Stopford, J. M. & L. T. Wells, Jr., *Managing the Multinational Enterprise*, Basic Books, 1972.

Streeten, Paul, "Costs and Benefits of Multinational Enterprises in Less-Developed Countries", in John H. Dunning, Ed., *The Multinational Enterprise*, George Allen & Unwin Ltd., 1971, pp.240-263.

Teece, David J., "Technology Transfer by Multinational Firms: The Resource Cost of Transferring Technological Know-how", *The Economic Journal*, 87, Jun. 1977, pp.242-261.

Teece, David J., "The Multinational Enterprise: Market Failure and Market Power Considerations", *Sloan Management Review*, Spring 1981, pp.3-17.

Teece, David J., "Multinational Enterprise, Internal Governance, and Industrial Organization", *American Economic Review*, May 1985, pp.233-238.

Toyota Jid osha Kabushiki Kaisha, *Toyota, a History of the First 50 Years*, Toyota Motor Corporation, 1988.

U.S. Department of Commerce, Bureau of Economic Analysis, *U.S. Direct Investment Abroad: 1989 Benchmark Survey, Final Results*, Washington, DC: U.S. Government Printing Office, Oct. 1992.

U.S. Department of Commerce, International Trade Administration, *Foreign Direct Investment in the United States, 1986 Transactions*, Washington, DC: U.S. Government Printing Office, 1987.

U.S. Department of Commerce, International Trade Administration, *Foreign Direct Investment in the United States, 1987 Transactions*, Washington, DC: U.S. Government Printing Office, 1988.

U.S. Department of Commerce, International Trade Administration, *Foreign Direct Investment in the United States, 1988 Transactions*, Washington, DC: U.S. Government Printing Office, 1989.

U.S. Department of Commerce, International Trade Administration, *Foreign Direct Investment in the United States, 1989 Transactions*, Washington, DC: U.S. Government Printing Office, 1990.

United Nations, Economic and Social Council, Commission on Transnational Corporations, *Work Related to the Definition of Transnational Corporations - Question of the Definition of Transnational Corporations*, E/C.10/1984/17, Feb, 1984.

United Nations Centre on Transnational Corporations, *World Investment Report 1991: The Triad in Foreign Direct Investment*, ST/CTC/118, 1991.

United Nations Transnational Corporations and Management Division of Department of Economic and Social Development, *World Investment Report 1992: Transnational Corporations as Engines of Growth*, ST/CTC/130, 1992.

Walmsley, John, *Handbook of International Joint Ventures*, Graham & Trotnamn Limited, 1982.

Wang, Jian-Ye and Magnus Blomström, "Foreign Investment and Technology Transfer a Simple Model", *European Economic Review*, 36, 1992, pp.137-155.

Wille, John D., "Joint-venturing Strategies", in John D. Carter, Robert F. Cushman & Scott Hartz (ed.), *The Handbook of Joint Venturing*, Dow Jones-Irwin, 1988.

Williamson, Oliver E., "The Vertical Integration of Production: Market Failure Considerations", *American Economic Review*, 61, May 1971, pp.112-23.