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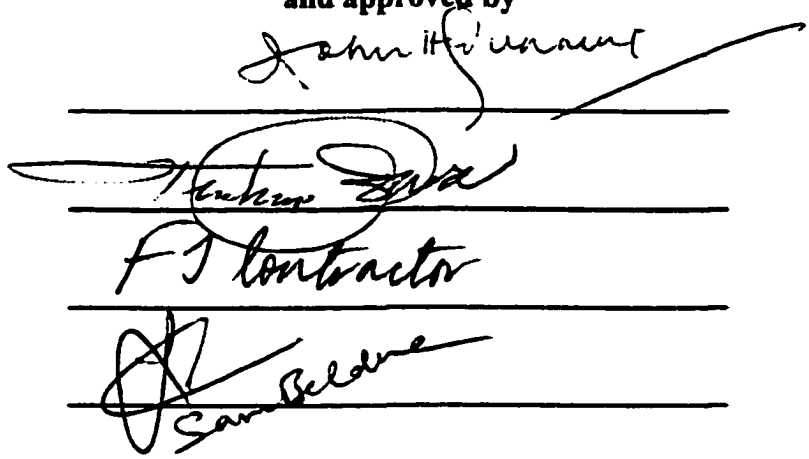
SECTORAL DEVELOPEMNT, STRUCTURAL ADJUSTMENT AND INTERNATIONAL BUSINESS ACTIVITIES: A CASE STUDY OF TAIWAN'S EXPERIENCE

By Jyh-Der Lin

A dissertation submitted to the
Graduate School - Newark
Rutgers, The State University of New Jersey

in partial fulfillment of requirements
for the degree of
Doctor of Philosophy
Ph.D. in Management Program

Written under the direction of
Professor John H. Dunning
and approved by



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ABSTRACT OF THE THESIS

Sectoral Development, Structural Adjustment and International Business Activities: A Case Study of Taiwan's Experience

By Jyh-Der Lin

Thesis director: Professor John H. Dunning

The main purpose of this study is to examine the interaction among the development of an economy's economic sectors, structural adjustment and the economy's international business activities. In order to understand the possible causal relationships involved, three major questions were formulated to serve as the guideline for the study: (1) What theoretical aspects do we need to consider when we examine the development of a country's economic sectors and its structural adjustment? (2) What are the determinants for the development of a country's economic sectors and its structural adjustment? (3) How international business activities may affect the development of a country's economic sectors and its structural adjustment?

From the literature review, it shows that the main theoretical aspects of a country's structural adjustment are "what to produce" and "how to produce." Both aspects are dynamically adjusted over time and the adjustment process of

both aspects starts from the transformation of both country-level resources and firm-level resources.

Moreover, based upon the overview of Taiwan's economic development, econometric analyses, and case study of Taiwan's electronics sector, this study finds: (1) international business activities do have positive impacts upon an economy's sectoral development and adjustment process; (2) the impacts from international business activities may differ depending upon the nature of economic sectors and the development stage of an economy; (3) for the impacts upon structural adjustment, inward IDIs from less CA sectors have positive impacts upon the adjustment from primary sectors to less CA sectors. IDIs and ODIs of CA sectors also have positive impacts upon the adjustment from less CA sectors to CA sectors; (4) through international business activities from and to developed countries, developed countries may provide significant assistance to the development of CA sectors in less developed countries.

ACKNOWLEDGEMENTS

It has been a long journey to the completion of this thesis. The journey began when I decided to fly thousands of miles away from my homeland, Taiwan, to United States. It continued as I received academic training and carried out my research tasks at Rutgers University. On one hand, it's my ambitious hope that this thesis may add something to the research of international business. On the other, however, seeing what have been accomplished by existing research efforts, and expecting what will be achieved by future research works, I could only imagine that this thesis may just like a drop of water falling into a deep lake. Therefore, what is already achieved by this thesis has to be judged by readers like you.

I would like to express my thanks to people who have guided me throughout the dissertation process. In particular, I am grateful to my Ph.D. supervisor, Professor John H. Dunning. Ever since I started my Ph.D. study at Rutgers University, he has helped me with customary support, analytical insights, helpful discussions and valuable time. Besides, I must also thank Professor Farok Contractor, Professor Sriram Beldona and Professor Terutomo Ozawa, all members of my Ph.D. committee, for their continuous encouragement, suggestions and advice.

I owe a large debt to my wife Ching-Ching Lee who put up with me while I struggled for completing the dissertation. Her love, patience and many warm

welcomes have been the most precious support. Also, I would like to appreciate my family in Taiwan for their continuous support and caring since I came to United States. Last, I would like to share the joy of completing this thesis with my new-born son, Jonathan Lin. He has not only inspired me and Ching-Ching during the last stage of my dissertation writing, but also opened our eyes with regard to God's wonderful grace and creation.

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CHAPTER 1
INTRODUCTION

As more and more economic sectors (or industries) are becoming global in scope (Porter, 1986), the nature and the extent of competition of many economic sectors will, therefore, be significantly affected by international business activities (including inward and outward direct investment and cross-border inter-firm collaboration) existing within these economic sectors. In these so-called "global" economic sectors, firms will involve selling worldwide, sourcing component and materials worldwide, and locating activities in many nations to take advantage of low costs. Also, they form alliances with firms from other nations to gain access to complementary assets and/or resources.

This development is meaningful for most less developed countries (LDCs). Most LDCs try to achieve economic growth and higher income level. To accomplish this, the country in question will need to continuously improve its economic performance in order to reach a more advanced economic stage. Nevertheless, as Porter (1990) has noted, economic progress has to be achieved by upgrading their competitive positions, through achieving higher-order competitive advantages in existing economic sectors and developing the capability to compete successfully in new, high-productivity segments and sectors. All these requirements, in fact, imply that a country's economic upgrading process needs to be accomplished through the upgrading of its existing economic sectors and the birth of higher value-added economic sectors in its economy. In other words, the economic upgrading process is accomplished through significant changes in the nature and structure of a country's economic activities. As Dunning (1985) has noticed that these changes are actually the key elements for the adjustment of a country's economic structure. We may, therefore, contend that the accomplishment of a country's economic progress

depend much upon the adjustment of its economic structure, which, on the other hand, requires the successful development of its existing and new economic sectors.

Since international business activities are becoming more and more crucial for the development of many economic sectors, it is therefore reasonable to believe that international business activities could affect both the upgrading of existing economic sectors and the creation of new economic sectors. Hence, we may argue that, when LDCs try to strive for their economic progress, they must consider the influences coming from both intra- and/or inter-industry international business activities undergone within their economic sectors by either foreign firms or their own national firms.

Although the causal relationship between international business activities and the adjustment of economic structure should be significant due to the globalization of many economic sectors, so far, we have only limited knowledge about how international business activities could affect the development of various economic sectors, and to what extent. So far, it seems that most researchers do not pay much attention to elucidating these issues. In stead, they mainly focus upon issues concerning national competitive advantages, such as the determination of national competitive advantages, and its influence upon a nation's economic performance (see for example, Porter, 1990; Dunning, 1993b; Gray, 1991; Narula, 1993). As a result, not much has been done to clarify the relationship between the development of economic sectors (including the upgrading of existing economic sectors and the birth of higher value-added economic sectors) and international business activities. The analysis of this issue should be able to make us understand more about the role of international business activities in a country's structural adjustment. This understanding should also be meaningful for both policy makers and researchers.

Hence, based upon the above belief, the interaction among the development of economic sectors, structural adjustments and the international business activities existing within the economic sectors will be examined. In order to understand the complicated causal relationships involved, we would need to answer the following questions: (1) What theoretical aspects do we need to consider when we examine the development of a country's economic sectors and its structural adjustment? (2) What are the determinants for the development of a country's economic sectors and its structural adjustment? (3) How international business activities may affect the development of a country's economic sectors and its structural adjustment? The answers to these questions are critical to our understanding about the interaction among the development of economic sectors, structural adjustments and the international business activities.

Nevertheless, to verify the appropriateness of these theoretical explanations, we still need to consider applying these explanations to real world.

Among many countries, Taiwan's experience of economic achievement deserves our attention. The incredible economic success achieved by the Republic of China (ROC) or Taiwan has been witnessed by numerous authors (see for example, Riedel, 1992; Wang, 1992; Chen, 1989; Ranis, 1992). Various economic indicators reflect this great achievement. In 1960, its GNP per capita merely reached US$ 141, which was far lower than many other countries (such as Malaysia and Philippines) at that time. However, an average annual growth rate of real GNP per capita of 9 percent during the last three decades had resulted in a per capita GNP of US$ 7,959 in 1990, leaving most LDCs far behind. In 1993, Taiwan's per capita GNP had already reached US$ 10,556. In the same year, Taiwan ranked as the 14th major trading country in the world. Its continuous trade surpluses have resulted in foreign exchange reserve amounting to more than US$ 90 billion, which puts Taiwan in second place in the world behind only

Japan. All these reveal that Taiwan has become a major player in world market. Its strong potential in national competitiveness can not be ignored.

Nevertheless, despite the fact that the academic community has paid attention to Taiwan's "economic miracle", little has been done regarding the contribution made by international business activities. For the purpose of this study, we would like to investigate how Taiwan's industrial structural adjustments are associated with the IBAs performed by either Taiwanese firms or foreign MNEs. The theoretical basis examined here will be the answers to the above research questions.

In order to deal with the above issues, this study will be divided into the following chapters. In next chapter, we will discuss the theoretical background concerning industrial structural adjustments, including the basic concepts and the dynamics of structural adjustment. Based on the theoretical foundation, we then, in chapter 3, consider how IBAs are related to the dynamics of industrial structural adjustments, and how and when IBAs can help the accomplishment of industrial structural adjustment.

In chapter 4, we will provide a historical review of Taiwan's IBAs and the various aspects of Taiwan's structural adjustments. First, we will inspect the historical path of Taiwan's economic development. Then, an overview of Taiwan's structural adjustment and the characteristics of Taiwan's IBAs will be presented. In section 4, the interactions between Taiwan's industrial structural adjustments and IBAs will be discussed to see the appropriateness of the arguments made in chapter 3.

In chapter 5 and 6, we will present the empirical evidence for research hypotheses constructed in chapter 3. First, in chapter 5, through various statistical tests, we will see if the research hypotheses we proposed in chapter 3 could actually predict the relationship between the adjustment of Taiwan's

economic sectors and its international business activities. Secondly, in chapter 6, we will examine the development of Taiwan's most successful sector - the electronic sector, to show how international business activities may affect the development of an economic sector.

In chapter 7, on the basis of the findings from previous chapters, we will present the concluding remarks and some directions for future research.

CHAPTER 2

THEORETICAL BACKGROUND: THE RELATIONSHIP BETWEEN STRUCTURAL ADJUSTMENT AND ECONOMIC SECTORS, AND THE DETERMINANTS OF ADJUSTMENT PROCESS

2.1. Basic Concepts of Structural Adjustment: The Transformation of "What to Produce" and "How to Produce" Aspects

From past literature, it seems that there is still no widely accepted definition of structural adjustment. Hence, although the development of economic sectors is believed to be key elements of structural adjustment (Dunning, 1985), their inter-relationship is yet in need of further clarification. Furthermore, if we want to identify the determinants for structural adjustment and the development of economic sectors, we also need to find out what theoretical aspects are crucial for both structural adjustment and the development of economic sectors.

Frequently, structural adjustment is deliberated from a country's scope. Hence, it is often discussed with concepts like economic restructuring, economic development and economic progress (see for example, Dunning, 1985, 1993a; Dunning and Webster, 1990; Nicholas, 1990; Ozawa, 1992). For many authors, structural adjustment seems to have close relationship with the accomplishment of economic restructuring, economic development and economic progress.

To some extent, it may be adequate to say that all these concepts are actually different aspects of the same phenomenon that is extremely complicated and requires analysis from country level. Hence, Dunning and Webster (1990) contend that "economic development is, of course, a change in the structure of the economy concerned." Apparently, there is close relationship among economic structure, economic growth and economic development. If the term "structural adjustment" refers to the adjustment of a country's economic structure, then,

apparently, the analyses are better approached from country level. Let's call this kind of structural adjustment as "macro" structural adjustment.

For "macro" structural adjustment, we need to clarify the meaning of "structural adjustment" at country-level. Basically, "macro" structural adjustment refers to the adjustment of a country's economic structure. From literature, it seems to indicate a process that will lead to changes in the nature and structure of a country's economic activities. A number of scholars (e.g. Dunning, 1993; Vernon, 1966; Smith, 1776/1908; Ozawa, 1992; Porter, 1990) have emphasized the importance of this process.

In his article, Ozawa (1992) argues that economic growth and development are achieved through a process of industrial structural upgrading, which involves changes in the nature and composition of a country's major industrial activities. Further, Ozawa contends that this process is an evolutionary path and follows a "sequencing of development" from labor-intensive to capital-intensive industrial activities.

Similar concepts are also mentioned in Porter's (1990) book. Porter notices that each country goes through its own process of development. Along the trajectory of development process, the country may exhibit a number of stages. Each stage reflects the characteristic sources of advantage of the country's firms in international competition and the nature and extent of a country's internationally successful industries and clusters. Also, each stage highlights the attributes of a country's economic sectors that are most critical to rising economic prosperity.

According to Dunning (1985), there are two aspects of a country's economic structure. Both aspects reveal the major characteristics of a country's economic activities. The first aspect is concerned with the way in which resources are distributed among alternative uses; namely, the question of "what to produce". It

refers to the structure of a country's production at a certain time. The other is related to the manner in which resources are used in any given activity, which is essentially a "how to produce" question. This aspect is mainly about the efficiency achieved by a country's economic sectors. Therefore, when we examine various issues related to "macro" structural adjustment, we would need to consider how the above two aspects are adjusted accordingly as an economy evolves. In other words, "macro" structural adjustment involves changes in the structure of a country's production, and in the efficiency achieved by the country's economic sectors.

Dunning's concepts allow us to identify the main aspects of a country's structural adjustment. Nevertheless, based upon his concepts, we still need to clarify few issues. First, we need to clarify what is referred by change in the structure of a country's production. From Ozawa's concept, the change in a country's production structure refers to changing importance from one group of industrial sectors to another group of industrial sectors over a certain period of time. In other words, as a result of structural adjustment, the importance (such as GDP share or export share) of "new" sectors[1] to the economy will grow significantly as adjustment process proceeds, while the importance of "old" sectors will become stagnant or even decline. Also, the sequence of changing, according to Ozawa (1992) and Dunning (1985), may gradually move from primary sectors and/or labor-intensive sectors to capital-intensive sectors, and then towards technology- and/or human capital- and information-intensive sectors. Hence, for most economies, their structural adjustment process may tend

[1] The "*new*" sectors mentioned here refer to those economic sectors that were not important to the economy before structural adjustment, and become important to the economy after adjustment process completes. The "*old*" sectors mentioned here refer to those economic sectors that were important to the economy before structural adjustment, and become unimportant to the economy after adjustment process completes.

to start from having primary and/or labor-intensive sectors as the major contributors to their economic prosperity, and then shift to capital-intensive sectors, and finally to technology- and information-intensive sectors. Moreover, the nature of products (especially the product technology and the core resources used to produce these products) and the way of performing value activities for both groups of economic sectors may be quite different as well. Therefore, in most cases, the technological capabilities and the resources (either created assets or natural assets) crucial to "old" economic sectors may only be of limited importance to "new" economic sectors. This kind of adjustment is more like a "discrete-type" of macro structural adjustment. In other words, after certain time period, the economy "jumps" from one group of economic sectors to another group of economic sectors. We can call this type of structural adjustment as "unrelated structural adjustment". Because the transformation of crucial resources for unrelated adjustment may require a lot of efforts, it is most likely that unrelated structural adjustment results from a relatively long-term process. One example for this kind of structural adjustment is the transformation of an economy from cash crops production to food production.

Aside from unrelated macro structural adjustment, we can also identify the other kind of structural adjustment: the related structural adjustment. For related structural adjustment, the nature of product and/or the core process technology may not change radically after the adjustment process. Especially, the resources that are important to old sectors may still be the backbone of the new ones. Unlike unrelated structural adjustment, related structural adjustment is more like a "continuous-type" of adjustment process. New economic sectors inherit and utilize most of the resources from old economic sectors, and labor force that used to work for old economic sectors has little difficulty in adapting to new sectors' production processes. Hence, relatively speaking, the economy does not

need to spend too much effort on transforming major resources and labor force for "new" sectors. In turn, we can expect that related structural adjustment is more likely to occur within a relatively short-term process. One example for this kind of adjustment is the transformation of an economy from food sector to textile sector. For both sectors, unskilled labor force is the major input for their production processes. After a short period of training, the labors that used to work for food sector can easily learn the skills for manual operations in textile sector.

The second issue we need to clarify is the precise meaning of "how to produce" aspect of structural adjustment. According to Dunning (1985), it refers to the efficiency achieved within sectors, and is reflected by the productivity ratios achieved by different sectors. For many economists, they often overlook this condition due to the assumption that factor inputs are being used in the optimum way. However, in reality, this may not be the case. Inefficiency does exist within sectors. Hence, through improving sectoral productivity, output could normally be raised. This normally depends upon the motivation and the ability of firms to produce efficiently in a particular sector. Also, it requires that firms adopt new process technology and/or organizational capabilities to perform their value activities.

The above concepts can also apply to the structural adjustment from a sector's scope. Let's call this kind of structural adjustment as "meso" structural adjustment. By adapting Dunning's ideas to sector level, we may say that meso structural adjustment could also come from two aspects; namely, "what to produce" and "how to produce." Nevertheless, since the conceptual level used for "meso" structural adjustment is quite different from that for "macro" structural adjustment, the above two aspects of "meso" structural adjustment is distinct too.

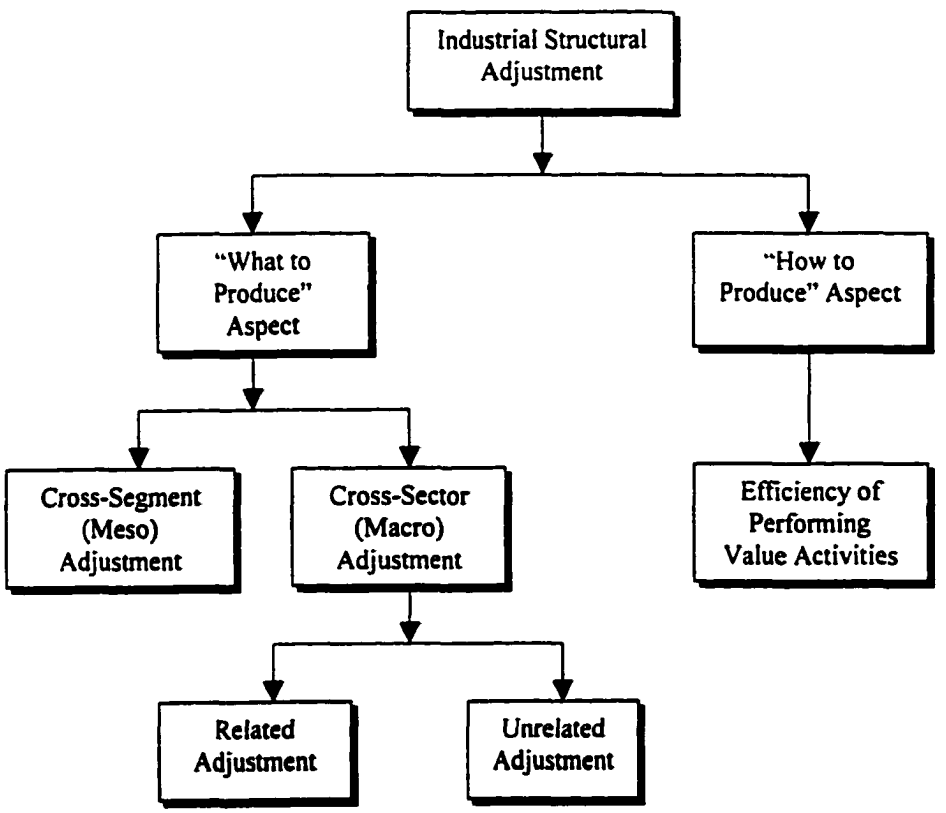
For "what to produce" aspect, by using the concepts of "product segmentation" (Porter, 1986), we may consider this aspect as the changing importance of product varieties that are pursued by the firms of a certain economic sector from one group of segments to another. In other words, as a result of structural adjustment, the importance (such as production share) of "new" product segments to the sector will grow significantly as adjustment process proceeds, while the importance of "old" segments will become stagnant or even decline. In addition, the sequence of change normally moves from low value-added activities to high value-added activities. Moreover, since the changes occur within sector, the possible extent of un-relatedness for meso structural adjustment is normally less significant than that for macro structural adjustment.

As for "how to produce" aspect of meso structural adjustment, it refers to the efficiency of performing value activities and organizing the entire value chain. Similarly, in order to serve different segments and use different ways to perform value activities, firms may need to cultivate different competitive advantages, and different technological and organizational capabilities. Also, it may utilize different kind of resources for transforming their value activities.

Based on the above discussion, we may categorize different types of industrial structural adjustment as shown in Figure 2.1. Again, from Porter's (1990) ideas about economic progress, Dunning and Webster's (1985) concepts regarding economic development, and Ozawa's (1992) notion about industrial transformation, we may conclude that, structural adjustment, no matter at which conceptual level, consists of two major components: the transformation of "what to produce" and the transformation of "how to produce" of an economy (or an economic sector). For the transformation of "what to produce", it is revealed by the changing importance of economic sectors/segments to the whole economy.

As an evidence of structural adjustment, "new" sectors/segments will make higher and higher share of contributions (such as GDP volume and export volume) to the economy, while the share of contributions from "old" sectors/segments to the economy will become stagnant and then decline. Till a certain point of time, the contributions from "new" sectors/segments will eventually override those from old sectors/segments.

Figure 2.1. Types of Industrial Structural Adjustment



For the transformation of "how to produce", it normally refers to the enhancement of efficiency achieved by an economy's economic sectors/segments, which can be exhibited by the higher sectoral (or segment) productivity.

2.2. The Dynamic Aspect of Structural Adjustment

2.2.1. Stage Theory of Economic Development and Structural Adjustment

Based upon last section, we understand that a country's economic structure is characterized by both "what to produce" and "how to produce" aspects. Hence, structural adjustment, no matter which kind, is achieved through the transformation of "what to produce" and "how to produce" aspects. Then, the next question is: what make these two aspects transformed over time?

As mentioned before, the "what to produce" aspect involves the rise of one group of new economic sectors, and/or the decline of another group of economic sectors that used to dominate the prosperity of the economy. As to "how to produce" aspect, it is concerned with the efficiency achieved by each economic sector. Hence, the answer regarding the transformation of "what to produce" and "how to produce" is closely related to why average firms of growing economic sectors will become competitive and have better performance during a period of time, while those of "declining" sectors will face difficulty in competition and performance at the same time?

Basically, this question largely depends upon how firms of economic sectors can compete more successfully or serve the market in a better way. As we mentioned earlier, in order for firms to produce a variety of products and perform numerous value activities, firms will need to utilize numerous types of resources and capabilities to carry out these operations. Therefore, many scholars (for example, Williamson, 1979; Barney, 1989, 1991; McGrath, MacMillan and Venkataraman, 1995) noticed that the availability and quality of resources and capabilities may significantly affect the success of firms' value-creating strategies. Consequently, to understand why average firms of certain sectors are more efficient than those of other sectors, we need to know what resource or capabilities are critical to the operations of firms. According to Ozawa (1992),

there are three major "country-level" resources used in a nation's overall industrial activity: primary factors (natural resources and labor), physical capital and human capital. These resources compose of this nation's resource endowment available for all economic sectors. In order to produce the products and sell to the market, firms of an economic sector will need to know how to acquire and use different type of primary factors, physical capital and human capital to perform their value activities. If a nation is not adequately endowed with the country-level resources demanded by an economic sector (either unavailable or with poor quality), average firms of this economic sector would not be able to perform the value activities efficiently and effectively in this nation. As a result, in this nation, average firms of this economic sector could not compete successfully, and the development of this economic sector will tend to be rather limited, as new firms will not be attracted to this sector due to the difficulty faced by average firms of this sector.

Other than the above country-level resources, there are resources (such as technological and organizational capabilities) possessed by firms of an economic sector. These "firm-level" resources (or capabilities) are used in various value activities performed by individual firm. Based on these firm-level resources, firms are able to utilize the above three country-level resources and transform them into marketable products or services. Similarly, if most firms of an economic sector are not properly equipped with these firm-level resources (again, either unavailable or poorly equipped), they could not transform the country-level resources into marketable products or services successfully, even though the nation may be well endowed with the necessary country-level resources. Consequently, the performance of the firms in this sector would not be good enough to attract new firms entering this sector. In turn, the development of this economic sector would also tend to be limited in this nation.

Therefore, it is clear that the development of an economic sector depends upon (1) the availability and the quality of country-level resources (namely, primary factors, physical capital, and human capital); and (2) the availability and the quality of firm-level resources (especially, firm-specific technological and organizational capabilities). In addition, because country-level resources and firm-level resources will transform over time, the transformation will result in the changes of the availability and the quality of certain country-level resources and firm-level resources. As a result, there will be rise of some economic sectors as well as the decline of some other sectors from time to time. This explains why the adjustment process of economic structure, as many have observed (Chenery, 1979; Chenery *et al.*, 1986; Balassa, 1980, 1988; Porter, 1990; Ozawa, 1992; Dunning, 1993, 1994), is not a one-time event but essentially a continuous and dynamic process. Furthermore, from the past experience of currently advanced economies, it also shows that the adjustment process seems to follow certain path of development.

Thus, based upon the above observation, stage theorists have used different perspectives to identify various stages along the adjustment process. In his study, Ozawa (1992) contends that the adjustment process will be optimal if it starts from the initial stage of labor-intensive, low-skill manufacturing (or from the initial stage of natural resource extraction) and moves on to the subsequent stage of relatively physical capital-intensive industrial activities and finally to the more advanced stage of human capital-intensive growth. Porter (1990) also notices this stage-compatible theory of structural adjustment. He contends that, as the factor endowment evolves, the economy may go through four different stages of development: (1) factor-driven, (2) investment-driven, (3) innovation-driven, and (4) wealth-driven. Each stage is characterized by different type of

economic activities (from natural-resource-based activities to research and development (R&D)).

The stage theory seems plausible and consistent with most countries' experience of structural adjustment over time. Also, it shows that, as a nation moves from one stage to another, both its major economic sectors and the ways of production will change correspondingly. Therefore, the transition from one stage to another also rests upon the transformation of "what to produce" and "how to produce" aspects.

Nevertheless, from stage theory, we are not clear why the availability and the quality of country-level resources and firm-level resources will transform over time. The driving forces behind this transformation should benefit our understanding about why some economic sectors will rise and some others decline during a certain period of time. In next section, we will examine what these driving forces are.

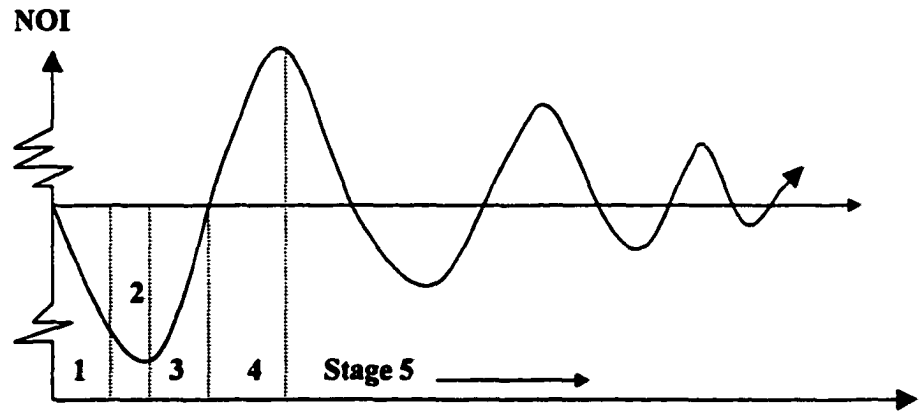
2.2.2. The Driving Forces for the Dynamics of Structural Adjustment

In his books and articles, Dunning (1981, 1986, 1988, 1993a, 1993b; Dunning and Narula, 1994) has provided us a strong conceptual basis for understanding the dynamic aspects of structural adjustment. His concepts concerning the investment development path (IDP) deserve special attention.

The main argument proposed by IDP is that, according to Dunning and Narula (1994), countries may go through different stages of development, and these stages can be possibly classified according to "the propensity of these countries to be outward and/or inward direct investors." Also, as Dunning (1992) has argued, a country's propensity to be outward and/or inward direct investor will depend on three factors: (1) the extent and pattern of the

competitive or ownership specific (O) advantages of the indigenous firms of the countries concerned, relative to those of firms of other countries; (2) the competitiveness of the location-bound resources and capabilities of that country, relative to those of other countries (the L specific advantages of that country); and (3) the extent to which indigenous and foreign firms choose to utilize their O specific advantages jointly with the location-bound endowments of home or foreign countries through internalizing the cross-border market for these advantages, rather than by some other organizational route (i.e. their perceived I advantages). Therefore, it is the transformation of these three factors that changes a country's NOI position and, in turn, moves this country from one stage to another stage of development. The track of IDP is illustrated in Figure 2.2. Figure 2.2 shows that, there are five main stages of development.

FIGURE 2.2. THE PATTERN OF THE INVESTMENT DEVELOPMENT PATH



NOTE: This diagram is not drawn to scale; it is presented for illustration purposes only

Source: Dunning, J.H. and R. Narula, 1996. ***Foreign Direct Investment and Governments: Catalysts for Economic Restructuring.*** New York: Routledge.

In addition to the above arguments, the IDP theory also examines two important aspects of a country's economic transformation process; namely, as countries move along their development paths, how their structural adjustment

are accomplished, and how their involvement in international business activities is changed. The main idea is that, through the changes in the configuration of the OLI advantages facing foreign-owned firms and that facing indigenous firms, both aspects will change accordingly.

During the early stages of IDP, due to insufficient L advantages and inadequate O advantages of indigenous firms, countries may largely engage in resource-based, traditional and labor-intensive manufacturing sectors. Also, the country may only attract those inward direct investments that aim at exploiting this country's natural endowment. During later stages, as countries make continuous improvement in their L specific advantages (especially, enlarged market, human capital, innovatory capacity, and infrastructure), and indigenous firms gradually accumulate their O advantages based on possession of proprietary assets and internalization advantages, the major industrial activities will progressively change toward more technologically sophisticated as well as higher value-added ones. At the same time, because of the changes in the configuration of OLI advantages, countries can also experience the significant growth in both outward direct investment and inward direct investment. The purpose of these direct investments will change from exploiting natural resources or low-cost labor to acquiring those assets that are strategic and sophisticated as well.

From the concepts proposed by IDP, it is clear that, as there are changes in a country's L advantages and changes in its indigenous firms' O advantages, the importance of some of its economic sectors/segments (and the corresponding value-creating methods) will be different too. Therefore, when L advantages and O advantages change, it is quite likely that the country will have different group of economic sectors/segments as the major strength of its economy. These sectors/segments will replace the old ones and become dominant in the

economy. Hence, we may say that, the driving forces behind a country's industrial structural adjustments (for example, from labor-intensive industries to more technology-intensive industries) rests significantly on the transformation of the configuration of its OLI advantages. In particular, the transformation of this country's L advantages and its indigenous firms' O advantages plays a very important role during the process. In the following paragraphs, we will see how OLI advantages may transform over time.

Based on Dunning's definition of OLI advantages, we may say that OLI advantages actually refer to the following three aspects: (1) the organizational capabilities of indigenous firms to exploit their own competitive advantages and other country's comparative advantages; (2) the relative competitive advantages of indigenous firms compared to those of other international competitors; and (3) the comparative advantages of a country's "basic and advanced factors"[2] (Porter, 1990). The first two aspects of OLI advantages, including indigenous firms' organizational capabilities and competitive advantages, are, by their nature, largely dependent upon the strengths possessed by individual firms, and the remaining one, the comparative advantages of basic and advanced factors (or, natural assets and created assets), is dependent partly on country's natural endowment (for basic factors), and partly on country's ability to create "advanced factors." This line of thinking is consistent with the conclusion we made in last section, which states that the transformation of both "what to produce" and "how to produce" requires transformation of country-level resources and firm-level resources. The availability and quality of a country's country-level and firm-level resources will significantly affect the performance of various economic

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[2] The ideas of basic and advanced factors are very close to the "natural assets and created assets" proposed by Dunning (1993). We will use Porter's terms and Dunning's terms interchangeably.

sectors/segments operating in its economy. We will now consider the mechanisms for upgrading these aspects.

The O and I advantages are mainly related to the competitive advantages and the organizational capabilities possessed by indigenous firms (namely, the firm-level resources). Essentially, they are influenced by the efforts made by indigenous firms.

While analyzing firm's competitive advantage, a number of studies, especially the works by Porter (1980; 1985), have focused upon firm's privileged product market position and industry level characteristics. Although this research direction has provided many insights on the formation of firm's competitive strategy, nevertheless, it suffers from failing to address why some firms are able to get into advantageous positions in the first place, and why some firms are able to sustain these positions and others are not (Porter, 1991). Hence, facing this limitation, many (see for example, Barney, 1989, 1991; Grant, 1991) turn to focus on analyzing the link between a firm's internal characteristics and its market position. The major conceptual basis they used rests on the importance of a firm's resources, capabilities, and core competencies to its competitive advantage. This new approach to firm's competitive advantage is known as "the resource-based theory of competitive advantage" (Grant, 1991).

According to the resource-based theory (see for example, Conner, 1991; Grant, 1991; Peteraf, 1993), a firm's competitive advantage is not based on its superior position in product market. In order to enjoy competitive advantage and superior competitive position in any market, a firm needs to access and utilize a complex set of tangible and intangible assets (and/or resources) to effectively exploit cost and differentiation advantages (Markides and Williamson, 1994). There are various resources necessary for firm's operations. These firm resources could be grouped into the following categories: financial,

physical, human, technological, reputation, and organizational (Barney, 1991; Grant, 1991). Hence, organizational capabilities and technological capabilities are actually part of firm's resources for achieving competitive advantages.

Based on the argument made by resource-based theory, we may, then, maintain that a firm's competitive advantage actually relies upon the configuration of its assets and/or resources. In turn, it is obvious that the transformation of a firm's competitive advantages also relies on the transformation of a firm's assets and/or resources stocks. Then, regarding the dynamics of a firm's competitive advantages, the crucial question is: "How these firm-level resources may transform over time?" This question is also critical to the adjustment process of an economic structure.

Basically, in order to transform firm-level resources, a firm needs to accomplish both the creation of new resources and the upgrading of existing resources. Hence, the answer to the above question turns to how new resources can be acquired or created by firm, and how existing resources can be upgraded over time.

According to Markides and Williamson (1994), a firm may gain access to its required resources in a number of ways. First, it may obtain its resources with the so-called "endowment" which establishes the business. For example, a company established to exploit a proprietary technology often receives a valuable patent asset from its founder. Secondly, it may acquire the resources on the open market, or contract directly for the services (such as equipment lease). Or, it might access the required resource by sharing its other resources with an alliance partner. Finally, it may accumulate the required resources through a process of combining tradable inputs with existing resource stocks and learning by doing (Dierickx and Cool, 1989).

Among the above four approaches, the first three are most concerned with the initial stock of firm resources (the endowment of firm) and the access to new resources from external sources (through purchase or exchange with external sources). The last one, the resource accumulation process, can either create new resources or upgrade existing resources through internal efforts.

From the viewpoint of a firm's long-term prosperity, the internal resource accumulation process is likely to be the most important approach for transforming the configuration of its resources. This is because, under the threats from competitor's actions, most firms will face the risk of failing to sustain their competitive advantage by using their firm-level resources. Apparently, a firm's competitors may identify the resources required for achieving similar competitive advantage. Also, they will try to find ways in replicating this competitive advantage. They may either seek to imitate these resources through one of the four mechanisms above, or they may try to substitute these resources with other resources that can achieve similar advantage. This implies that readily tradable resources can not act as the major sources of long-term competitive advantage (Williamson, 1975). Similarly, resources that can be quickly and/or cheaply accessed through endowment, acquisition or sharing can only provide short-lived competitive advantage. Moreover, as competitors may continuously attempt to develop substitutes for a firm's proprietary resources, the firm also needs to update its resource stock constantly to obtain its sustained competitive advantages. Therefore, if a firm wishes to transform its competitive advantages in a way such that it can prevent the challenge from its competitors, the only one that it can rely upon is its consistent efforts on creating new resources and upgrading existing resources that are not easily acquired or imitated. In other words, the internal resource accumulation process is the major approach for firm to transform its long lasting competitive advantages. As to the first three

approaches, firms can only access resources that are good for short-term advantages, or resources merely as inputs for resource accumulation processes.

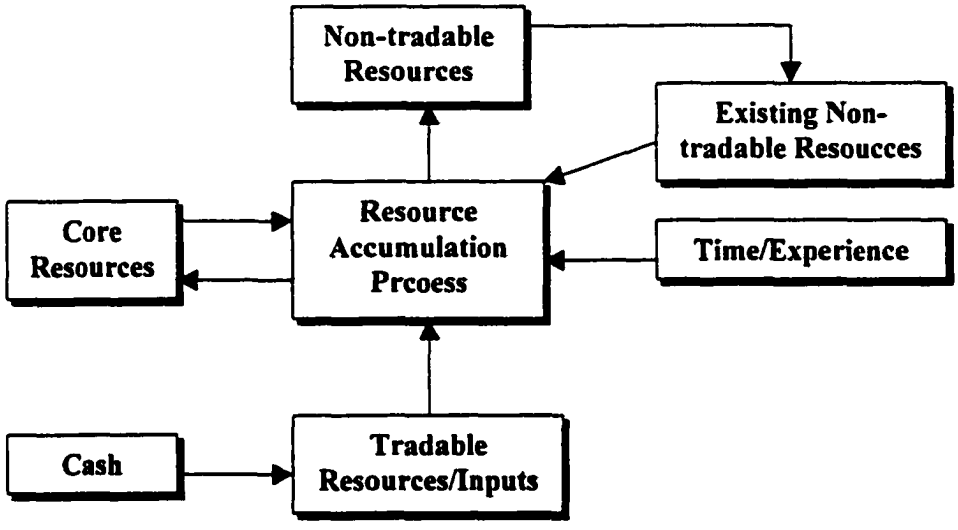
Also, we should notice that, even when a resource can be accessed through acquisition, alliance, or sharing, it is quite likely that this resource will not perfectly fit the need and the environment of the firm. Therefore, normally, this resource will need some adaptation to the firm's need and environment, and integration with the firm's existing asset bundles. Under such circumstance, internal asset accumulation processes actually plays a significant role in molding the externally acquired resources. Furthermore, it shows that the path of a firm's internal accumulation process is characterized by elements which are specific to the firm itself (Dunning, 1993a). Therefore, the resources acquired from firm's accumulation process are not easily imitated or copied by others.

As a result, we may say that, in order to develop and transform a firm's long lasting competitive advantage, it will need not only resources that can be quickly and/or cheaply accessed through endowment, acquisition or sharing, but also its ability to continuously adapt and improve its strategic resources to meet market-specific demands and to create new strategic resources that it can exploit in existing or new markets.

Now, let's consider how firm may carry out its internal resource accumulation process. According to Markides and Williamson (1994), a firm's resource accumulation processes for nontradeable, nonsubstitutable resources may require inputs that include cash, time, readily tradeable resources, existing nontradeable resources, and the "core competencies" necessary for producing new resources. Among all these inputs, the core competencies play a crucial role in resource accumulation. Core competencies include the pool of experience, knowledge and systems, etc. which can be used to reduce the cost or time required for either creating a new, strategic resource, or expanding the stock of

existing resources. By integrating these inputs, a firm can create new non-tradeable resources or upgrading existing nontradeable resources. The process is shown in Figure 2.3. Based on this model, hence, we know that, in order to accomplish the resource accumulation process for transforming competitive advantages, firms will need financial resources, tradeable resources, core competencies, and their own experience and knowledge as the inputs. Also, the production of new resources and upgraded resources will demand a period of time to accomplish.

FIGURE 2.3. RESOURCE ACCUMULATION PROCSSES



Source: Markides, C.C. and P.J. Williamson, 1994. Related Diversification, Core Competences and Corporate Performance, ***Strategic Management Journal***, 15: 149-165.

Therefore, as a summary, we may argue that, the major mechanism for upgrading indigenous firms' competitive advantages rests on their capabilities of acquiring or creating the necessary resources. These firm-level resources can be the endowment of firms, or acquired through purchase, or provided by their alliance partners. More importantly, indigenous firms should count on internal resource accumulation processes to create new resources and upgrade existing

resources for the targeted economic sectors/segments. All these approaches, if taken properly, should have impact upon upgrading indigenous firms' firm-level resources which in turn, may transform their competitive advantages for competition in targeted sectors/segments. Consequently, the "what to produce" and "how to produce" aspects of an economy may be adjusted to some extent as well.

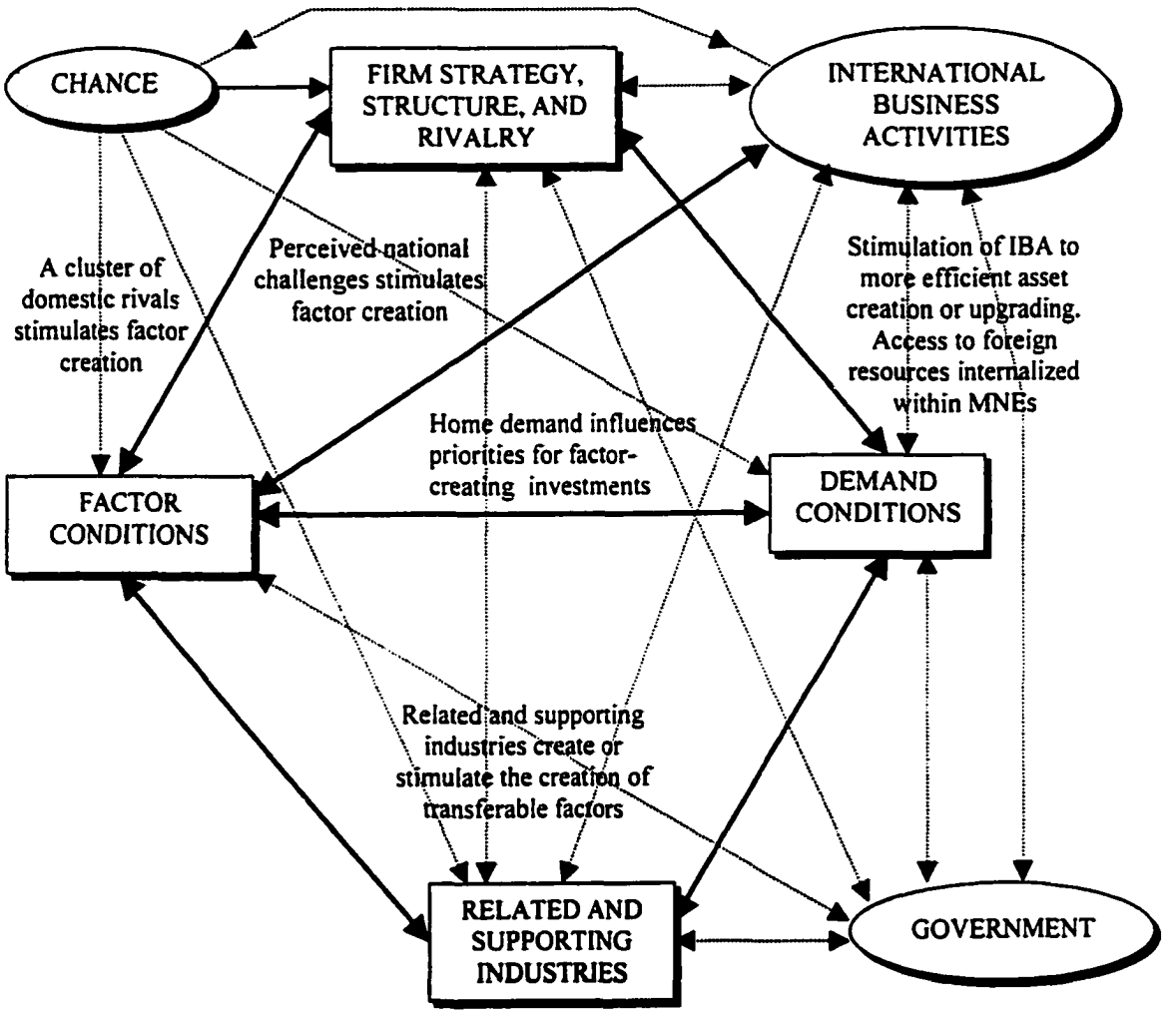
As to the second aspect of OLI advantages, the comparative advantage of a country's basic and advanced factors (namely, the availability and quality of country-level resources), it seems that advanced factors are becoming more and more important than basic factors. Apparently, a country's natural endowment does play a role in a country's economic activities. However, as the advantages due only to basic factors are often fleeting and vulnerable (for example, unskilled and semiskilled labor), basic factors are increasingly less significant to the upgrading of a country's comparative advantage. In stead, advanced factors are now the most significant ones in that they are necessary for producing differentiated products and proprietary production technology. Moreover, this kind of factors are created rather than inherited. The creation of advanced factors requires large and sustained investments from public and private institutions. Thus, advanced factors are less likely to accumulate in a short time. Nations will enjoy comparative advantage where they possess unusually high quality institutional mechanisms for advanced factor creation.

The mechanisms for creating advanced factors are best captured by the conceptual framework named as "Dunning-Porter framework" (DPF) (Narula, 1993). This framework modifies Porter's "diamond" by adding international business activities (IBAs) as a third exogenous variable[3] (see Figure 2.4). Each

[3] The other two exogenous variable of DPF are government and chance.

variable of this modified "diamond" will, individually and as a system, have influence over a nation's competitive advantage, and interact with other variables in the model. Hence, the extent and quality of, and the interaction between, these determinants will decide the strength, composition, and

FIGURE 2.4. INFLUENCES ON FACTOR CREATION



Source: Dunning, J.H. 1992. The Competitive Advantages of Countries and the Activities of Transnational Corporations, ***Transnational Corporations***, 1(1): 135-168.

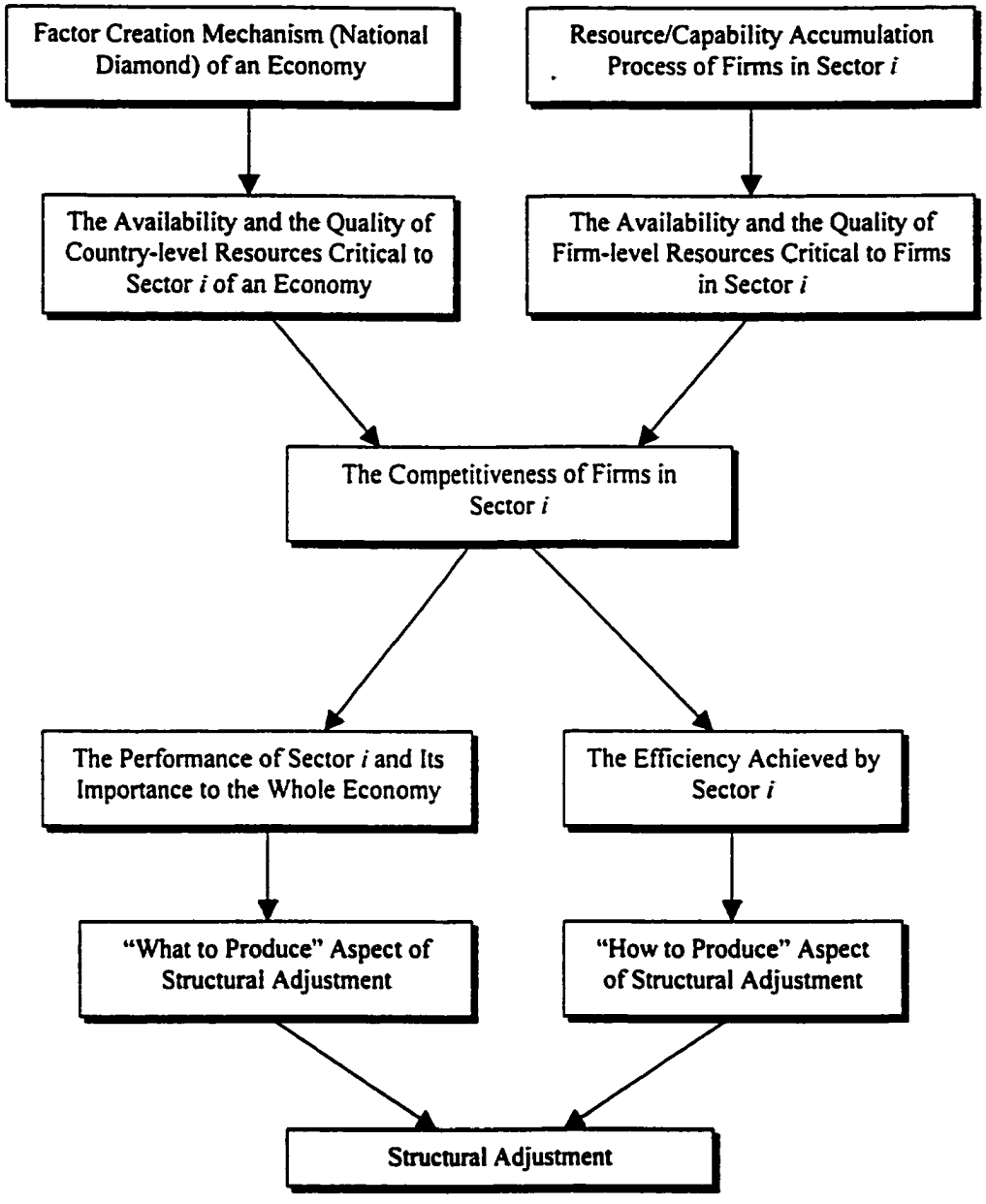
sustainability of a nation's competitive advantage. As one of the major determinants of national diamond, a country's factor creation is, therefore, interacted with other variables. Through these interactions, the whole system then actually works as the factor-creation mechanism that dominates the creation

and upgrading of advanced factor. The impact of each variable on factor creation is illustrated in Figure 2.4. The relationships involved in this system are highly complicated. In next subsection, we will consider the role of IBAs played in factor creation.

In brief, the comparative advantage of a country's factor condition is decided by its national diamond, with several groups of determinants mutually interacted with one another. Depending upon the basic factors and the advanced factors created by a country's national diamond, the availability and quality of country-level resources for various economic sectors/segments will vary too. As a result, it may significantly affect the performance of various sectors/segments operated in this country. In turn, it will have impact upon the adjustment of this country's economic structure.

Based upon the above discussion, we may formulate the conceptual framework for the dynamic process of structural adjustment (as shown in Figure 2.5 on next page). It shows that, during a certain period of time, an economy's economic structure may adjust as a result of a series of events. The adjustment process starts from the transformation of both country-level resources and firm-level resources. Due to the interactions among determinants of national diamond and the resource accumulation accomplished by indigenous firms, the availability and the quality of both country-level resources and firm-level resources for each economic sector will change accordingly. This, in turn, will result in the rise of certain economic sectors in the economy, as well as the decline or stagnation of some other sectors in the same economy. Also, there could be impact upon the efficiency achieved by various economic sectors. All these changes then lead to the transformation of "what to produce" and "how to produce" aspects that account for a country's structural adjustment.

Figure 2.5. The Dynamic Process for the Development of an Economy's Economic Sectors and Its Structural Adjustment: A Possible Sequence of Events



CHAPTER 3

THE ROLE OF INTERNATIONAL BUSINESS ACTIVITIES IN SECTORAL DEVELOPMENT AND STRUCTURAL ADJUSTMENT

3.1. The Potential Contributions from International Business Activities to Sectoral Development and Structural Adjustment

In previous chapters, we already identify the driving forces behind a country's structural adjustment process. In this section, we will first discuss various types of international business activities (IBAs) and the possible impact from each kind of IBAs. Then, in the following section, we will examine the conditions for IBAs to have impact upon a country's economic sectors and structural adjustment process.

Essentially, in order to affect a country's economic sectors and structural adjustment process, IBAs, no matter which type, need to have influence over the "what to produce" and "how to produce" aspects. Hence, the impact from IBAs should be related to the transformation of both country-level resources and firm-level resources. Thus, the potential contributions from IBAs may come from the following approaches. First, IBAs may directly provide indigenous firms the necessary firm-level resources for entering higher value-added sectors/segments. Secondly, IBAs may assist the resource accumulation process of indigenous firms for developing and upgrading their critical firm-level resources. Thirdly, IBAs may take part in the factor creation mechanism of an economy so that the economy could provide more advanced factors for upgrading its existing sectors/segments and develop new sectors/segments. Through the above three approaches, IBAs could act as an important driving force that brings about a country's structural adjustment. Now, let's examine how IBAs may make contribution to a country's structural adjustment process.

According to Dunning (1993c), the impact of IBAs on both host and home countries may significantly depend upon the nature of IBAs. This is because different types of IBAs are aimed at achieving different investment motives, which will, therefore, focus upon different economic goals, and, in turn, will have different impact upon the economies of home countries and host countries. Hence, before we evaluate the impact of IBAs, we will need to discuss the characteristics of different types of IBAs.

Essentially, there are two kinds of international business activities that may have impact upon a country's structural adjustment; namely, the inward direct investments (IDIs) coming from foreign firms and the outward direct investments (ODIs) made by indigenous firms. In addition, firms can participate international inter-firm or inter-organizational cooperative arrangements to expand their business territory.

For foreign direct investments (FDIs, including IDIs and ODIs), according to Dunning (1994a), there are four different types of FDIs: resource-seeking, market-seeking, efficiency-seeking and strategic asset-seeking. In the following paragraphs, we will briefly discuss each type of FDIs.

For resource-seeking, the investing firms aim at acquiring particular and specific resources from other countries at a lower cost than could be obtained in their home country. There are two main types of resource seekers. The first type of resource-seeking investors seek physical resources of one kind or another. The resources they seek include most minerals, raw materials, and agricultural products. Basically, the motives of this kind of investments could be cost minimization and security of supply sources. The second group of resource seeking investments comprise those looking for plentiful supplies of cheap and well motivated unskilled or semi-skilled labor. This kind of FDI is usually

undertaken by firms from countries with high real labor costs to supply labor intensive intermediate or final products for export.

For market-seeking FDI, the investing firms invest in a particular country or region to supply goods or services to markets in these or in adjacent countries. In most cases, part or all of these markets have been serviced previously by exports from the investing company. Later on, due to tariff or other cost-raising barriers imposed by host counties, or because the size of the markets now justifies local production, supplies through exporting is no longer the best choice. Also, market-seeking investment may be undertaken to sustain or protect existing markets or to exploit or promote new markets.

As to efficiency seeking FDI, the motivation is to rationalize the structure of established resource based or market-seeking investment in such a way that the investing company can gain from the common governance of geographically dispersed activities. Such benefits are essentially those of the economies of scale and scope and of risk diversification. Usually, the efficiency seekers will be experienced, large and diversified MNEs producing fairly standardized products and engaging in internationally accepted production processes. There are two kinds of efficiency seeking FDI. The first is that designed to take advantage of differences in the availability and cost of traditional factor endowments in different countries. The second kind of efficiency-seeking investment is that which takes place in countries with broadly similar economic structures and income levels and is designed to take advantage of the economies of scale and scope, and of differences in consumer tastes and supply capabilities. For this kind of FDI, traditional factor endowments play a less important role in influencing FDI, while "created" assets play a more important role.

The fourth group of FDIs are those that aim at acquiring assets from foreign companies. These desired assets are believed capable of promoting the investing

firm's long-term strategic objectives, especially that of sustaining or advancing their international competitiveness. Hence, the main motive for strategic asset-seeking investment is not to exploit specific cost or market-seeking advantages over their competitors, but to add to the acquiring firm's existing portfolio of assets that are perceived to either sustain or strengthen their own overall competitive position or weaken that of their competitors.

After examining the characteristics of different type of FDIs, now, let's consider how FDIs, including IDIs and ODIs, may contribute to a country's structural adjustments. According to Dunning (1992), when foreign MNEs make IDIs in host country, there will be two major benefits for host country. First, it is likely that foreign MNEs will provide different package of resources and capabilities (such as technological and organizational capabilities, financial capital, etc.) compared to that provided by domestic investors. Secondly, MNE's operations in host will have unique impact on the productivity of indigenous resources. This is accomplished both by redirecting resources to where they can be more productively employed, and by improving the quality of host's existing resources and capabilities. The implication for these benefits is that, through IDIs, foreign MNEs can provide three contributions to host country's structural adjustments: (1) supply of new resources and capabilities to host's indigenous firms; (2) introducing more productive sectors or industries to host (affecting the "what to produce" aspect of host); and (3) upgrading host's factor endowment. As we discussed in previous section, the supply of new resources and capabilities is one of the ways that may help to strengthen the firm-level resources possessed by host's indigenous firms. The upgrading of host's factor endowment will, on the other hand, enhance the comparative advantage of host's country-level resources.

Also, because nation states are increasingly competing for resources and capabilities provided by MNEs (Dunning, 1993c), MNEs can, themselves, influence host government's behavior, including that directly impinges on the national diamond of host. In other words, in order to attract or keep the IDIs from MNEs, governments may be prompted to take action that may affect the locational advantage of their country-level resources in a variety of ways, as described by Porter.

For ODIs made by indigenous firms, the benefits also depend on the purpose of ODIs. For ODIs that are of resource seeking, the investing firms can acquire other country's resources that are otherwise scarce or more costly at home. Since the objective for this kind of ODIs is to acquire resources (e.g. natural resources and cheap labor), these ODIs are actually the means to use host country's factor endowment to complement home country's factor endowment. For those countries that do not have abundant natural resources, such as Japan and today's Taiwan, this international strategy is critical for their national competitiveness. Hence, Rugman and Verbeke (1993) use the concept of "double diamond" to capture the inter-relationship between host country's national diamond and home country's diamond. It shows that, due to ODIs, the investing firm need not only consider its home country's national diamond but also its subsidiaries' country diamonds. Similar dependence also appears in efficiency-seeking and strategic asset seeking ODIs. We will discuss these relationships later.

For market seeking ODIs, the major benefits may include the increase in sales volume or the protection of current sales volume. Both benefits will provide the necessary financial resources for investing firm to undergo its resource accumulation process. As we discussed earlier, this process is crucial for developing or upgrading its strategic resources. Moreover, by exposing itself to

different national environment, the investing firm can also accumulate its experience and capabilities for international expansion.

As to efficiency seeking ODIs, the objective is to exploit economies of scale and scope by integrating assets, production and markets regionally or globally. To carry out this kind of ODIs, the investing firms need to develop superior coordination mechanism to accomplish cross-border integration. Hence, efficiency seeking will not just lower down the investing firm's cost structure, but by the process itself, the investing firm will gradually upgrade or create its unique organizational capabilities. Also, normally, this kind of ODIs tends to identify the most efficient locations for performing value activities. Thereby, the investing firm will actually utilize some location advantages provided by these locations. Again, this implies that, through ODIs, host country's diamond becomes one of the bases that supply the investing firm necessary production factors.

The strategic asset seeking ODIs are aimed at acquiring other country's country-level and/or firm-level resources (including technological and organizational capabilities, human capital and financial capital) that are critical to investing firms' strategic goals. Therefore, this type of ODIs is actually one of the methods that investing firms use to accumulate their firm-level resources. Through strategic asset seeking ODIs, the investing firms may acquire the firm-level resources necessary for more profitable sectors/segments.

In addition to all the benefits mentioned above, through ODIs, the investing firms could also monitor the current developments accomplished by foreign competitors. From the strategic actions taken by their competitors, the investing firms may identify the potential threats to their current businesses or the new opportunities that may be worthy of pursuit.

In addition to IDIs and ODIs, indigenous firms' participation in cross-border inter-firm or inter-organizational relationships can also provide a variety of helps to a country's structural adjustments. First, the participating firms may reduce the amount of investments necessary for developing certain firm-level capabilities/assets. Second, by combining with other partners' existing firm-level capabilities/assets, the desired new capabilities/assets may be created more quickly and efficiently. Third, through inter-partner learning process, firms may acquire necessary capabilities/assets from their partners, or learn the key hints for developing critical firm-level resources on their own. Fourth, by participating in technology-based inter-firm cooperation, firms may keep informed of the most current development of new opportunities.

In sum, IBAs may provide various kinds of assistance to a country's structural adjustments. First, IBAs may make indigenous firms and government aware of more productive sectors/segments. Secondly, through utilizing other nations' country-level resources, both indigenous MNEs and foreign MNEs may directly affect the factor creation mechanisms of home and other host countries (either provide resources to host countries or push governments of home and hosts to improve the comparative advantage of their country-level resources). Third, due to foreign MNEs' supply of new firm-level resources and capabilities, host country's indigenous firms may upgrade their firm-level resources for creating or sustaining their competitive advantages. Fourth, for firms that join international inter-firm cooperation, they may receive a number of benefits from the collaborative relationships. On one hand, they may reduce the amount of investment for developing new firm-level resources/capabilities, or create the desired resources/capabilities more efficiently and effectively. On the other hand, they may acquire new firm-level resources/capabilities from partners, or learn from partners about how to create new resources/capabilities on their own.

All the above aspects will help to enrich and enhance indigenous firms' firm-level resources and the comparative advantages of the country's endowment in country-level resources. In turn, they will contribute to the accomplishment of the country's structural adjustment. In the following sections, we will examine the conditions regarding when international business activities can actually affect a country's structural adjustment.

3.2. The Conditions that International Business Activity Can Assist the Upgrading of A Country's Economic Sectors

From previous section, we understand that IBAs may provide various kinds of assistance to a country's industrial structural adjustment. However, from past experience, it shows that IBAs do not necessarily lead to the upgrading of a country's economic activities. This indicates that there are certain conditions, which will decide if IBAs could, in fact, have impact upon a country's economic sectors and the adjustment process of its economic structure. In this section, we will consider what these conditions are and how they are related to a country's sectoral development and structural adjustment process.

Among all conditions, the basic requirement for IBAs to have impact upon a country's economic structure is the existence of inward or outward IBAs in this country's various economic sectors. First of all, the country in question needs to have open and positive attitude toward both inward and outward IBAs. If IBAs are highly restricted, it is very unlikely that IBAs could have significant impact upon the country's structural adjustment.

Other than government's policy toward IBAs, nor will IBAs exist in the economic sectors for no reason. As we discussed earlier, each IBA has its economic goal to be accomplished. Hence, in order to have inward or outward IBAs operated in economic sectors, there must be some incentives coming from

home country and/or host countries such that indigenous firms or foreign firms in various economic sectors are willing to carry out either inward IBAs or outward IBAs. Among these incentives, the endowment of country-level resources of home and hosts, and the firm-level resources possessed by firms of various economic sectors are often critical[1]. This is especially true for sectors that rely on natural resources as their core resources for production, and sectors that highly depend upon advanced firm-level resources to perform their value activities. For these sectors, the acquisition of needed country-level resources and/or firm-level resources is critical for the success of firms. Hence, whether inward and outward IBAs will be active in certain economic sectors is often closely related to the availability and the quality of home country's and/or host country's country-level resources and firm-level resources. For example, for agriculture and mining sectors, the basis for IBAs (both inward and outward) is often the availability and the quality of natural resources located in home country or host countries. For high-tech sectors, the major concern for IBAs (both inward and outward) is, on the other hand, the availability and the quality of technological firm-level resources possessed by indigenous firms or foreign firms. Hence, for both indigenous firms and foreign firms, the availability and the quality of country-level resources and firm-level resources provided by home and host countries will decide where they will carry out their value activities. Thus, while considering the economic environment of a country, if the country's country-level resources and/or firm-level resources are quite insufficient for the value activities of an economic sector, IBAs will not be active or even hardly exist in this sector. Consequently, IBAs will not have significant impact upon the growth or decline of this sector.

[1] In addition to country-level resources and firm-level resources, there are some other factors that will affect the emergence of IBAs. For example, the market size of host countries and home country, and government's attitude toward IBAs. For more detailed analysis, see Narula's book (1996).

Even if IBAs are attracted to certain economic sectors of a country, these activities do not necessarily have impact upon the development of these sectors and this country's structural adjustment. Again, from the discussion we made in Chapter 2, it is clear that, a country's structural adjustment process will involve at least two dynamic events. First, both country-level resources and firm-level resources need to be transformed into those resources that are adequate for the rise of new economic sectors/segments, and for many occasions, unfavorable to the continuous growth of old economic sectors/segments. Secondly, the potentials of new growing economic sectors/segments need to be recognized and, then, pursued by indigenous firms or government. If IBAs could assist the accomplishment of the above two events, then IBAs should be able to provide positive impact upon the success of a country's structural adjustment.

Aside from the above two dynamic events, another development that often, although not necessarily, associates with a country's structural adjustment is concerned with the phenomenon that existing economic sectors/segments may progressively lose their strengths in the economy during or after the adjustment process. This development usually results from the changes in the economy's country-level and firm-level resources, and it may significantly hinder the structural adjustment if firms of the economy still rely upon declining sectors/segments to provide most of the financial resources for creating or acquiring new resources and capabilities. Again, depending upon the cause responsible for this development, different kind of international business activities may provide different helps for alleviating the adverse impact upon the adjustment process.

Now let's start from considering how the potentials of new growing sectors/segments can be recognized by the economy. The potentials of new growing sectors/segments could be recognized and pursued by indigenous

firms and/or government when there are needs or incentives for indigenous firms and/or government to search for new opportunities. Although for some cases, the indigenous firms and/or government will pay attention to certain new growing sectors/segments because of the great profit potentials that are expected from these sectors/segments. Nevertheless, under most circumstances, the major driving force for searching new opportunities comes from the pressure for competition.

Apparently, as firms and governments of other countries are continuously searching for ways to enhance the competitiveness of their economic activities, a country's economic sectors/segments are constantly under the pressure that they may loose strengths due to the progress made by competitors. Hence, in order to remain competitive while facing the potential threats, firms and/or governments need to continuously find ways to strengthen the competitiveness of their economic activities. This can be achieved most effectively either by entering higher value-added economic sectors/segments, and/or by learning to utilize more productive value-creating methods for existing sectors/segments. Both alternatives, however, require that firms and government first identify what sectors/segments and value-creating methods are most promising. Hence, in order to find the right targets for future development, both indigenous firms and government will need to continuously search for new opportunities through internal efforts, or monitor the most recent developments occurred in external environment (either occurred in foreign countries or in the country) to identify new opportunities. The monitoring function may be carried out by firms (Cantwell, 1994) and/or by public institutions. Also, indigenous firms and government may receive helps from international business activities (both inward and outward ones) to identify new opportunities. As we discussed in section 3.1, inward international business activities (including IDIs and inward

cross-border inter-firm collaboration) may introduce more productive sectors to recipient country through MNE's operations. Outward international business activities (including ODIs and outward cross-border inter-firm collaboration), on the other hand, can allow indigenous firms to notice the most promising economic activities developing in foreign countries.

As to the transformation of country-level resources and firm-level resources, as we mentioned earlier, it largely depends upon a country's factor creation mechanism and its indigenous firms' internal resource accumulation process. Nevertheless, as the resources required for new growing sectors/segments are becoming more and more complicated, it is quite possible that the country's government and its indigenous firms can not develop all the necessary capabilities and resources simply on their own. The above situation may occur under several different occasions.

One possibility is that related firms have only part of the capabilities and firm-level resources for developing the resources needed by new growing sectors/segments, while foreign companies or organizations possess the solutions for developing the needed resources. Under such circumstance, they must search for helps from foreign companies or organizations to get the desired capabilities and assets. However, in order to induce the foreign resource owners to provide the needed resources, either some firm-level resources possessed by indigenous firms, or some country-level resources desired by these foreign companies could be used to exchange for the desired capabilities and assets.

Another possibility occurs when there is high risk and large investments for innovations associated with the new growing sectors/segments. Under such circumstance, the related indigenous firms may wish to share the provision of necessary financial resources and the investment risks with foreign companies or organizations.

Also, the related indigenous firms may seek help from foreign companies or organizations when there is need to combine incremental technological advances across a wide variety of disciplines. In other words, there is close interdependence among various kinds of product and process technologies that related indigenous firms and government alone could not produce the complete solutions for the new growing sectors/segments. Hence, the development of the new growing sectors/segments must count on cross-border cooperation.

For the transformation of country-level resources, it is possible that the government can not afford the investment in constructing infrastructure (such as airport, highway, telecommunication system, etc.), or indigenous firms do not have the adequate technological and organization capabilities to complete the construction of infrastructure for government on their own. Under these situations, government will need to invite foreign companies to invest in constructing infrastructure, or help indigenous firms complete the construction of infrastructure for government.

All the above situations will allow foreign companies or organizations to have positive impact upon a country's structural adjustment process. This is most likely to occur when countries in earlier development stages receive inward international business activities from countries in later development stages. Normally, the MNEs from countries of later development stages possess the firm-level resources that are needed by firms of countries in earlier development stages for upgrading their economic activities. Therefore, for developing countries, the inward international business activities from developed countries often provided them certain momentum for economic growth and structural adjustment.

Another issue critical to the success of structural adjustment is about how indigenous private firms and government can continue their supports for the

investments in new growing sectors/segments. Basically, there are two ways through which private firms and government can find financial resources to support the investments. First, related indigenous firms and government may use their own financial resources to upgrade related firms' competitive advantages, and improve the comparative advantage of the country's created factors. As we mentioned earlier, in order to upgrade their competitive advantages, these related firms need to acquire or create the necessary resources through purchase, partnership with other organizations, or internal efforts. All these approaches, apparently, require a variety of investments. These investments may come from the financial resources possessed by related indigenous firms and/or the financial resources provided by government (for example, through subsidy from government). For financial resources possessed by related indigenous firms, the accumulation of these financial resources will, essentially, come from the profits earned from their current major businesses. These businesses may or may not belong to the economy's current dominant sectors/segments. By using the resources accumulated from current major businesses, these indigenous firms can, therefore, afford to acquire the capabilities/assets from external sources or develop the capabilities/assets internally for entering new growing sectors/segments and utilizing new value-creating methods.

As to the financial resources provided by government to support related firms' efforts for new growing sectors/segments and new value-creating methods, they may depend upon government's financial capability and its attitude toward the new growing sectors/segments and new value-creating methods. This may be affected by a variety of factors. Among all, foreign MNEs can play a role in affecting government's decision regarding its support for new growing sectors/segments and new value-creating methods. When foreign

MNEs actively make inward investment in these growing sectors/segments, government will gradually notice the potentials of these sectors/segments. If these sectors/segments keep growing, it may finally lead to government's willingness to encourage the growth of these sectors/segments by indigenous firms.

In addition to the support for related indigenous firms, government may also facilitate the adjustment process by upgrading the comparative advantage of the country's created factors. To accomplish this, government may encourage both public and private institutions to make large and continuous investments in educational institutions, apprenticeship programs, government and private research institutes, and infrastructure. All these efforts, again, demand a great amount of financial resources that are largely collected from private sectors. Since the existing major sectors/segments still dominate the economy before the adjustment process completes, it is therefore reasonable to say that, at this stage, a lot of government's investments in supporting indigenous firms' efforts and in upgrading country's created factors actually come from the financial resources collected from existing major sectors/segments.

Hence, from the above discussion, we know that related indigenous firms and government rely on both firms' existing major businesses and the economy's existing major sectors/segments to acquire the financial resources for transforming country's created factors, and related indigenous firms' competitive advantages and capabilities. Therefore, when firms' existing major businesses and the economy's existing major sectors/segments tend to lose their strengths, it may cause significant impact on the accomplishment of structural adjustment. Because of these threats, both related indigenous firms and government may face the risk that they can not find enough financial resources to invest in new growing sectors/segments. In turn, the success of industrial

structural adjustment will be hindered. To prevent this danger, appropriate strategic actions must be taken to reverse the above adverse impacts.

The strategic actions depend very much upon the reasons why firms' existing major businesses and the economy's existing major sectors/segments may lose their strengths during the adjustment process. In Ozawa's articles (Ozawa, 1992; 1995), he uses a concept called "increasing factor incongruity" to analyze this phenomenon. Ozawa states that current major sectors/segments may loose their strengths under two different circumstances. First, it may occur when the products of current major sectors/segments change rapidly along the path of its product life cycle as they are transformed from a newfangled good to a standardized one, even though the factor endowments of the economy remain the same. Firms that originally enjoyed good competitive positions in these sectors/segments can no longer sustain their competitive advantages in production at home and thus, will need to transplant production abroad to restore an appropriate "factor congruity". Second, factor incongruity may emerge when the factor endowments of a country become increasingly more capital-abundant and labor-scarce. Products whose factor intensity used to be compatible with the initial state of labor abundance will no longer be produced cost-effectively at home, although the products themselves may remain unchanged in their factor requirements. The first scenario that is considered by increasing factor incongruity is closely related to the changes in firms' competitive advantages. As to the second one, it is largely concerned with the changes in a country's locational advantages. In either case, the dominant positions enjoyed by current major sectors/segments or value-creating methods at home will gradually fade away from this stage. To avoid the adverse impacts from the above situations, the indigenous firms may transplant production to other countries, and/or explore new markets that can still accept the products.

Also, they can use differentiation strategy (such as adding specific features to existing products, or improving the quality of products and after-sale service) to remain competitive in the current product markets. By taking the above strategic actions, the current major sector/segments and/or value-creating methods may still continue their profitability for some time.

Other than the scenarios described above, the competitiveness of current major sectors/segments may decline simply because the life cycles of their products are too short. Thus, even if the products themselves are not labor intensive or standardized, and the factor endowments of an economy remain unchanged, firms may still face the threats of losing strengths in these sectors/segments in a relative short period. Hence, they may need to continuously explore new opportunities to prevent the damages from short product life cycle. This is especially true for those sectors/segments that have high innovation rate. For this kind of sectors/segments, transplanting labor-intensive value activities to other countries can not really solve the problem. Nor can the market-seeking strategy (namely, exploring new markets in other countries that are still not very competitive yet) and the differentiation strategy (such as adding specific features to existing products, improving the quality of products and after-sale service) solve the problem sufficiently in the long-run. The only solution is to continuously and efficiently develop or acquire the resources and capabilities needed for penetrating new growing sectors/segments and/or innovating new products. Hence, under this circumstance, the advancement of indigenous firms' firm-level resources (especially those related to technological capabilities) is the major determinant for reversing the threats from short product life cycle.

In addition to the use of their own financial resources, the indigenous firms and government may also receive helps from foreign sources to acquire

resources needed for upgrading indigenous firms' competitive advantages and the country's created factors. For example, during the early stage of Taiwan's economic development (in the 1950s and 1960s), the U.S. government offered financial aid to Taiwan for restructuring Taiwan's economy and building up Taiwan's infrastructure. This funding had provided the necessary resources that Taiwan's government could use to upgrade its indigenous firms' competitive advantages and its created factors.

On the basis of the above discussion, we may, then, summarize the major conditions concerning when IBAs could assist the accomplishment of a country's structural adjustment process.

The first condition is related to factors that will lead to the occurrence of IBAs in economic sectors. As we discussed earlier, government's policy toward IBAs will decide if IBAs could have significant impact upon the country's economic sectors. If government restricted the operations of IBAs in certain sectors, then IBAs will not significantly affect the development of these economic sectors. In addition, for sectors that heavily rely upon use of certain country-level resources and/or firm-level resources, the endowment for country-level resources and firm-level resources in home country and host countries will play an important role in affecting the emergence of inward IBAs and/or outward IBAs. If the resource endowment at home already provides indigenous firms the necessary resources (with good quality and relatively low cost) for performing value activities, there would be no incentive for indigenous firms to acquire resources from other countries. Thus, the impact from outward IBAs will not be significant under such circumstance. Similarly, if the resource endowment could not induce foreign firms to acquire resources inside the country, the impact from inward IBAs will not be significant for the economy either.

The second condition is concerned with an economy's inability to recognize the potential opportunities arising from new growing sectors/segments. It refers to a situation such that without the information provided by foreign companies or organizations, or collected from foreign markets, neither private firms nor government will pay attention to the new growing sectors/segments. Hence, either inward IBAs or outward IBAs may help indigenous firms or government to notice the potentials of new growing sectors/segments.

The third condition is related to an economy's inability to autonomously accumulate the necessary resources (including technological and managerial capabilities) that are needed for the economic activities of new growing sectors/segments. For this case, foreign companies or organizations may either directly provide the resources to indigenous firms or help indigenous firms to accumulate the resources essential for the targeted new growing sectors/segments.

The fourth condition originates from the situation when indigenous firms and government do not have enough financial resources to support the investment[2] necessary for the emergence and growth of new sectors/segments. This situation is particularly serious when existing major sectors/segments are losing competitiveness while most of the financial resources are still collected from these declining sectors/segments. Under such circumstance, the financial resources that are needed for the investments in new growing sectors/segments will become more and more unavailable. Thus, indigenous firms may either try to seek additional financial resources from foreign sources, or they can transplant production to other countries to remain the competitiveness of existing major sectors/segments. To look for financial resources from foreign sources,

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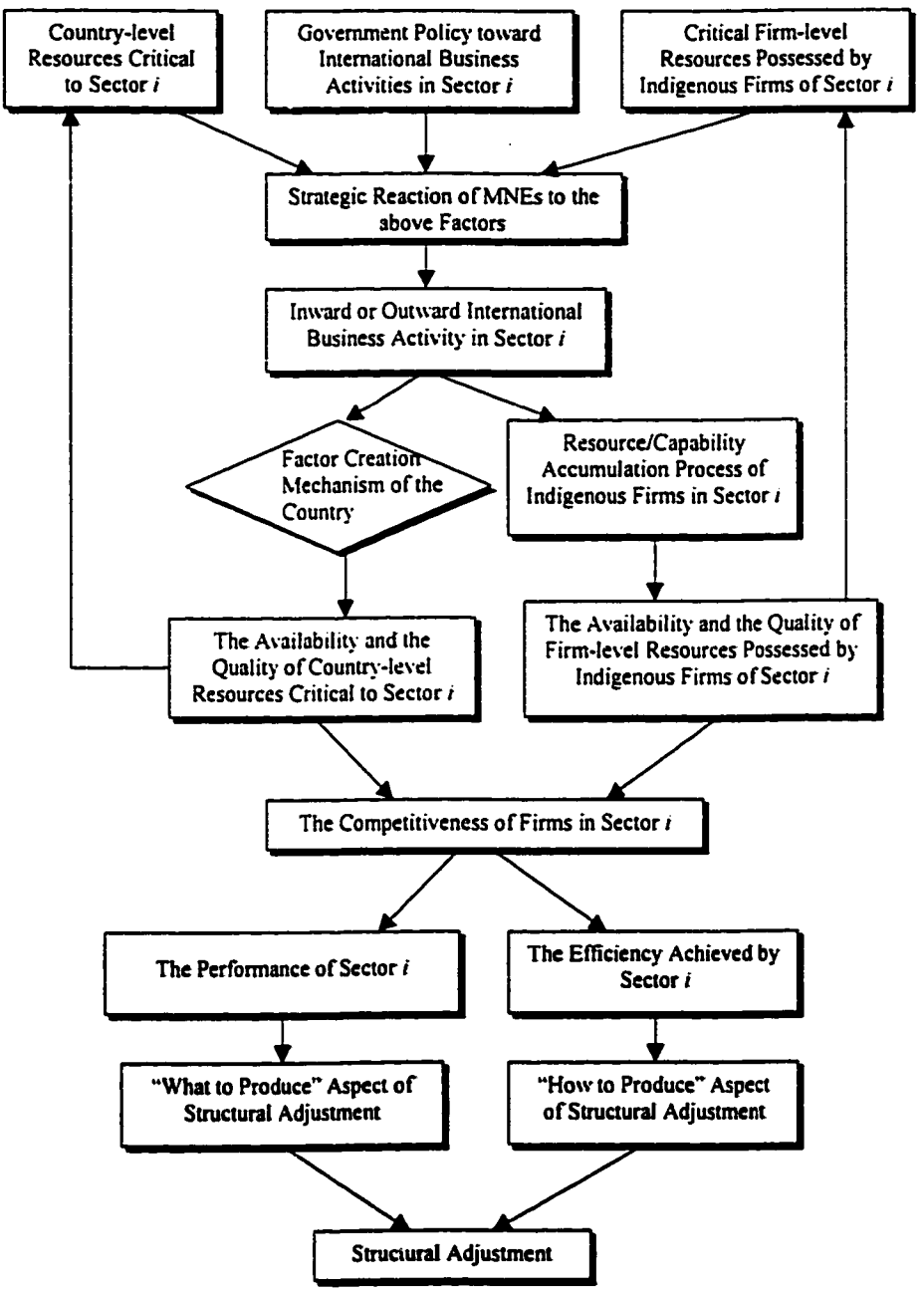
[2] These investments may include those in developing new technological capabilities, and in upgrading the economy's created assets for new growing sectors/segments.

indigenous firms may often need to invite foreign companies to jointly develop the capabilities needed for the targeted new sectors/segments. Hence, joint

Figure 3.1. The Dynamic Inter-Play among International Business Activity, Sectoral Development, and Structural Adjustment



ventures or strategic alliances are possible options for this case. As to

transplanting production to other countries, it involves outward international business activities taken by indigenous firms for strengthening their existing major businesses.

The above four conditions point out the possible occasions that international business activities may have positive impact upon a country's structural adjustment process. Apparently, international business activities may not always lead to the success of a country's structural adjustment. It largely depends upon how well can international business activities provide the resources or information that will benefit the creation of new firm-level resources for economic sectors, and how well can they affect the factor creation mechanism of a nation's country-level resources. A dynamic causal relationship describing this impact is shown in Figure 3.1.

It is clear that, if the resources or information acquired or transferred from international business activities do not match the critical needs for the economy's structural adjustment, then the international business activities operated either by foreign firms or by indigenous firms can not really help to upgrade the economy's economic sectors/segments. Therefore, if the outward international business activities operated by national firms can't acquire the resources necessary for upgrading existing major businesses, or transfer back the information or resources needed for the new growing sectors/segments, then these outward business activities will not be very meaningful for the economy's structural adjustment. Similarly, if the inward international business operated by foreign firms fail to provide the financial resources or technological/managerial capabilities lacked by the economy's existing or new sectors/segments, then nor the inward international business activities will be very useful for the accomplishment of structural adjustment. Therefore, we may understand that, there are certain kind of international business activities that possibly fail to

benefit the development of an economy's economic activities. First, inward international business activities that solely involve selling final products or acquiring natural resources in host country will not provide significant assistance to upgrade host country's economic sectors. Secondly, outward international business activities that solely tend to transplant disadvantageous production to other countries may deteriorate the growth of existing economic sectors, if the investing firms do not upgrade their products and processes in home country.

As a summary, the international business activities may help to upgrade a country's economic activities only if these business activities can somehow affect the factor creation for country-level resources, or transfer the complementary resources to the economy for upgrading its O and L advantages. Also, with the help from international business activities, the economy's factor creation mechanism can function properly to provide enough and high quality country-level resources for economic sectors, and indigenous firms can themselves absorb the transferred resources and capabilities and then develop new firm-level resources for new sectors/segments. If that's the case, then we can expect that the operations of international business activities will gradually bring about either cross-sector or cross-segment adjustment as well as promote the growth and competitiveness of new sectors/segments.

3.3. The Influence from International Business Activities: How They Affect the Development of Individual Economic Sector and Economic Structure

From last section, we understand that the basis for international business activities to have impact upon an economy's economic activities rests upon what economic policy and resource environment can induce the operations of international business activities, and what resources can be transferred from international business activities. It implies that the development of different

economic sectors/segments will be affected differently by international business activities. This is mainly because the existing resources available to each of the economic sectors may or may not induce the occurrence of IBAs. Also, different types of IBAs will bring different set of resources and capabilities to the economy, which may or may not benefit the development of the sector in which the IBAs operate. In addition, each economic sector has its unique environment that may or may not favor the operations of international business activities. Hence, in this section, we will first examine how the development of different economic sectors is related to international business activities. Then, based upon the relationship between sectoral development and international business activities, we will examine how the economic structure as a whole is related to international business activities.

3.3.1. The Relationship between Sectoral Development and IBAs

In order to examine how different economic sectors may be affected by IBAs, we will divide economic sectors into three groups. The classification is based on the criteria used by *World Investment Directory* (United Nation, 1995; Narula, 1996) which focuses on the technological capabilities used by each sector's major value activities. Three groups of economic sectors are classified according to the technological intensity associated with their value activities: primary sectors, less technological intensive sectors, and more technological intensive sectors[3]. Since technological capability is one of the most important created assets demanded by

[3] The classification is as following:
a. **Primary Sectors**: 1) Agriculture and 2) Mining;
b. **Less Technology-Intensive Sectors**: 1) Food, Beverage, and Tobacco; 2) Textiles, Leather and Clothing; 3) Paper and Printing; 4) Non-metallic Mineral Products; and 5) Metals & Metallic Products;
c. **More Technology-Intensive Sectors**: 1) Coal, Petroleum Products; 2) Chemicals; 3) Rubber & Plastics; 4) Mechanical Equipment; 5) Electrical Equipment; 6) Motor Vehicles; 7) Other Transportation Equipment; 8) Other Manufacturing (Instruments, etc.).

economic sectors, and it normally calls for the co-existence of other created assets (such as skilled labor), we can, therefore, expect that the technological intensity of an economic sector is parallel to the intensity of created assets used by the same sector. Hence, we will user other names for the above three groups: primary sectors, less created-asset intensive (abbreviated as less CA) sectors, and created-asset intensive (abbreviated as CA) sectors.

Primary Sectors. For primary sectors, the major products they provide are minerals, raw materials, and agricultural products. These may include oil, copper, tobacco, sugar, bananas, coffee and tea, for example. Hence, we may understand that the development of these sectors/segments rely mostly on how to exploit the natural resources or produce agricultural products more efficiently and cost effectively. This shows us that there are two factors crucial for the development of a country's primary sectors. One is the macro environment concerning natural assets in the economy, including the existing stocks of natural resources, and the land, soil and weather condition for producing agricultural products. The other is the method to exploit natural resources or to produce agricultural products.

Essentially, the macro environment concerning natural assets in an economy is location-bound. Hence, either the exploitation of natural resources or the production of agricultural products must be carried out in the countries where these location-bound natural assets exist. Without L advantages in related location-bound natural assets, the primary sector of an economy in question can not supply its primary products efficiently and cost effectively. Thus, for MNEs that aim at acquiring particular minerals or agricultural products at a lower real cost, they would invest in countries that are well endowed with the necessary natural assets. As to countries that are not well endowed with the related natural assets, there may be only limited operation scale in the related primary sectors.

Also, there will not be too much inducements for foreign firms to invest in these primary sectors. This is because the value activities of primary sectors depend largely upon an economy's L advantages in natural assets.

In addition to that, certain firm-level resources may also benefit the growth and competitiveness of primary sectors. For value activities related to exploiting minerals and raw materials and producing agricultural products, the suppliers of primary sectors may still utilize certain complementary capabilities for improving their efficiency and cost effectiveness in upstream value activities. Moreover, these suppliers need to deal with downstream value activities (in particular, outbound logistics, marketing and sales) for sales of their outputs to targeted markets (both domestic and international). Therefore, the marketing experience and distribution channels owned by MNEs, and the capital investments and technology from MNEs in oil sector and agricultural cash crops (like rubber, coffee, and sugar) have significantly enhanced the outputs of these primary commodities in some developing countries. Compared to the traditional methods to produce and sell mineral products and/or agricultural products, MNEs often offer much better ways to do the job. Therefore, for suppliers of primary sectors, both their performance and their efficiency may still be enhanced by inward international business activities that are of resource-seeking type. This is especially true for countries that are still in their early stage of economic development. Due to lack of advanced firm-level resources necessary for improving their value activities, local suppliers of primary sectors could normally benefit most at this stage.

As to outward IBAs from primary sectors, again, because indigenous firms normally do not possess too many advanced firm-level resources during the early stage of economic development, there may not be too many outward IBAs.

Consequently, for primary sectors, the influence from outward IBAs may be quite limited during the early stage of economic development.

Nevertheless, we should notice that the L advantages enjoyed by certain primary sectors of a country might change over time. This is especially true for countries that only have limited natural assets. For example, the stock of minerals may become depleted, or the land and labor force for mining, farming and planting may become less available due to the competitive demands from manufacturing sectors, or become too costly due to the overall increase in income level. Under such circumstance, the goals of international business activities may begin to change accordingly. Resource-seeking type of IBAs may gradually be redirected to other countries that still have L advantages in the needed natural assets. Instead, due to the lack of proper natural country-level resources for producing primary goods locally, market-seeking type of inward IBAs may emerge for sale of primary goods to these countries. Hence, the imports of primary goods to these countries through these foreign investors may probably increase together with the magnitude of market-seeking type of inward IBAs. If the imported primary goods are rather competitive in terms of price and quality, local production of similar primary goods could be seriously hurt in the long run. Moreover, as local suppliers have accumulated more and more advanced firm-level resources after early stage of economic development, we may also expect that the assistance from inward IBAs upon the performance and the efficiency of primary sectors may tend to be less and less significant (even insignificant at all). Thus, after early stage of economic development, we may expect that the impacts from inward IBAs upon the economy's primary sectors may most likely to be negative. Nevertheless, the actual impacts depend very much upon government's policy toward their primary sectors. If government

decides to protect their local suppliers, then the influence from inward international business activities will be restricted.

On the other hand, for countries with limited natural resources, as their national firms grow and become capable of doing outward international business activities, these firms might also make resource-seeking type of outward IBAs to acquire primary goods from foreign sources. Consequently, if the cost and quality of these externally acquired primary goods are quite competitive, it may also hurt the performance of primary sectors at home in the long run. Under such circumstance, for economies lack of natural resources, the outward IBAs occur after early stage of economic might have negative impacts upon primary sectors. Other than resource-seeking type of outward IBAs, there could be market-seeking type of outward IBAs for certain competitive primary goods that are produced locally and relatively competitive. This may reduce the negative impacts of outward IBAs. Nevertheless, this kind of primary goods could be quite few for countries with limited natural resources. Hence, after early stage of economic development, outward IBAs are most likely to have negative impacts upon primary sectors.

As a summary from the above discussion, we may contend that, for the primary sectors of an economy, the L advantages of natural assets are the major determinants that decide how IBAs may affect these sectors. While the economy still has L advantages in related natural assets, it is more likely that there will be inward IBAs attracted to primary sectors. By providing capitals, more advanced process technologies and marketing capabilities, inward IBAs could positively affect the performance and the efficiency of primary sectors.

However, as manufacturing sectors begin to appear and compete with primary sectors for the country-level resources in the economy, or the stock of natural resources become depleted after exploitation during previous stage, the L

advantages that used to support the strength of related primary sectors may fade away. This may directly influence the role of IBAs in these sectors. The major goal of inward IBAs may gradually transform from resource-seeking to market-seeking due to the L disadvantages and shrinking supply from local production. As a result, the inward IBAs may adversely affect the performance of primary sectors, and may have no significant impact upon the efficiency of primary sectors. Similarly, the goal for outward IBAs from primary sectors during later stage of economic development is most likely to acquire natural resources from foreign countries. Hence, nor will outward IBAs have significant impact upon the efficiency of primary sectors during the later stages of economic development. Moreover, outward IBAs may possibly have negative association with the performance of primary sectors.

Therefore, based on the above discussion, the following research hypotheses are proposed:

H1a: *For economies that only have limited natural resources, the performance of primary sectors may positively associate with inward international business activities during the early stage of economic development.*

H1b: *For economies that only have limited natural resources, the efficiency of primary sectors may positively associate with inward international business activities during the early stage of economic development.*

H1c: ***For economies that only have limited natural resources, the performance of primary sectors may negatively associate with inward international business activities after the early stage of economic development.***

H1d: ***For economies that only have limited natural resources, the efficiency of primary sectors may not associate with inward international business activities after the early stage of economic development.***

H1e: *For economies that only have limited natural resources, the performance of primary sectors may not associate with outward international business activities at the early stage of economic development.*

H1f: *For economies that only have limited natural resources, the efficiency of primary sectors may not associate with outward international business activities at the early stage of economic development.*

H1g: *For economies that only have limited natural resources, the performance of primary sectors may negatively associate or insignificantly associate with outward international business activities after the early stage of economic development.*

H1h: *For economies that only have limited natural resources, the efficiency of primary sectors may not associate with outward international business activities after the early stage of economic development.*

The above hypotheses regarding the impacts of international business activities upon the development of primary sectors can be represented by the following equations:

$$PPS = f(IIBAPS, OIBAPS)$$
$$EPS = f(IIBAPS, OIBAPS)$$

Where *PPS* = performance of primary sectors, *EPS* = efficiency of primary sectors, *IIBAPS* = inward IBAs of primary sectors, and *OIBAPS* = outward IBAs of primary sectors.

Less Created-Asset Intensive Sectors. For less CA sectors, their value activities are not so much dependent upon the availability and the quality of natural country-level resources. Most of these sectors involve the use of production line(s) for transforming primary products to final goods for household consumers (such as food processing and textile sectors) or intermediate goods for other economic

sectors. Hence, although certain natural country-level resources (such as unskilled labor) are still quite crucial for some value chains of less CA sectors (inbound logistics and/or manufacturing, in particular), these resources are not the only determinant for the performance of less CA sectors. Compared to primary sectors, less CA sectors utilize more complicated product technology and production & operation system to produce the products. Hence, to less CA sectors, firm-level resources may be even more critical for the performance of manufacturing value activities. However, for developing economies at early stage of development, the availability and the quality of advanced country-level resources (few, although) and firm-level resources are often unable to support the needs for developing their less CA sectors. Therefore, the acquisition of certain advanced country-level and firm-level resources (including financial resources, technological and managerial capabilities) from foreign sources is often crucial at this stage. Furthermore, foreign companies from later development stages are usually the suitable candidates for providing the necessary financial resources, technological and managerial assistance to build up the local production facilities. This means that inward international business activities (either inward direct investments or collaborative agreements) from more developed economies that involve setting up local production facilities in the host economy (either efficient-seeking or resource-seeking type) may have significant impacts during this period. On the other hand, due to the low-income level of host economies at early stage of development, the size of domestic market for less CA sectors is limited too. Hence, at this stage, the main purpose for inward IBAs is not to sell finished goods (namely, market-seeking type) to host economies, but to reduce the production costs and sell the outputs back to home economy or to other countries.

After early stage of economic development, however, the influence from inward international business activities might gradually change. Due to the fact that the technologies used by less CA sectors are generally less sophisticated and relatively stable, the transfer of technology from foreign investing firms is often easier to take place. Local partners of foreign investing companies may gradually pick up the technological and managerial capabilities for value activities after they worked with their foreign partners for some time. Also, local employees of foreign companies may also help to dissipate the technological and managerial capabilities possessed by foreign firms after they started up their own businesses or worked for other indigenous firms. Moreover, indigenous firms in less CA sectors may also emerge as financial capitals are gradually accumulated in the economy and opportunities from exports become more and more appealing. Therefore, after a certain period of time, more and more indigenous firms may enter less CA sectors and set up their own production facilities for performing value activities that require less advanced firm-level resources. Also, some of these firms might be able to perform manufacturing activities on their own, and even upgrade their technological capabilities without too much help from foreign companies. Hence, after early stage, indigenous firms may gradually become competitors of foreign companies in less advanced products. To avoid competition and save costs, foreign companies may gradually change into buyers of lower value added products and/or shift their subsidiary's major focus from lower value added segments to higher value added segments, or even reduce the scale of their operations in the host economy. Furthermore, as indigenous firms have increasingly improved their firm-level resources, the possible assistance from inward IBAs might also turn to be more related to upgrading indigenous firms' product and process technology, if possible. Consequently, after early stage of economic development, inward

IBAs may still have positive impact upon host country's less CA sectors, although the focus of foreign firms may turn to more advanced segments and their impact to host may become less significant compared to that in startup stage. On the other hand, after indigenous firms already accumulate some financial resources, they may also be capable of taking certain strategic actions to enhance their performance. Rather than solely count on foreign buyers or local market for selling their products, indigenous firms may also make market-seeking type of outward IBAs to increase their sales volume.

As the economy gradually transforms its major economic sectors from primary sectors to less CA sectors, the availability of some of its country-level resources needed by less CA sectors may change after certain period of time as well. Above all, the expansion of less CA sectors would normally lead to the rise of average personal income which, in turn, will lead to the rise of labor cost and, then, L disadvantages in unskilled labor force which is critical to the manufacturing value activities of many less CA sectors. As a result, labor-intensive type of value activities may become less and less cost-effective in the economy. This situation may particularly threaten the competitiveness of lower value added products that normally involve more labor-intensive value activities along their value chain. Hence, as the economy keeps moving away from primary sectors to less CA sectors and CA sectors, performing labor-intensive value activities in the economy would become more and more costly. As a result, indigenous firms and foreign investors that highly depend upon low-cost labors in their value activities would gradually turn to other countries for transplanting their labor-intensive value activities. Only firms that rely less upon low-cost labor as their major competitive advantages may continue their operations in the economy. In other words, as the economy gradually loses its L advantages in cheap unskilled labor force, it also forces less CA sectors to

migrate from low value added segments to higher value added segments which count more on advanced country-level and firm-level resources. Hence, for foreign firms that still decide to do inward IBAs in the economy at this stage, their focus would normally be those higher value added products that demand more sophisticated product and process technology, or new methods to perform value activities that require less unskilled labor. Also, due to the rise of personal income in the economy, there might be market-seeking type of inward IBAs, the purpose of which is to sell higher value added products to the economy with growing purchasing power. Accordingly, their assistance to indigenous firms of less CA sectors will change to transferring firm-level resources related to higher value added products or less labor-intensive value activities. Nevertheless, as indigenous firms accumulate more and more firm-level resources, and the competition between foreign firms and indigenous firms become more and more intense, the transfer of firm-level resources from inward IBAs will tend to be more and more restricted. Therefore, although inward IBAs may still provide assistance to the performance and the efficiency of less CA sectors, the impacts could tend to be less and less significant over time.

On the other hand, the change of L advantage in low-cost labor force would also induce outward IBAs by indigenous firms that still rely low-cost labor as their major competitive strength. In order to remain competitive in labor-intensive products, these firms will do resource-seeking outward IBAs or efficiency-seeking outward IBAs to replace the costly operations at home. Hence, it may reduce home economy's production and/or exports of labor-intensive products. However, the profits acquired from low value-added products produced elsewhere could also help to upgrade the products produced at home. This could benefit the performance and the efficiency of primary sectors after a period of time. Other than resource-seeking type of outward IBAs,

there might be asset-seeking type of outward IBAs as well to migrate products from lower value added products to higher value added products. Again, due to the increasingly intense competition between indigenous firms and foreign firms, the assistance from asset-seeking type of outward IBAs may also tend to be less and less significant. Also, indigenous firms may still make market-seeking outward IBAs to further increase their sales volume for supporting their product and process upgrading efforts at home. Hence, based upon the above discussion, we may expect that outward IBAs of less CA sectors may still have positive association with the performance and the efficiency of less CA sectors. However, like inward IBAs of less CA sectors, the impacts may tend to be less and less significant over time.

As a summary, the L advantages of country-level natural resources are not so much critical for less CA sectors as for primary sectors. Even if there are L advantages in related country-level natural resources, without certain firm-level resources (technological and managerial capabilities, in particular), firms of less CA sectors still can't perform their value activities successfully. When an economy tries to transform its major sectors from primary sectors to less CA sectors, a lot of its indigenous firms may still lack of the firm-level resources necessary for the value activities of less CA sectors, since these resources are not likely to accumulate properly from the value activities of primary sectors. Thus, the help from inward international business activities (either resource-seeking or efficiency-seeking type) may be most significant at early stage of economic development. After this stage, however, the impact from inward IBAs might change as a result of the changes in country-level resources and firm-level resources. First, as less CA sectors continue their growth in the economy, indigenous firms may begin to accumulate the firm-level resources for lower value added products and even higher value added products. Secondly, the

growth of less CA sectors will also lead to the rise of personal income level as well as the rise of labor cost. Hence, the investing motives for inward international business activities may change to buying lower value added products from indigenous firms, or to produce higher value added products locally as well. In turn, their impacts may tend to adjust to transferring more advanced firm-level resources to indigenous firms for higher value added products. However, as indigenous firms may become more and more competent, the transfer of advanced firm-level resources might become more and more restricted. Consequently, the impacts from inward IBAs may tend to be less and less significant. On the other hand, if personal income level keeps improving as economy grows well, there might be market-seeking type of inward IBAs aimed at selling higher value added products to the economy. As to outward IBAs, after indigenous firms have accumulated their firm-level resources to some extent, they may make resource-seeking or efficiency-seeking outward IBAs to circumvent the influence from L disadvantages in country-level resources. Also, there might be market-seeking outward IBAs for selling products that are more competitive in the international markets. This could benefit the performance of less CA sectors to some extent. Therefore, based upon the above discussion, we can propose the following hypotheses:

H2a: *For less CA sectors, their performance may positively associate with inward international business activities during the early stage of economic development.*

H2b: *For less CA sectors, their efficiency may positively associate with inward international business activities during the early stage of economic development.*

H2c: *For less CA sectors, their perforamnce may not associate with outward international business activities during the early stage of economic development.*

H2d: *For less CA sectors, their efficiency may not associate with outward international business activities during the early stage of economic development.*

H2e: *For less CA sectors, their performance may positively associate with inward and outward international business activities after the early stage of economic development, but the causal relationship may be less significant compared to that in early stage.*

H2f: *For less CA sectors, their efficiency may positively associate with inward and outward international business activities after the early stage of economic development, but the causal relationship may be less significant compared to that in early stage.*

The above hypotheses regarding the impacts of international business activities upon the development of less CA sectors can be represented by the following equations:

$$PLCAS = f(IIBALCAS, OIBALCAS)$$
$$ELCAS = f(IIBALCAS, OIBALCAS)$$

Where *PLCAS* = performance of less CA sectors, *ELCAS* = efficiency of less CA sectors, *IIBALCAS* = inward IBAs of less CA sectors, and *OIBALCAS* = outward IBAs of less CA sectors.

Created-Asset Intensive Sectors. For CA sectors, country-level natural resources is even less important compared to less CA sectors. Due to the technology-intensive nature of CA sectors, their performance considerably relies upon the availability and the quality of country-level created assets and advanced firm-level resources. Along the value chains of CA sectors, although certain value

activities may still require the use of unskilled or semi-skilled labor force (for example, the assembly operations for finished products), the value created by these value activities could account for only minor portion of the total value. Most value is created from the core components of the products of which product technology and process technology normally involve sophisticated knowledge. This sophisticated knowledge is usually the basis for firm's competitive advantages in CA sectors. Hence, when CA sectors first arise in an economy that is still in its early stage of economic development, the indigenous firms of the economy normally do not possess the capabilities for creating the product technology and process technology used in the core components. As a result, they generally start from segments of which value activities can best exploit the economy's advantageous country-level natural assets, and firm-level resources already possessed by indigenous firms, while at the same time, count on foreign firms to provide core components for less technology-intensive value activities. Therefore, during the early stage of Taiwan's economic development, inward IBAs will normally provide a lot of helps to the growth of CA sectors. As to outward IBAs of CA sectors, because there is not enough firm-level resources to support the operations of outward IBAs at this stage, there should not be too much assistance from outward IBAs.

On the other hand, during the early stage of CA sectors, inward IBAs from foreign firms are most likely to be resource-seeking or efficiency-seeking type. The main investment motive for these inward IBAs is to utilize the economy's advantageous country-level resources and firm-level resources for part of their value chain. Through these inward IBAs, however, there might also be technology transfer from foreign firms to indigenous firms. Just as the case for less CA sectors, the technology transfer might be realized via the cooperation (either alliances or joint ventures) between indigenous firms and foreign firms, or

local employees who work in subsidiaries of foreign firms. As a result, the indigenous firms may gradually accumulate their firm-level resources, and be capable of performing more and more complicated value activities that are far beyond pure assembly operations. After certain point of time, indigenous may eventually start manufacturing simpler products solely on their own, and compete with foreign firms in lower value added products. This development, as in less CA sectors, then, may force foreign firms become purchasers of low value added products, and further upgrade their product lines produced in the host economy. Moreover, due to the continuous accumulation of firm-level resources, indigenous firms may also be capable of making outward IBAs.

Nevertheless, due to the technology-intensive nature of CA sectors, the firm-level resources (technological capabilities, in particular) required for higher value added products normally innovate constantly. Therefore, to produce most advanced products, the indigenous firms may still need assistance from foreign companies of more developed economies. Unless indigenous firms already possess the advanced firm-level resources for product design and process technology, they will need to keep close cooperation with their foreign partners to acquire more advanced firm-level resources for product and process upgrading. This is especially true for sectors that have high product innovation rate, and involve sophisticated process and product technologies. Other than that, if, as we mentioned before, the R&D activities for these sectors/segments involve high risk, large investments and/or complicated technological interdependence, then the cooperation between indigenous firms and foreign firms from more developed economies will continue to be crucial for technological advance. The cooperation may be carried out through either outward or inward international business activities of asset-seeking type. Aside from the above scenarios, when the economy is no longer a good location for

performing certain value activities or producing products for certain segments (such as those mostly count on unskilled-labor for production process), resource-seeking or efficiency-seeking type of outward IBAs will normally be the choice to continue these disadvantageous business operations. This tells us that, for countries (particularly developing countries) that strive to establish their CA sectors, the assistance from inward international business activities may be consistently crucial ever since the economies start building up their strengths in CA sectors. As to outward international business activities, the assistance may become evident after the early stage of economic development. Therefore, based upon the above discussion, we may propose the following hypotheses:

H3a: *For created asset intensive sectors, their performance may positively associate with inward international business activities for all stages of economic development.*

H3b: *For created asset intensive sectors, their efficiency may positively associate with inward international business activities for all stages of economic development.*

H3c: *For created asset intensive sectors, their performance may not associate with outward international business activities during the early stage of economic development.*

H3d: *For created asset intensive sectors, their efficiency may not associate with outward international business activities during the early stage of economic development.*

H3e: *For created asset intensive sectors, their performance may positively associate with outward international business activities after the early stage of economic development.*

H3f: *For created asset intensive sectors, their efficiency may positively associate with outward international business activities after the early stage of economic development.*

The above hypotheses regarding the impacts of international business activities upon the development of CA sectors can be represented by the following equations:

$$PCAS = f(IIBACAS, OIBACAS)$$
$$ECAS = f(IIBACAS, OIBACAS)$$

Where *PCAS* = performance of CA sectors, *ECAS* = efficiency of CA sectors, *IIBACAS* = inward IBAs of CA sectors, and *OIBACAS* = outward IBAs of CA sectors.

3.3.2. The Relationship between Economic Structure and International Business Activities

From last section, we already saw how international business activities may have impacts upon the development of different group of economic sectors. Based upon these impacts, international business activities may also affect the changing importance of different group of economic sectors to the whole economy over time. This is crucial for the "what to produce" aspect of the economy's structural adjustment. In this section, we will examine how international business activities will affect an economy's transition from primary sectors to less CA sectors, and from less CA sectors to CA sectors.

Transformation from Primary Sectors to Less CA sectors. When an economy gradually transforms from primary sectors to less CA sectors, we may see that the growth of primary sectors begins to decline as transition continues, and less CA sectors begin to grow steadily at the same time. Hence, during this transition stage, we could expect that the performance of less CA sectors would grow much faster than the performance of primary sectors. In other words, if we use the same measurement for performance of economic sector, the value of this measurement for less CA sectors would become larger and larger, while the

value of the same measurement for primary sectors will grow slower or even decline. Hence, the ratio of this performance measurement for less CA sectors to that for primary sectors should become larger and larger.

As we contended earlier, for economies with only limited country-level natural resources, their inward IBAs of primary sectors may negatively associate with the performance of primary sectors after early stage of economic development. Also, their outward IBAs of primary sectors may have negative or insignificant association with the performance of primary sectors. It's therefore reasonable for us to predict that, the change of performance of primary sectors should have negative association with inward IBAs, and have negative or insignificant association with outward IBAs of primary sectors. Hence, in turn, we may expect that inward IBAs of primary sectors will positively associate with the economy's transition from primary sectors to less CA sectors, and outward IBAs of primary sectors will positively or insignificantly associate with the economy's transition from primary sectors to less CA sectors. As for less CA sectors, again, based on the discussion we made in last section, we know that, during the early stage of their development, the performance of less CA sectors will have significant and positive association with inward IBAs, yet insignificant association with outward IBAs. After early stage, both inward and outward IBAs might have positive association with the performance of less CA sectors. Nevertheless, the impact may tend to be less and less significant (or even insignificant at certain point of time) compared to the impacts from inward IBAs at early stage. Therefore, we may propose the following hypotheses:

H4a: *For economies that only have limited natural resources, their transition from primary sectors to less CA sectors will positively associate with inward international business activities of primary sectors.*

H4b: *For economies that only have limited natural resources, their transition from primary sectors to less CA sectors will positively or insignificantly associate with outward international business activities of primary sectors.*

H4c: *For economies that only have limited natural resources, their transition from primary sectors to less CA sectors will positively associate with inward international business activities of less CA sectors.*

H4d: *For economies that only have limited natural resources, their transition from primary sectors to less CA sectors will be positively or insignificantly associated with outward international business activities of less CA sectors.*

The above hypotheses regarding the impacts of international business activities upon the structural adjustment from primary sectors to less CA sectors can be represented by the following equation:

$$SAPRLCA = f(IIBAPS, OIBAPS, IIBALCAS, OIBALCAS)$$

Where *SAPRLCA* = measurement for structural adjustment from primary sectors to less CA sectors, *IIBAPS* = inward IBAs of primary sectors, and *OIBAPS* = outward IBAs of primary sectors, *IIBALCAS* = inward IBAs of less CA sectors, and *OIBALCAS* = outward IBAs of less CA sectors.

Transformation from less CA sectors to CA sectors. When an economy gradually transforms from less CA sectors to CA sectors, it also implies that the growth of less CA sectors begin to decline as transition proceeds and CA sectors begin to grow steadily. Therefore, just as the case for transition from primary sectors to less CA sectors, during the transformation process, the performance measurement for CA sectors should become larger and larger, while the same performance measurement for less CA sectors would become stagnant or even decline.

Again, based on the discussion we make earlier, we know that, during the later development stages of less CA sectors, both its inward and outward IBAs might still have positive association with the performance of less CA sectors. Nevertheless, the impact may tend to be less and less significant. Hence, we may predict that inward and outward IBAs of less CA sectors may have negative association with the economy's transition from less CA sectors to CA sectors, and this association may tend to be less and less significant or even insignificant at certain point of time. For CA sectors, both inward and outward IBAs may have significant and positive association with their performance for all stages. Hence, we may predict that inward and outward IBAs of CA sectors may have positive and significant association with the economy's transition from less CA sectors to CA sectors. Hence, we may propose the following hypotheses:

H5a: *For economies that transform from less CA sectors to CA sectors, the transition will negatively associate with inward international business activities of less CA sectors.*

H5b: *For economies that transform from less CA sectors to CA sectors, the transition will negatively associate with outward international business activities of less CA sectors.*

H5c: *For economies that transform from less CA sectors to CA sectors, the transition will positively association with inward international business activities of CA sectors.*

H5d: *For economies that transform from less CA sectors to CA sectors, the transition will positively association with outward international business activities of CA sectors.*

The above hypotheses regarding the impacts of international business activities upon the structural adjustment from primary sectors to less CA sectors can be represented by the following equation:

$SALCACA = f(IIBALCAS, OIBALCAS, IIBACAS, OIBACAS)$

Where *SALCACA* = measurement for structural adjustment from less CA sectors to CA sectors, *IIBALCAS* = inward IBAs of less CA sectors, and *OIBALCAS* = outward IBAs of less CA sectors, *IIBACAS* = inward IBAs of CA sectors, and *OIBACAS* = outward IBAs of CA sectors.

3.4. The Assistance from Developed Countries through International Business Activities and Sectoral Development of CA sectors

It is quite often that the resources and capabilities resided in one country would complement those resided in another country. This complement would be rather noticeable between less developed countries and developed countries. As we mentioned earlier in section 3.2, the MNEs from countries of later development stages usually possess more advanced firm-level resources that are needed by countries in earlier development stages for upgrading their economic activities. Therefore, for most developing countries, if they possess adequate L advantages to attract inward international business activities from more developed countries, these inward IBAs would normally become the major channel for transferring relatively advanced firm-level resources and capabilities to developing countries. Based on these firm-level resources, indigenous firms of developing countries can thus facilitate their own competitiveness and the growth of whole economic sector. This benefit is most obvious for the startups and continuous growth of CA sectors in developing countries. For developing countries, they normally begin their economic development from primary sectors or less CA sectors. Hence, when they tend to build up CA sectors in their economy, they often do not possess the core firm-level resources for CA sectors. As a result, they basically count on MNEs from developed countries to provide them more advanced firm-level resources for building up CA sectors. Therefore,

for developing countries, if they possess adequate L advantages to attract inward international business activities, the inward international business activities from more developed countries will frequently have positive association with the performance of their CA sectors during the startup stage. Moreover, as the performance of CA sectors is enhanced, the importance of CA sectors to the whole economy may also improve accordingly. Hence, during the startup stage of CA sectors, inward international business activities from more developed countries will also have positive association with the importance of CA sectors.

The importance of inward IBAs from developed countries will continue to be significant even after the CA sectors are well-established in developing countries. Due to the technology-intensive nature of CA sectors, more advanced product and process technologies are needed for upgrading existing products and operations of indigenous firms. In addition, due to the increasing technological complexity and the need for sharing financial investments and risks, cross-border R&D cooperation between indigenous firms and MNEs from developed countries may also become more and more popular even after indigenous firms already possess the advanced firm-level resources for CA sectors. This kind of inter-firm cooperation can be realized either through inward IBAs from developed countries or outward IBAs to developed countries. Therefore, for developing countries, we may have the following hypothesis:

H6a: *For CA sectors of developing countries, their performance positively associate with inward international business activities from developed countries for all stages of development.*

H6b: *For CA sectors of developing countries, their efficiency will positively associate with inward international business activities from developed countries for all stages of development.*

In addition to acquiring advanced firm-level resources through inward international business activities from developed countries, the indigenous firms of developing countries may also obtain advanced firm-level resources from developed countries through outward international business activities. This type of outward international business activities will normally occur after the early stage of CA sectors (due to limitation of firm-level resources at early stage for outward IBAs), and is often strategic asset seeking type of which purpose is to acquire advanced firm-level resources from foreign firms or organizations. It may involve buyouts of existing firms in developed countries so that investing firms may exert direct control over the resources or capabilities owned by the acquired firms. Or, the investing firms could hire local experts, technicians or researchers in developed countries for developing the advanced firm-level resources needed for front-line products. Another approach could be collaborative alliance in developed countries to acquire advanced firm-level resources through alliance operations or foreign partners. Through these various approaches, indigenous firms may gradually accumulate advanced firm-level resources that will, in turn, strengthen their product technology and process technology. Consequently, the performance of CA sectors will be enhanced, and the importance of CA sectors will increase as well. Based on the above discussion, we may have the following hypotheses:

H7a: *For CA sectors of an economy, their performance will not associate with outward international business activities to developed countries at early stage, but will positively associate with outward international business activities to developed countries after startup stage.*

H7b: *For CA sectors of an economy, their efficiency will not associate with outward international business activities to developed countries at early*

stage, but will positively associate with outward international business activities to developed countries after startup stage.

The above hypotheses regarding the impacts of international business activities from developed countries upon the performance and the efficiency of CA sectors can be represented by the following equations:

$$PCAS = f(IIBADC, OIBADC)$$
$$ECAS = f(IIBADC, OIBADC)$$

Where *PCAS* = performance of CA sectors, *ECAS* = efficiency of CA sectors, *IIBADC* = inward IBAs from developed countries, and *OIBADC* = outward IBAs to developed countries.

3.5. Factors Affecting the Contributions of International Business Activities to Structural Adjustment

It is clear, from previous discussions, that a country may acquire a variety of helps from international business activities to facilitate its industrial structural adjustment. This may be good news for many developing countries that are eager to accomplish industrialization in their country. However, because of the influence from other factors, even there is resource complement between foreign firms and indigenous firms, international business activities may still fail to benefit the accomplishment of industrial structural adjustment.

This possible outcome is already revealed by the results of some previous research. In the early work by Bornschier (1980), he tested the relationship between foreign investment and economic growth in some developing countries, and found that while the flow of inward investment was positively associated with economic growth, there was a negative relationship between the degree of foreign participation (measured by the stock of capital controlled by MNEs to total capital stock) and economic growth. In another study by O'Hearn (1990), he

did a longitudinal study of Ireland and also confirmed the same results. Nevertheless, O'Hearn argued that one of the reasons for these results was the inability of domestic firms to respond to the rigors of the free market that often accompanied the opening of a country's border to inbound MNE activity. This controversy is also revealed in a recent UNCTC project (Dunning, 1993). Its preliminary result show that in Korea, Taiwan and Singapore, FDI has promoted exports and growth, while in Mexico, Malaysia and Thailand, export-led growth appears to have prompted FDI.

These inconsistent results indicate that international business activities alone can not determine the direction of a country's economic development. There are some other factors that may affect the impacts from international business activities. From "Dunning-Porter framework", it is clear that there are two other factors critical to the impacts from international business activities: government and chance.

For the influence from "government", it is mostly related to government's role in shaping the characteristics of the economy's macro environment. As Dunning (1993a) has noted, the consequences of MNE activity on the economic welfare of a particular country will vary according to this country's configuration of ESP characteristics. The ESP characteristics, according to Koopman and Montias (1971), refer to economic environment (E), economic systems (S) and government policies (P). Here environment encompasses the resources and capabilities, including a wide range of intangible assets to a particular country, as well as the ability of its enterprises to use these to service domestic or foreign markets. Systems mean the macro-organizational mechanism within which the allocation of these resources and capabilities is decided. Policies means the strategic objectives of governments and the macro or

micro measures taken by them, or related institutions, to implement and advance these objectives, within the system and environment of which they are part.

By considering the influence from recipient country's ESP characteristics, Dunning further contends that, from a dynamic viewpoint, two factors are most important to the likely impact of MNEs; namely, the macro-organizational policies and development strategies pursued by recipient country, and the structure of the diamond of competitive advantages identified by Porter. The macro-organizational policies will affect the structure of the diamond of competitive advantage and, through the diamond, affect the asset accumulation of particular firms or sectors. In turn, they influence indigenous firms' competitive advantages and hence, the accomplishment of industrial structural adjustment.

It is, therefore, not difficult to understand that the macro-organizational polices (P) and attitudes of a country towards international business activities may be of critical importance in determining what the consequences that international business activities may bring to this country's structural adjustment. In general, governments that pursue outward-looking and export-led (OL-EL) industrialization are likely to impose relatively few restrictions on inward investment or the activities of foreign-owned firms. Under such circumstance, international business activities will therefore, has more decisive impact upon the country's structural adjustment process. If, on the other hand, countries in question pursue or have pursued inward-looking and import-substituting policies (OL-IS), the authorities are prone to maintain close supervision over all forms of inward investment and the behavior over all foreign affiliates. Then, we can expect that international business activities in this kind of countries will only have limited influence over their structural adjustment. Hence, while we are trying to evaluate the possible impact that

international business activities may bring to a particular country's structural adjustment, we need to, at the same time, take into account what attitude the country in question have toward international business activities. This is important for our empirical studies since in IL-IS economies, the impact of international business activities could be quite dim. Therefore, even if international business activities did make some contributions to the economy, the effects may be too insignificant or be distorted by other factors so that we are unable to catch from the statistical data. To avoid this problem, it may be easier for us to examine the impact occurred in OL-EL economies, since in these economies, the international business activities are more likely to have decisive impact upon structural adjustment process. It follows that the effects from international business activities in these economies may be more adequately evaluated from the statistical data.

Another critical factor that may influence the impacts from IBAs is chance. According to Porter, chance events are occurrences that have little to do with circumstances in a nation and are often largely outside the power of firms and the national government to influence. The examples of chance events may include "major technological discontinuities, discontinuities in input costs (such as oil crisis), surges of world or regional demand, war or political decisions by foreign governments."

Basically, these chance events may have significant impacts upon the determinants of a nation's diamond. In turn, they will lead to the change of a country's competitive position. For example, the advent of computer electronics provided an opportunity for the rise of Taiwan's computer industry. The quotas placed on Hong Kong and Japan lead to the fast development of apparel industry in Taiwan.

In particular, due to certain chance events, there may be transformation of the quality and the availability of an economy's country-level resources and firm-level resources. Under such circumstance, the economy may begin its structural adjustment even without the assistance from international business activities.

CHAPTER 4

A HISTORICAL REVIEW OF TAIWAN'S ECONOMIC DEVELOPMENT AND INTERNATIONAL BUSINESS ACTIVITIES

The rapid growth and successful structural adjustment of Taiwan's economy demand explanations. Many studies have been done, ranging from those focusing on the role of the agricultural sector in the earlier stages of Taiwan's development (Lee, 1971) to much more comprehensive studies covering trade, industry, and labor through the mid-1970s (Galenson, 1979) and after (Kuo, 1983; Galenson, 1985; Lau, 1986). So far, however, there were only few studies (for example, Schive in 1990) aimed at analyzing the far-reaching effect of international business activities on Taiwan's economy. A thorough investigation of the role of international business activities in Taiwan's industrial structural adjustment is clearly warranted.

In order for analyzing the impacts on Taiwan's economic sectors from international business activities, we will first review the historical path of Taiwan's economic development over the past four decades. The review will focus on the evolution of Taiwan's economic structure and its international business activities. Then, based upon this analysis, we will examine the possible causal relationship between Taiwan's economic sectors and its international business activities.

4.1. An Overview of Taiwan's Economic Development

The economic transition process of Taiwan over the last fifty year can be characterized by the existence of six distinct sub-phases: the early economic development phase (before 1950s), the import-substitution phase (1950-1962), the early export-oriented phase (1962-1973), the late export-oriented phase (1974-1979), the economic transformation phase (1980-1987) and finally, the outward

investment and technology deepening phase (1987 till now). For the first four phases, natural assets played a major role in Taiwan's economic progress. The last two stages, on the other hand, relied heavily on the created assets accumulated from the previous phases and the helps from foreign MNEs.

4.1.1. The Early Economic Development Phase (before 1950s)

Before the Nationalist Party (or Kuomintang, KMT) took control of Taiwan in 1945, Taiwan was a colony of Japan since 1895. During this period, agriculture was the major contributor to Taiwan's economy (see Table 4.1.). The Japanese government made a lot of efforts to make Taiwan's existing farmers much more productive. In addition to improving Taiwan's agricultural system (for example, expanding the use of fertilizer and building up Taiwan's irrigation system), Japanese also made investments in infrastructure, such as railroads, which benefited the farm economy as well. Hence, due to these efforts, there was significant growth in agricultural production during this period. According to Clark (1989), during this period, agriculture accounted for approximately half of total production and two-thirds of employment (see Table 4.1), created a major source of capital to finance the development of other sectors, and produced a growing food surplus for sale and export.

The extraction of these agriculture surpluses was associated with expansion in industrialization. A range of Japanese-owned industries, including food processing, chemical, textiles, cement and petroleum refining, were also established in Taiwan through inward investments. Among these industries, food-processing industry (especially the sugar industry) was the dominant sector during this period (see Table 4.2.). Also, agricultural demand for fertilizer helped to stimulate the chemical industry as well, and in the 1930s, with World War II looming, the Japanese began moving some heavier industries to Taiwan.

Between 1912 and 1940, manufacturing grew at a healthy rate of around 6 percent per annum (Wade, 1990 p.74). At the same time, the trading sector also developed, as Taiwan was used by Japan as a center for processing raw materials imported from South East Asia which were then re-exported to Japan (Hobday, 1995 p.96).

Table 4.1. Agriculture's Share in Net Domestic Product (NDP), in Labor Force, and in Total Exports, 1911-1973

	1911-20	1921-30	1931-40	1947	1951-53	1964-67	1971-73
1. Share of agricultural NDP in total NDP	41.8	39.4	35.2	43.9	36.7	25.6	15.1
2. Share of agricultural labor force in total	72.9	70.2	66.3	—	50.0	42.0	30.0
3. Share of agricultural exports in total exports	—	—	—	—	90.9	45.8	17.1

Source: E. Thorbecke (1979), "Agricultural development", in W. Galenson (ed.), *Economic Growth and Structural Change in Taiwan*, chapter 2, p.134.

Based on the above analysis, we can see that most of the production created in Taiwan during this period was in natural resource-based sectors. However, due to Japanese inward investments at this stage, Taiwan gradually established the basis for industrialization. Moreover, since these Japanese-owned companies hired Taiwanese as technicians, low-level managers or middle-level managers, many Taiwanese gained experience in the technical professions and management. Later on, after Japan's defeat, these Taiwanese who served under the Japanese became important human resources for Taiwan's economic development.

Table 4.2. Major Industries in Taiwan during 1915-1939

	1915-19	1920-24	1925-29	1930-34	1935-39
1. Ind. Product. / Total Prod.	38.8%	41.2%	38.8%	43.3%	43.0%
2. Share of Ind. Production					
Food Processing	—	74.6%	70.3%	73.3%	69.4%
Chemicals	—	7.9%	9.3%	7.8%	9.9%
Machinery & Metals	—	4.0%	4.2%	4.8%	7.6%
Textiles	—	1.7%	1.5%	1.1%	1.5%

Source: George W. Barclay, *Colonial Development and Population in Taiwan* (Princeton, N.J.: Princeton University Press, 1954), p.38.

Another important policy that made important contribution to Taiwan's later development was Japanese efforts on building up Taiwan's educational system. By 1940, there were already almost 60 percent of children attended primary school. Further, Japanese established agriculturally oriented two-year secondary schools in most towns. Hence, by the mid-1940s, Taiwan had far more educated people than most of the provinces of China. These educated people played as propelling factor for the growth of Taiwan's economy after 1949.

4.1.2. The Import-Substitution Phase (1950-1962)

After KMT took control of Taiwan's economy after its defeat in 1949, the economic strategy of Taiwan in the 1950s was no longer limited to just reviving and stimulating the agricultural sector. Because of the end of the colonial relationship with Japan followed by the loss of mainland markets, Taiwan lost considerable profits from its agricultural exports and the opportunity to replace previously imported Japanese manufactures. Hence, the KMT government moved aggressively to promote "import substitution" in a variety of light consumers industries by sealing off the domestic market. Tariffs were

substantially raised, with average minimal rate doubling from about 20 percent in 1948 to over 40 percent in 1955. Effective tariff rates were estimated to be significantly higher than normal ones. Import quotas for specific goods, especially luxury items, were also implemented and expanded over the 1950s. Foreign exchange rates were manipulated to discourage imports and avoid high inflation rates (e.g., multiple exchange rates were introduced in April 1951 and the New Taiwan dollar, or NT$, was overvalued). As a result, nondurable consumer goods received the greatest protection under these various devices, while imports of plant equipment received the most favored treatment.

The import substitution was quite successful, at least in the short run. Most industrial goods were priced 50 percent or more above nominal import costs (Lin, 1973; p.51). This certainly provided a strong financial incentive to develop "infant industries." The import substitution program brought several impacts upon Taiwan's economic and industrial structure. First, it provided a primary stimulus for industrial expansion (see Table 4.3). According to Lin (1973), import substitution produced 91 percent of the increase in non-food manufacturing production between 1937 and 1954. Second, Taiwan was able to expand its industrial base from primarily food processing to other light industries (for example, textiles, bicycles, rubber and leather goods, chemicals, and wood products) and to the beginning of machinery and metals production in the 1950s (see Table 4.6).

Nevertheless, according to the research made by Kuo, Ranis and Fei (1981), during this phase, most of the island's industries remained concentrated in labor-intensive production, which was seemingly in line with Taiwan's comparative advantages at that time. In addition, the state maintained a strong hand over Taiwan's economic activity. Especially, the KMT government tightly controlled large-scale, complex technological fields and intermediate goods. State

enterprises dominated fuels, chemicals, mining and metalworking, fertilizer and food processing, textiles, and utilities. The government promoted these industries through direct intervention and financial support. During the 1950s, up to one half of Taiwan's industrial production took place in state-owned enterprises (Chaponniere and Fouquin, 1989 p.28). In steel, petrochemicals, shipbuilding and automobiles, state enterprises accounted for a large proportion of total investment through the 1960s (Wade, 1990 p.110). Moreover, the state had strong influence over the allocation of credit and foreign exchange.

Table 4.3. Indicators of Taiwan's Economic Structure and Performance during 1950s

Indicators	1952	1954	1956	1958	1960
Real GNP Growth %	12.1	9.6	5.5	6.6	6.5
GNP per capita (US$)	195	177	139	170	153
Real Industrial Growth %	—	5.8	3.5	8.6	14.1
Real Agri. Growth %	—	2.1	7.7	6.7	1.4
Ind. % NDP	18.0	22.2	22.4	23.9	24.9
Manuf. % NDP	10.9	14.5	14.5	15.5	16.8
Service % NDP	46.1	46.1	46.0	45.1	42.3
Agri. % NDP	35.9	31.7	31.6	31.0	32.8
Agri. % Employment	56.1	54.8	53.2	51.1	50.2
Export % GDP	8.6	5.8	8.6	8.7	9.6
Import % GDP	14.8	13.2	14.0	12.6	17.4
Trade Balance (mil. US$)	-71	-118	-76	-70	-133
% Industrial Exports.	8.1	10.6	17.0	14.0	32.3

Source: *Taiwan Statistical Data Book* (1987), Taipei, Taiwan: Council of Economic Planning and Development.

After enjoyed short-term success from import substitution strategy, by the end of the 1950s, the growth potential created by this strategy appeared to have been exhausted. Two major problems arose from this policy. First, the domestic market became saturated with Taiwan produced goods, and the economy began to slow down in late 1950s and early 1960s due to the inefficiency and monopoly created by protection. Second, because the successful import substitution in light

and consumer industries requires considerable importation of both capital goods and industrial raw materials, it created serious balance-of-trade and balance-of-payments problems.

As a result, the government decided to refocus its strategy towards promoting growth through the export of labor intensive goods.

4.1.3. The Early Export-Oriented Phase (1962-1973)

The government adopted several major policies in the late 1950s and early 1960s aimed at promoting exports, domestic investment and industrialization. Exchange rates were adjusted to more realistic levels (e.g., the dual exchange rates were abolished and the overvalued NT$ was depreciated), which made foreign trade and exporting more profitable. In addition, cheap credit and rebates on imported components and raw materials were made available to exporters; trade associations were formed to promote and subsidize exporting; and the establishment of export processing zones (EPZs) stimulated assembly work by low-cost Taiwan labor for export. Domestically, tax reform and decreased regulation encouraged private enterprises, and foreign investments were encouraged rather than restricted. At the same time, the protectionism trade system was substantially liberalized, since most export industries needed to import various components. Tariffs were also cut considerably, and other types of import restriction were reduced.

All these changes in policy have successfully stimulated the growth of private foreign investment, economic growth and the changes in economic structure during 1960s and 1970s. Private foreign investment, which had averaged less than 1 percent of gross domestic capital formation during the 1950s, rose to over 4 percent during 1960-1967 and to 9 percent at the beginning of the 1970s. In addition, over than half of the private foreign investments flowed

into sectors that require the use of created assets (see Table 4.4). These investments were crucial to the growth of Taiwan's created asset-intensive sectors during this period.

Table 4.4. Foreign Inward Investment by Manufacturing Sectors during 1960s and 1970s

	% of Total Foreign Inward Investment		% Foreign Inward Investment of All Investment	
Manufacturing Sectors	1962-69	1973-79	1962-69	1973-79
Electrical Machinery	33.6	44.5	18.9	33.6
Textiles	20.9	4.8	4.3	2.2
Chemicals	12.9	14.9	4.5	6.1
Machinery	6.8	8.7	11.6	22.3
Basic Metals	6.5	5.6	5.5	3.4
Footwear	5.5	1.3	5.1	8.0
Food Processing	4.7	2.1	1.5	2.9
Rubber & Petroleum	4.5	3.0	14.5	15.9
Nonmetallic Minerals	2.0	12.0	1.1	20.2
Paper	1.6	1.1	2.7	2.8
Wood	0.9	1.3	1.0	3.9
Leather	0.1	0.7	1.5	13.7
All Manufacturing Sectors	100	100	N/A	7.9

Source: Shirley W.Y. Kuo, Gustav Ranis and John C.H. Fei, 1981. *The Taiwan Success Story: Rapid Growth with Improved Distribution in the Republic of China* (Boulder, Colo.: Westview Press, pp. 32-33.

Also, the real GNP accelerated to a very high average of 11 percent annually during 1963-1973. This rapid growth resulted from a fundamental industrial transformation in the nature of Taiwan's economy. There was significant increase in manufacturing's share of total investment from 22 percent in the early 1960s to 33 percent in the early 1970s. Industrial production rose by 18 percent a year over the 1963-1973 period. As a result, manufacturing's share of net domestic product doubled from about 17 percent to 35 percent between the late 1950s and early 1970s. Conversely, agriculture ceased to be the dominant sector during the 1960s, as agriculture's proportions of national product and employment dropped from

about 29.2 percent to 14.1 percent and 49.7 percent to 33 percent, respectively, over the decade (See Table 4.5).

Table 4.5. Indicators of Taiwan's Economic Structure and Performance during 1960s and early 1970s

Indicators	1962	1964	1966	1968	1970	1972
Real GNP Growth %	7.9	12.3	9.0	9.1	11.3	13.3
GNP per capita (US$)	161	202	236	302	387	519
Real Industrial Growth %	7.9	21.2	15.6	22.3	20.1	21.2
Real Agri. Growth %	2.6	11.9	3.2	6.9	5.4	2.2
Ind. % NDP	25.7	28.9	28.8	32.5	34.7	40.4
Manuf. % NDP	17.0	20.9	20.3	24.1	26.4	32.4
Service % NDP	45.1	42.9	45.0	40.8	36.7	33.0
Agri. % NDP	29.2	28.2	26.2	22.1	17.9	14.1
Agri. % Employment	49.7	49.5	45.0	40.8	36.7	33.0
Export % GDP	11.4	17.1	17.1	18.7	26.3	38.0
Import % GDP	15.9	16.9	19.9	21.5	27.1	32.1
Trade Balance (mil. US$)	-86	5	-86	-114	-43	474
% Industrial Exports.	50.5	42.5	55.1	68.4	78.6	83.3

Source: *Taiwan Statistical Data Book* (1987), Taipei, Taiwan: Council of Economic Planning and Development.

The changes in the nature of Taiwan's industry also revealed in the following two ways. First, the country began to produce a wider range of manufactured goods that became increasingly sophisticated over time. The food-processing industry rapidly lost its dominant position during the 1960s as its share declined from 32 percent in 1960 to 17 percent in 1970 and 8.5 percent in 1979. In contrast, chemicals, metal products, and machinery scored the largest gains, while the textile industry remained fairly stable. Thus, the dominant industries progressed from food products to textile, electronics assembly, machinery & metals and chemicals over the 1950s and 1960s (See Table 4.6). Second, Taiwan's export mix became overwhelmingly industrial, proving that its manufactured products were more internationally competitive. In 1958, industrial products composed of only 14 percent of the Taiwan's exports. Then,

their share in total exports jumped to 50.5 percent in 1962, 68.4 percent in 1968, and 83.3 percent in 1972 (see Table 4.5). The nature of industrial exports also changed in line with the advance of Taiwan's leading industries from food processing to textiles to electronics, heavy chemicals, and machinery. For instance, between 1960 and 1970 processed agricultural products fell from 56 percent to 13 of total exports (sugar alone declined from 44 percent to 5 percent), whereas textiles grew from 14 percent to 32 percent, electronics goods from 0.5 percent to 12 percent, and machinery and metal products from 4 to 10 percent.

Table 4.6. The Change of Taiwan's Manufacturing Production (in percentage of total manufacturing output) from 1950s to 1970s

Major Manufacturing Sectors	1951	1960	1970	1979
Food, Beverages, Tobacco	33.4	31.8	16.5	8.5
Textile & Apparel	19.0	16.1	18.1	15.5
Chemicals	15.6	6.6	12.2	11.4
Wood & Furniture	4.2	5.2	4.7	4.5
Paper & Printing	7.5	8.5	4.9	5.2
Petroleum & Coal	3.7	5.4	9.1	4.5
Basic Metals	0.4	4.1	2.5	7.5
Electronics	0.7	2.1	10.7	12.6
Other Machine & Metals	4.5	9.2	10.7	13.5

Source: Gary S. Fields, 1985, "Industrialization and Employment in Hong Kong, Korea, Singapore, and Taiwan," in Walter Galenson, ed., *Foreign Trade and Investment: Economic Development in the Newly Industrializing Asian Countries*, Madison: University of Wisconsin Press, p.363.

Despite of the rapid growth in manufacturing sectors during this period, it is also worthy of notice that many products exported from these sectors were essentially labor-intensive. It implies that the niche for Taiwan's major economic sectors during 1960s and 1970s were largely based on a comparative advantage in low-cost labor force that was comparatively well educated and skilled. However, at the same time, small and medium industry in Taiwan did become

more capital-intensive over the 1960s as domestic entrepreneurs significantly upgraded their production techniques.

As a summary, during 1960s and early 1970s, the export-oriented policy adopted by Taiwanese government made Taiwan become internationally competitive in the production of labor-intensive manufactures based on a low-cost labor force. This strategy turned out to be very successful. Exports rose and pulled the economy to extremely high growth without significant inflation. Rapid growth, however, tightened Taiwan's labor market and led to rising wages. These, in turn, suggested that this strategy would eventually face some long-term constraints because Taiwan was gradually pricing itself out of the low-cost labor niche in the international economy.

4.1.4. The Late Export-Oriented Phase (1974-1980)

In 1973, Taiwan, as the economies of most other countries, was severely affected by the oil crisis. The large increase in oil price created massive inflationary pressures. Both wholesale and consumer prices, which had increased by fewer than 5 percent a year for the preceding decade, leaped to almost 30 percent average to 50 percent range. The global and domestic inflation put an immediate impact on Taiwan's export performance, which had been outstanding in the early 1970s. First, the global economic crisis was quickly transferred to Taiwan's externally oriented and dependent economy. Exports declined in real terms by over 6 percent per year in 1974-1975, as the proportion of GNP being exported fell from 42 percent to 35 percent between 1973 and 1975. Furthermore, real foreign investment, which had averaged increases of 20 percent per year over the previous decade, fell precipitously by 40 percent annually in these two years, dropping from 8 percent to 2.5 percent of total investment. Second, due the considerable rise in oil prices, the import bill of Taiwan on energy rose

significantly by 38 percent in real terms in 1974, creating a trade deficit of $1.3 billion (compared with a surplus of $0.7 billion in 1973) that equaled almost a quarter of total exports.

Poor performance in foreign trade, in turn, had a major adverse impact on the domestic economy because of Taiwan's highly trade-dependent economy (See Table 4.7). Real industrial production fell by 4.5 percent in 1974; Taiwan's GNP growth dropped to a minuscule 1.1 percent in 1975 after the effects of inflation were controlled. Industry was particularly hard hit as manufacturing's share of net domestic product dropped from 36 percent in 1973 to 29 percent just two years later. In terms of the commodity composition of exports, Taiwan's export decline in 1974-1975 was most obvious both in the traditional textile, clothing, and footwear industries and in the emerging electronics sector, indicating special problems in labor-intensive production. Heavy industries, such as iron and steel and industrial machinery, on the other hand, were not affected (but were still not major sectors for exports at that time).

This externally induced economic crisis produced a strong challenge to Taiwan. The government, thus, used various policy tools to control the adverse impact. First, the government applied conservative fiscal measures to counter inflation; second, the government managed inflationary pressures and psychology through a one-time major price increase. Third, the government tried to stimulate the economy by greatly increased public investments, mostly by state-owned enterprises. State investment, which had grown by 10 percent annually in 1972-1973, was increased by 50 percent in real terms to offset drops in foreign investment and growing pressure on the private sector. A lot of state investments went to building up heavy industry and infrastructure through government's "Ten Major Development Projects". This policy action helped the structural transformation away from labor-intensive industries and prepared

Taiwan the necessary created assets for the emergence of new major sectors that are more technology-intensive and/or capital-intensive.

Table 4.7. Indicators of Taiwan's Economic Structure and Performance during 1970s

Indicators	1973	1974	1975	1976	1977	1978	1979
Real GNP Growth %	12.8	1.1	4.3	13.9	10.1	13.9	8.5
GNP per capita (US$)	695	913	956	1122	1288	1628	1895
Real Industrial Growth %	16.2	-4.5	9.5	23.3	13.3	22.5	6.4
Real Agri. Growth %	2.7	1.9	-1.2	10.0	4.1	-1.8	5.2
Ind. % NDP	43.8	41.2	39.2	42.7	43.5	45.1	45.3
Manuf. % NDP	36.3	32.9	29.3	32.6	32.8	34.3	34.8
Service % NDP	42.1	44.3	45.9	43.9	44.0	43.7	44.4
Agri. % NDP	14.1	14.5	14.9	13.4	12.5	11.2	10.3
Agri. % Employment	30.5	30.9	30.4	29.0	26.7	24.9	21.5
Export % GDP	41.9	39.2	34.7	44.5	43.6	47.9	49.0
Import % GDP	35.6	48.7	39.0	41.5	39.7	41.8	45.1
Trade Balance (mil. US$)	691	-1321	-643	567	850	1660	1329
% Industrial Exports.	84.6	84.5	83.6	87.6	87.5	89.2	90.5

Source: *Taiwan Statistical Data Book* (1987), Taipei, Taiwan: Council of Economic Planning and Development.

The government's anti-inflation policies gradually produced positive impact on the nation's economy since 1976. Both the emergence of economic growth and the recovery of foreign trade were observed. Real GNP averaged 12 percent annual growth for the three-year period of 1976-1978. Manufacturing's share of net domestic product changed from 29 percent in 1975 to 34 percent in 1978, and the trade surplus grew to $1.7 billion in 1978, which amounted to 6 percent of GDP and 13 percent of exports. Inflation also remained under control, averaging fewer than 5 percent a year. At the same time, private domestic investment increased by 26 percent and foreign capital inflows by 13 percent as well.

In sum, the strong external economic shock resulting from the oil crisis had only a fleeting impact on Taiwan. This occurred partly because Taiwan already had created a strong and expanding economic base that was able to absorb the

shock. The government's quick response with a sophisticated and subtle program also played an important role during this phase.

4.1.5. The Economic Transformation Phase (1980 - 1987)

After the first oil crisis, Taiwan witnessed another round of rapid growth in the late 1970s. Nevertheless, the second oil price explosion of 1979-1980 brought this growth surge to an end. Real GNP, again, dropped from 14 percent in 1978 to 8.5 percent 1979 and 7 percent in 1980. Industrial output growth fell more sharply, from 22.5 percent in 1978 to 6.5 percent in 1979-1980 (see Table 4.7 and 4.8). However, in contrast to 1974-1975, exports continued to increase in real term (11 percent in 1979and 6 percent in 1980), and the country did not fall into trade deficit. Also, the savings and investment rates were not affected by this impact, showing that it was not so severe as that of the mid-1970s.

In order to control the possible adverse impact from the second oil crisis, the government, learning from previous experience, implemented similar strategy as described in last section to stimulate economic growth. The policies used by government during this period had almost immediate effects. Inflation almost completely disappeared by 1982; large and rapidly increasing trade balances appeared again in 1981 (see Table 4.8).

Nevertheless, unlike the first crisis, taming inflation and running a trade surplus did not lead to the rapid recovery of Taiwan's economy. In fact, Taiwan's economic performance continued to deteriorate during 1981-1982. As shown in Table 4.8, the growth rate of real GNP continued to decelerate to 5.7 percent in 1981 and 3.3 percent in 1982; the decline was even more marked in real industrial growth, which actually declined by 0.6 percent in 1982. The growth of exports in real terms also dropped from 6 percent in 1980 to 1 percent in 1982.

Table 4.8. Indicators of Taiwan's Economic Structure and Performance during 1980s

Indicators	1980	1981	1982	1983	1984	1985	1986
Real GNP Growth %	7.1	5.7	3.3	7.9	10.5	5.1	10.8
GNP per capita (US$)	2311	2548	2540	2748	3048	3143	3748
Real Industrial Growth %	6.8	3.5	-0.6	14.1	12.2	1.4	14.9
Real Agri. Growth %	0.0	-0.7	1.0	1.6	1.9	2.0	-1.6
Ind. % NDP	45.0	44.6	43.0	43.7	45.4	45.2	47.3
Manuf. % NDP	34.2	33.9	33.4	34.0	36.2	36.0	39.0
Service % NDP	45.8	46.7	47.8	47.5	47.0	47.9	46.1
Agri. % NDP	9.2	8.7	9.2	8.8	7.6	6.9	6.6
Agri. % Employment	19.5	18.8	18.9	18.6	17.6	17.5	17.0
Export % GDP	48.5	47.7	46.5	49.2	52.9	51.0	54.9
Import % GDP	48.5	44.8	39.6	39.8	38.2	33.4	33.4
Trade Balance (mil. US$)	78	1411	3316	4836	8497	10621	15624
% Industrial Exports.	90.8	92.2	92.4	93.1	93.9	93.8	93.5

Source: *Taiwan Statistical Data Book* (1987), Taipei, Taiwan: Council of Economic Planning and Development.

The reason for this continued download was largely related to the global recession and stagflation of the early 1980s, in contrast with the first and more severe oil crisis. This situation caused contraction of world markets, and in turn, strongly limited Taiwan's ability to use the taming of inflation as a mechanism for boosting exports through enhanced international competitiveness. Moreover, Taiwan's economic expansion had become increasingly dependent on growing export markets. Hence, poor export performance hindered economic recovery.

The economic recovery that began in the United States in mid-1983 opened the way for another period of rapid growth based on expanding export production. Real exports leaped by 14 percent in 1983 and jumped to 25 percent a year during 1986-1987. The success in exports led to significant amount of trade surplus from $1.4 billion in 1981 to $19.2 billion in 1987.

GNP and industrial production grew substantially too. GNP grew by 9 percent a year during 1983-1984 to 11 percent during 1986-1987. Real industrial product grew even faster than GNP, as it averaged 13 percent annually for 1983-

1984 and 1986-1987, indicating the increasingly industrial nature of Taiwan's economy.

One important development during this phase is about government's decision to transform Taiwan's industrial activities. From the economic cycles of the 1970s and 1980s, it showed that Taiwan had faced gradual erosion of its comparative advantage in labor intensive sectors (Wu, 1992). Hence, a basic change in economic strategy turned to be necessary. Due to this understanding, the government began to guide the economy toward capital-intensive industries such as machinery, steel, petrochemicals, and nonferrous metallurgy and to various types of high-technology industry, especially in the electronics and information-processing fields. Thus Taiwan hoped to establish a new international comparative advantage in more technology, skill, and capital-intensive products. In addition to the Ten Major Development Projects executed in the 1970s, government also started two new sets of programs in the 1980s (with twelve and fourteen projects, respectively). In particular, the Science-Based Industrial Park that opened in 1980 was designed to become Taiwan's Silicon Valley, which could bring together both domestic and foreign firms in high-tech industries.

Government's efforts toward transforming Taiwan's industrial structure during this period proved to be a success. It was directly reflected in Taiwan's production and trade statistics. As late as 1970, food, textile, and wood manufactures composed 53 percent of all exports (see Table 4.9). Over the next two decades, these natural asset based industries consistently lost ground to more created asset based sectors, falling to 28 percent of all exports in 1986. The principal export source became electronics, combining both high technology and labor-intensive assembly, which rose from 12 percent to 22 percent of all exports during this period. Heavier industries, such as rubber and plastics, metal

manufactures, and machinery, also became more important as their combined share of total exports tripled from 6 percent in 1970 to 19.3 percent in 1986. Hence, it showed that Taiwan has clearly established its international competitiveness in these products and proved that it could move beyond assembly work by low-cost labor.

Table 4.9. The Change of Taiwan's Industrial Structure (in terms of export mix) from 1970s to 1980s

Major Manufacturing Sectors	1970	1975	1980	1986
Food, Beverages, Tobacco	12.8%	10.8%	5.6%	5.1%
Textile & Apparel	31.7%	27.8%	22.6%	18.3%
Wood & Furniture	8.6%	4.4%	6.0%	4.4%
Chemicals	2.4%	2.0%	2.3%	2.7%
Rubber & Plastics	1.0%	7.4%	8.9%	9.4%
Metals Products	1.9%	2.5%	4.3%	5.9%
Machinery	3.2%	3.6%	3.8%	4.0%
Electronics	12.3%	14.7%	18.2%	22.3%

Source: *Taiwan Statistical Data Book* (1987), Taipei, Taiwan: Council of Economic Planning and Development.

The success of new economic strategy also received a lot of assistance from foreign capital. Apparently, in order to upgrade industrial activities, there was stronger need for technological development. To some extent, this was pursued by encouraging Taiwan's local R&D activities. Also, the government moved to attract foreign capital in the hope of promoting technology transfer. Thus many of the regulations governing foreign investment were loosen and liberalized during the 1980s with the result that foreign capital increased substantially from $164 million in 1977 to $1,223 million in 1987. Most of these foreign capital concentrated in high technology and heavy industries, particularly machinery, electronics, and non-metallic minerals. In general, as Simon (1988) has pointed out, Taiwan was fairly successful in promoting technology transfers to help upgrading its industrial structure.

Another important development is about the emergence of outward investments made by Taiwanese firms. In the 1980s, Taiwanese firms had clearly decided to invest abroad both because of uncertainty about Taiwan's future, and much more important, because of the country's declining ability to compete in the sectors with which it is more familiar. The outflow of capital from Taiwan rose from less than $1 billion in 1981 to $15.6 billion in 1986. In the late 1980s, more outward investment has been directed to Third World countries (including Mainland China), where Taiwanese firms can take advantage of low-cost labor to replicate their successful businesses at home.

4.1.6. The Internationalization and Technology Deepening Phase (1987 till now)

Since late 1980s, Taiwan' economy has come across major changes in its internal and external environment. These changes have led to the profound transformation of Taiwan's industrial structure.

Taiwan's comparative advantage in labor intensive production had completely disappeared since late 1980s. As Taiwan increasingly approached democratic system, the control of the government over strikes and labor movement was weaken. This resulted in substantial increase in unit labor costs. Moreover, the high level of education and high standard of living led to a serious shortage of low skilled labor. As a result, all those sectors or industry segments that were mostly based on low-skilled labor can no longer be as competitive as before. In order to pursue lower cost structure, indigenous and foreign firms were forced to move labor intensive operations to Southeast Asia LDCs and to Mainland China. This explains the significant growth of ODIs in 1989 and 1990.

On the other hand, by the late 1980s, Taiwan's competitive advantage had progressed from cheap labor to low-cost, productive, high-quality engineering

(Hobday, 1995). More and more Taiwanese firms had upgraded from assembly for standard and simple products. A lot of firms could actually design products through their product innovation skills. Some of them could even design and conduct R&D for complex products. This revealed that Taiwan's attempt to upgrade its industrial base have been rather successful. Nevertheless, as the speed for technological progress becomes faster and faster, Taiwan also faced the challenge from how to deepen the technological capabilities of its leading industrial sectors. Borrowing technology from other countries has become a less viable competitive strategy now, since Taiwan's industries gradually approach global technological frontier (Amsden, 1992). Moreover, developing technology and capital intensive industries through their own efforts is very expensive and time consuming. Hence, a lot of Taiwanese firms, especially those in electronics industry, actively pursued joint ventures and strategic alliances with other foreign firms. Also, in order to effectively attain the assistance from foreign multinationals for promoting industrial upgrading, the government enacted the Statue for Encouragement of Investment in 1990 to replace the Statue for Upgrading Industries. The essence of the new statue lies in its resort mainly to investment tax credits as the main incentive in promoting the designated industrial functions of R&D. The incentive with a five-year tax holiday has remained available, but only to those start-up enterprises in major technology-based industries or those classified as major investment enterprises. Further details of the major FDI incentives in Taiwan can be seen in Table 4.10. From these incentives, we can see that there is heavy emphasis on technology-based industries. Hence, it is obvious that attracting high-quality FDI has been on top of the policy agenda.

In addition to modifying the incentives for FDI, the government also tried to encourage the inter-firm cooperation between indigenous firms and foreign

multinationals. In 1995, the government abolished the Statue for Technical Cooperation. As a result, local firms' technical cooperation agreements with foreigners are no longer subject to official approval and screening. Moreover, by choosing the Asia-Pacific Regional Operations Center (APROC) plan as the backbone of Taiwan's future economic development policy, the government tends to attract multinationals to establish regional headquarters and/or regional operations centers in Taiwan and localize within Taiwan their high-value-added activities, such as R&D and the manufacture of high-tech products. Therefore, the Ministry of Economic Affairs (MOEA) aggressively invites world-class multinationals to conclude strategic alliances with indigenous firms. By signing a Letters of Intent, interested multinationals will receive active assistance for their inward investment projects. So far, according to the report from MOEA (MOEA, 1995), there are already a number of famous multinationals signed the Letters of Intent with MOEA.

As a result of the efforts mentioned above, the importance of capital-intensive and technology-intensive industries to Taiwan's economy has increased consistently. In 1985, technology-intensive sectors merely composed of 27% of all exports, and capital-intensive sectors accounted for only 36.5% of all exports. Nevertheless, in 1995, the exports from technology-based sectors and capital-intensive sectors reached 40.1% and 52% respectively (see Table 4.11). Again, it reveals that Taiwan's economy has migrated from natural-assets industrial sectors to created-assets industrial sectors.

Table 4.10. Major FDI Incentives in Taiwan

Incentives	Qualtifications
Tax Incentives	
Accelerated depreciation of facilities and equipment for R&D, energy saving, and pollution control purposes	
Tax credits for automation facilities or technology and pollution control devices or technology	Private manufacturing or technology services enterprises that spend NT$6000,000 or more on the relevant facilities or technology
Tax credits for expenditure on R&D, training and establishing international brand names	Enterprises investing at least NT$3 million in R&D, NT$6000,000 in training, NT$3 million in establishing an international brand name
5-year tax holidays and income tax credit for stockholders	Start-up enterprises in major technology industries or classified as major investment enterprises
Investment tax credit for corporate investment in periphery areas	Companies investing in areas with scant natural rescues or slow development as specified by the competent authority
Stamp tax, contract tax, and land increment tax deduction for merger deals	Companies involved in a merger deal
Tax exemption for retained earnings up to double the amount of corporate original capital investment	Manufacturers or technology services enterprises in designated technology and capital-intensive industries
Preferential land increment tax treatment for plant removal	Land increment taxes due as a result of the sale or transfer of the original plant
Financial Incentives	
Low-interest loans for the procurement of domestically made automation equipment	
Low-interest loans for the procurement of imported automation equipment	
Loans for the procurement of pollution control equipment	
Policy equity participation in high-tech investment	High-tech investments exceeding NT$200 million by start-ups or existing corporations

Source: W. Kuo and S. Chen (1996), "Views from Taiwan's Perspectives", *Workshop on Policy Competition and Foreign Direct Investment.*

Table 4.11. Export Performance of Taiwan's Technology-Intensive and Capital-Intensive Sectors (in Percentage of Total Exports)

Type of Sectors	1985	1986	1992	1993
Intensity of Labor Usage:	100	100	100	100
High	45.9	47.0	39.2	38.9
Middle	35.6	36.9	40.3	41.2
Low	18.5	16.0	20.5	19.9
Intensity of Capital Usage:	100	100	100	100
High	24.5	22.9	29.3	28.9
Middle	48.7	44.4	53.0	54.8
Low	26.8	27.7	17.7	16.3
Level of Technology Used:	100	100	100	100
High	18.8	18.4	29.5	31.4
Middle	33.6	33.7	38.5	40.3
Low	47.6	47.9	32.0	28.3
High-Tec Sectors*	27.0	27.6	37.9	40.1
Heavy Industries	36.5	35.6	49.1	52.0
Agricultural, Fish & Animal	1.7	1.7	0.9	0.8
Food Processing	4.3	4.7	3.3	3.2
Beverage & Tobacco	0.0	0.0	0.1	0.1

Note: High-Tec Sectors are determined by the expenditures on R&D, technology purchases and training, and the proportion of technicians to total employees. They include sectors like semiconductors, tele-communication products, and so on.

Source: *Monthly Statistics of Exports and Imports* (1994), Taipei, Taiwan: Ministry of Finance, September issue.

4.2. An Overview of Taiwan's Industrial Structural Adjustment

4.2.1. Changing Composition of Taiwan's Major Industrial Sectors: The "What to Produce" Aspect of Industrial Structural Adjustments

As described earlier, there are two aspects for industrial structural adjustments. One is the aspect of "what to produce", which refers to the changes in a country's composition of major economic sectors. The other aspect is "how to produce", which concerns with the production efficiency achieved by its economic sectors. Hence, in order to capture the picture concerning how Taiwan has undergone its industrial structural adjustment, we will need to examine the above two aspects respectively. Here, in this subsection, we will first look at the

"what to produce" aspect of Taiwan's economy. In next subsection, we will examine the "how to produce" aspect of Taiwan's economy.

To see how Taiwan has changed its major economic sectors (namely, the "what to produce" aspect), we will use three industry-level indicators to show the historical path of this process. They are relative comparative advantage (RCA) for economic sector, the percentage of total exports (PTE) by certain economic sector, and the percentage of GDP by economic sector.

In Dunning's (1985) article, he used RCA to measure the structural characteristics of UK's industrial activities over the period from 1971-1979. Based on RCA, we can identify what economic sectors of a country are most relatively competitive in international market over a time period. RCA is defined as:

$$RCA_i = [1 + (X_i - M_i) \div (X_i + M_i)] \div [1 + (X_t - M_t) \div (X_t + M_t)]$$

Where X = exports, M = imports, i = a particular sector, t = all sectors.

By computing the RCAs of Taiwan's economic sectors over the past 43 years (from 1952-1994), we can find the long-term trend describing how Taiwan has changed the composition of its major economic sectors. The results are summarized in Table 4.12. Also, based on each sector's historical RCA values, we can identify the evolution of Taiwan's natural asset/resources based and created assets/factors based economic sectors over the past 40 years (as shown in Figure 4.1 and 4.2). Figure 4.1 shows that, for Taiwan, during the past four decades, those sectors (including agriculture, minerals, food, beverage & tobacco preparations, textile, leather, wood, paper and non-metallic mineral products) that are largely based on natural assets tend to gradually lose their competitiveness in international market over time. On the opposite, from Figure 4.2, we can see that those sectors (including electrical machinery & apparatus, machinery, chemicals & pharmaceutical products, and transportation equipment that normally require the use of more created assets/advanced factors appear to

FIGURE 4.1. TREND FOR RCA VALUES IN NATURAL ASSET-INTENSIVE SECTORS AND LESS CREATED ASSET-INTENSIVE SECTORS

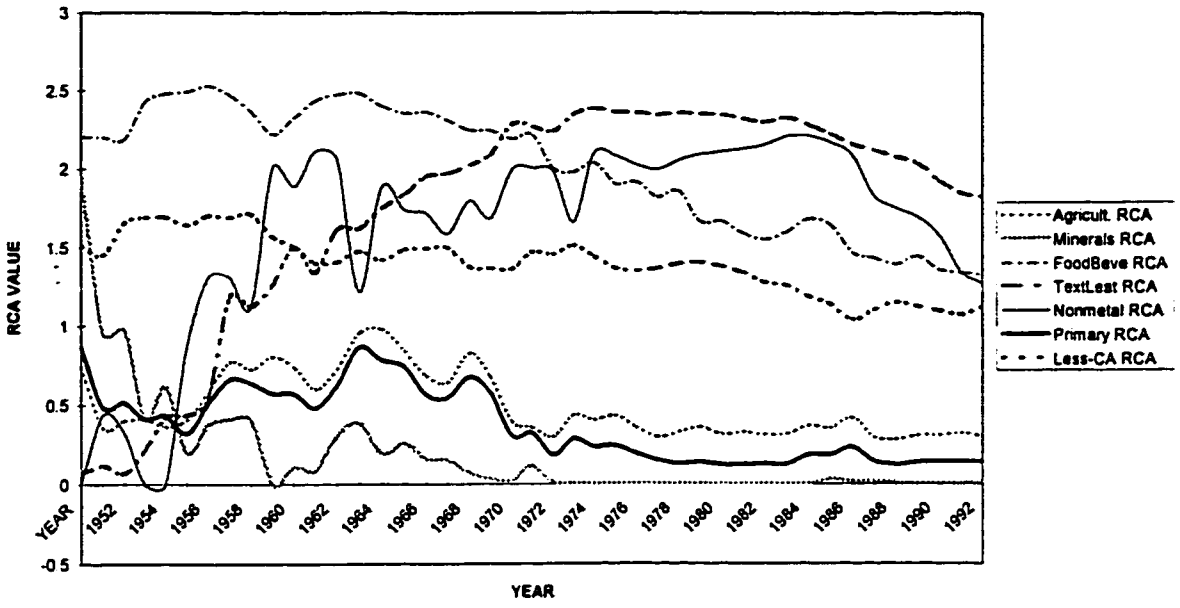
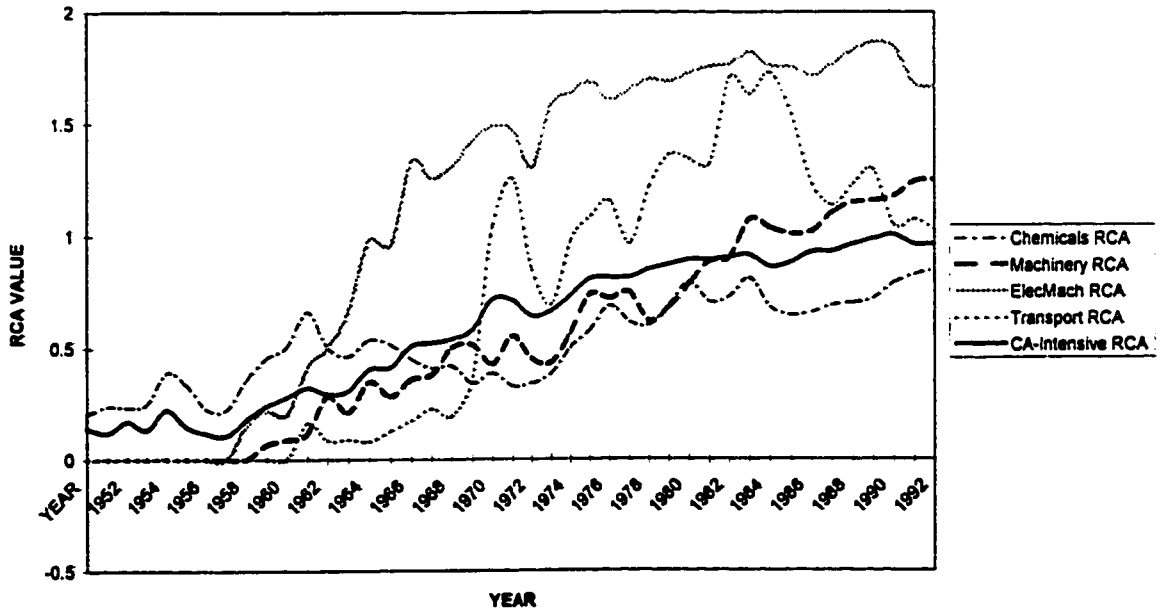


FIGURE 4.2. TREND FOR RCA VALUES IN CREATED ASSET-INTENSIVE SECTORS



gain their international competitiveness steadily over time. Moreover, from Figure 4.1, we may notice that the trend line for primary sectors used to slowly increase before 1964. After that, their RCA values continuously declined over

time. Same situation happened to food processing sector that heavily relied on sugar production during the same period. This clearly shows that, after 1964, Taiwan's primary sectors and food processing sector began to loose the momentum for improving their international competitiveness. As to economic sectors that are less created asset-intensive (including textile and non-metallic minerals), their RCA values began to decline between 1975 and 1983. This could be related to the sharp rise of labor cost during this period. For manufacturing sectors, the average monthly earnings of employees during 1975 and 1983 grew from NT$3,430 to NT$11,135. This sharp increase was certainly a big hit to Taiwan's less created asset-intensive sectors, since these sectors, such as Textile, utilized a lot of semi-skilled or unskilled labor forces during their production process. Hence, after this period, the competitiveness of these sectors in Taiwan also lost the momentum for further growth.

Table 4.12. The Change of Taiwan's Industrial Structure (in terms of RCA value) from 1952 to 1994

Economic Sectors	1952	1962	1972	1982	1994
Primary Sectors:	0.8710	0.5726	0.3084	0.1228	0.1448
Agriculture, Fish & Animal and Forest	0.7463	0.7395	0.3962	0.3156	0.3034
Minerals	1.9591	0.1088	0.0272	0.0040	0.0161
Less Created Asset-Intensive Sectors:	1.5122	1.5046	1.3690	1.3817	1.1236
Food, Beverage & Tobacco	2.2032	2.3247	2.1941	1.6711	1.3268
Textile, Leather, Wood & Paper	0.0706	1.5025	2.2889	2.3500	1.8243
Non-metal	0.0000	1.8865	2.0007	2.1124	1.2710
Created Asset-Intensive Sectors:	0.1393	0.2796	0.7192	0.8955	0.9658
Chemicals	0.2049	0.5068	0.3865	0.7945	0.8501
Machinery	0.0000	0.0871	0.4260	0.7849	1.2507
Electrical Machinery & Appliances	0.0000	0.2009	1.4898	1.7278	1.6633
Transportation Equipment	0.0000	0.0000	1.0482	1.3425	1.0270

Source: *Taiwan Statistical Data Book* (1995), Taipei, Taiwan: Council of Economic Planning and Development.

Similar development path is also confirmed by another indicator, the percentage of total exports (PTE) attributed to various economic sectors. It is computed by:

$$PTE_i = (X_i \div X_t) \times 100\%$$

Where X = exports, i = a particular sector, t = all sectors.

The reason for our use of this measure is due to the fact that Taiwan's economy is heavily dependent upon exports. Hence, by measuring the PTE_i of a certain sector, we can identify the importance of that sector to Taiwan's economy.

Table 4.13. The Change of Taiwan's Industrial Structure (in terms of % of total exports) from 1952 to 1994

Economic Sectors	1952	1962	1972	1982	1994
Primary Sectors:	11.21	10.09	4.62	2.21	0.75
Agriculture, Fish & Animal and Forest	8.62	9.63	4.55	2.18	0.71
Minerals	2.59	0.46	0.07	0.03	0.04
Less Created Asset-Intensive Sectors:	85.34	75.23	52.48	42.68	28.07
Food, Beverage & Tobacco	83.62	40.83	10.54	5.46	3.05
Textile, Leather, Wood & Paper	0.86	29.82	36.75	29.64	16.18
Non-metal	0.00	5.96	1.21	2.17	1.09
Created Asset-Intensive Sectors:	3.45	7.34	23.59	30.88	39.40
Chemicals	3.45	5.96	1.94	4.56	5.78
Machinery	0.00	0.46	1.77	3.81	6.97
Electrical Machinery & Appliances	0.00	0.92	17.77	17.62	22.49
Transportation Equipment	0.00	0.00	2.51	5.76	5.70
Others	0.00	7.34	19.31	24.23	31.78

Source: *Taiwan Statistical Data Book* (1995), Taipei, Taiwan: Council of Economic Planning and Development.

Table 4.13, Figure 4.3 and 4.4 show how PTEs of various industries has changed over time. From Figure 4.3, by examining the trend lines, we can see that the contribution of natural asset-based sectors to Taiwan's total exports also appear to gradually fade over the 43 years period. As to created asset-based sectors, according to Figure 4.4, their contribution to Taiwan's total

exports, on the other hand, is getting more and more important to the whole economy.

FIGURE 4.3. TREND FOR EXPORT RATIO IN NATURAL ASSET-INTENSIVE SECTORS AND LESS CREATED ASSET-INTENSIVE SECTORS

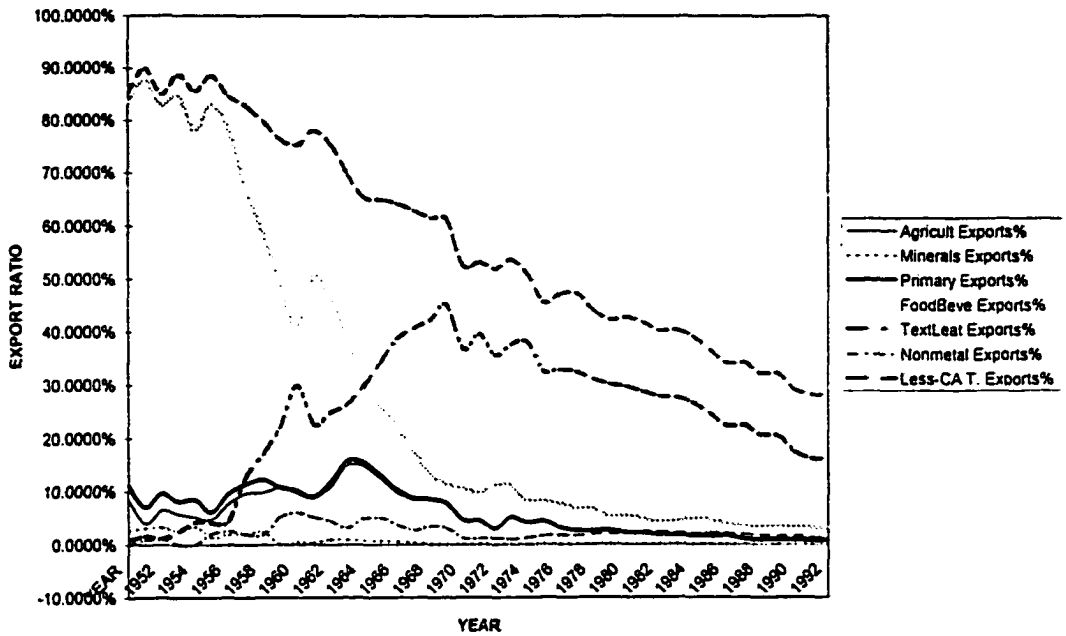
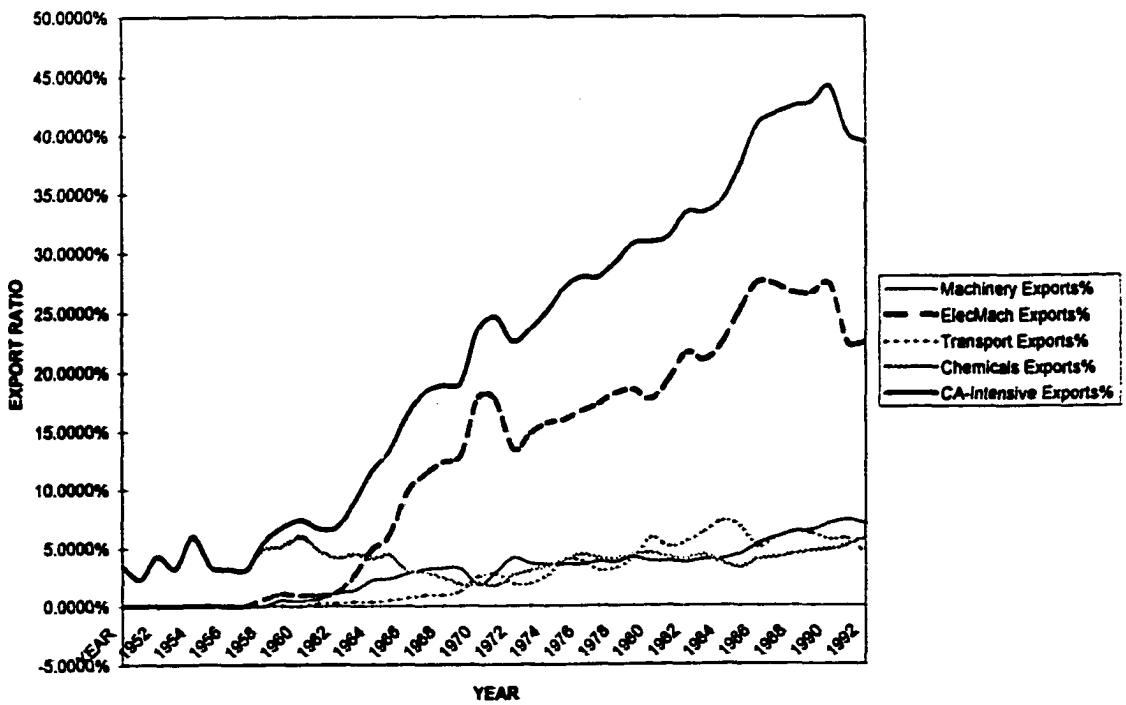


FIGURE 4.4. TREND FOR EXPORT RATIO IN CREATED ASSET-INTENSIVE SECTORS



Again, this indicates that created asset-based industries already replaced natural asset based industries as the major contributors to Taiwan's economic prosperity.

Table 4.14. The Change of Taiwan's Industrial Structure (in terms of % of GDP) from 1952 to 1994

Economic Sectors	1952	1962	1972	1982	1994
Primary Sectors:	34.04	25.53	10.74	6.91	3.31
Agriculture, Fish & Animal and Forest	32.01	23.33	9.75	6.28	3.03
Minerals	2.03	2.20	0.99	0.63	0.28
Less Created Asset-Intensive Sectors:	9.27	12.21	12.48	11.91	7.59
Food, Beverage & Tobacco	5.13	7.46	4.26	3.76	2.23
Textile, Leather, Wood & Paper	4.07	4.52	7.53	7.14	3.65
Non-metal	0.45	1.31	1.02	1.20	1.03
Created Asset-Intensive Sectors:	2.48	4.29	11.62	11.79	13.24
Chemicals	2.01	3.03	6.17	6.09	5.87
Machinery	0.19	0.39	0.96	0.83	1.18
Electrical Machinery & Appliances	0.12	0.41	3.01	2.95	4.20
Transportation Equipment	0.16	0.47	1.47	1.92	1.92
Services	48.1	46.8	46.1	47.9	59.2
Others	6.11	11.17	19.06	21.49	16.66

Source: *Taiwan Statistical Data Book* (1995), Taipei, Taiwan: Council of Economic Planning and Development.

From the historical path of each sector's contribution to Taiwan's GDP (see Table 4.14, Figure 4.5 and 4.6), it is also clear that created asset-intensive sectors have become more and more important to Taiwan's economy. Since 1952, the share of GDP created by primary sectors and less created asset-intensive sectors has continuously dropped (from 43.31% of GDP in 1952 to 10.9% in 1994). On the opposite, the share of GDP created by created asset-intensive sectors has risen steadily (from 2.48% in 1952 to 13.2% in 1994). If we only look at the GDP share by manufacturing sectors, the growth of created asset-intensive sectors is obvious too. In 1952, there were only 20.42% of manufacturing GDP from created asset-intensive sectors. In 1992, on the other hand, the share became 43.56%. Again, this indicator confirms that, as Taiwan's economy moving forward, the

created asset based industries has replaced natural asset based industries as the major industrial activities.

FIGURE 4.5. TREND FOR GDP SHARE IN NATURAL ASSET-INTENSIVE SECTORS AND LESS CREATED ASSET-INTENSIVE SECTORS

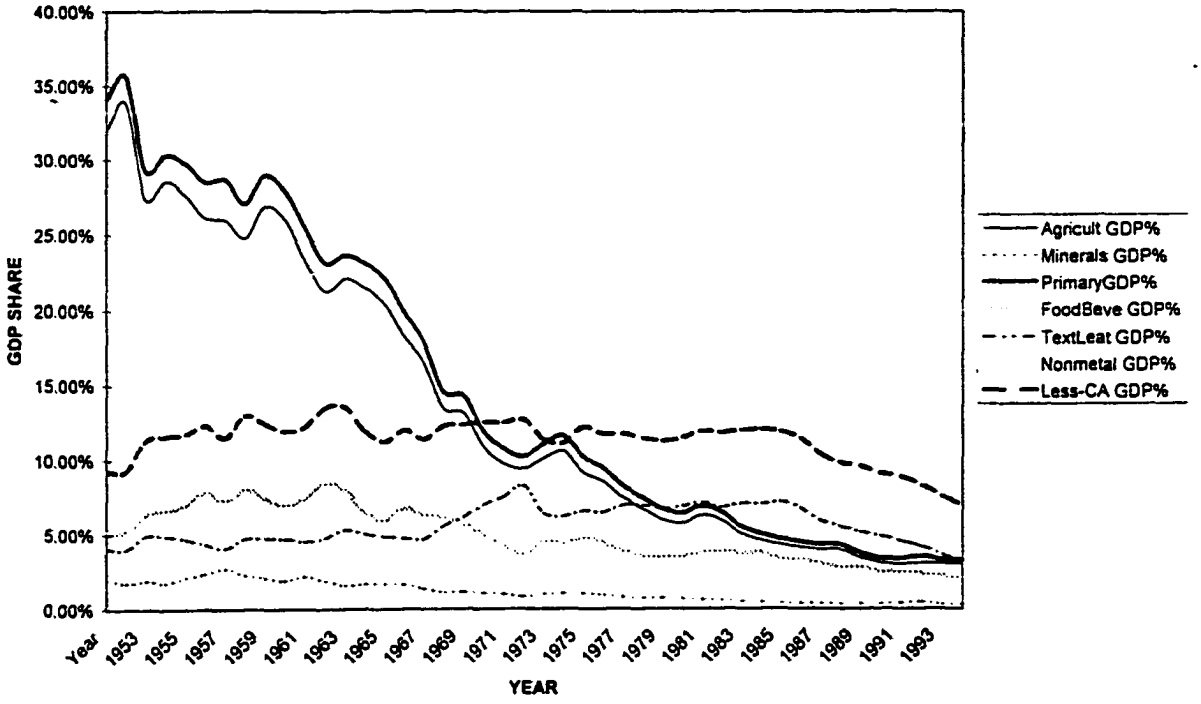
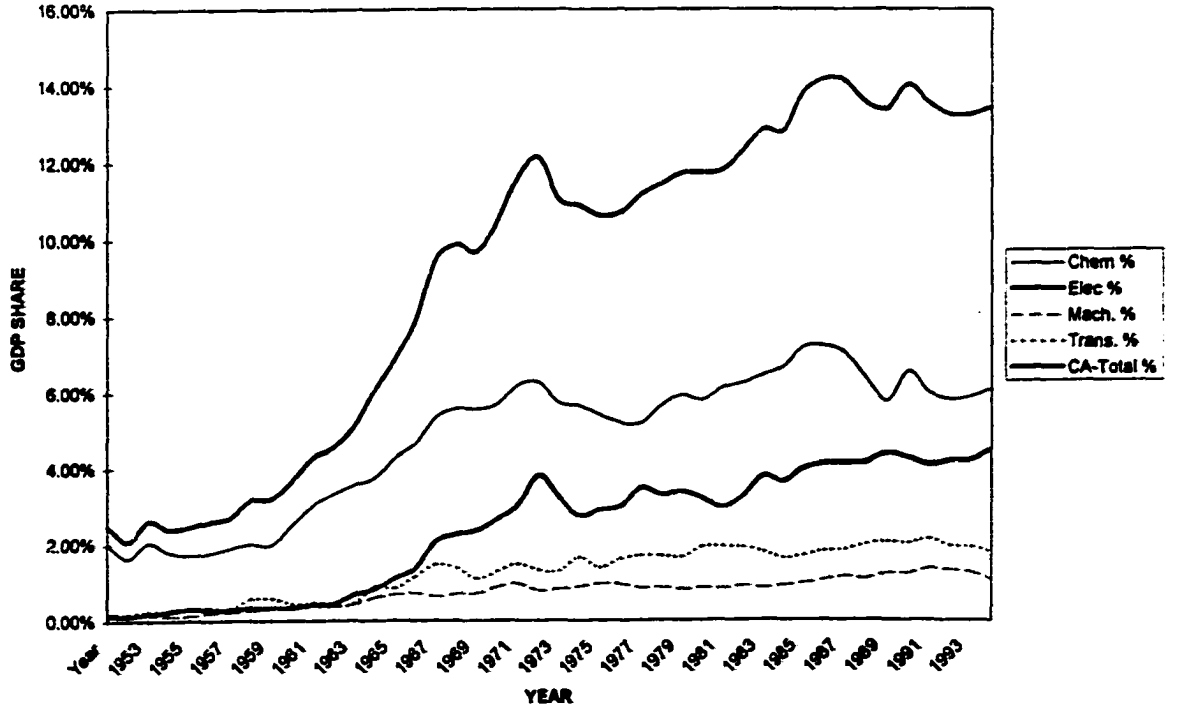


FIGURE 4.6. TREND FOR GDP SHARE IN CREATED ASSET-INTENSIVE SECTORS



4.2.2. Changing Efficiency Of Taiwan's Industrial Sectors: The "How To Produce" Aspect Of Industrial Structural Adjustments

In order to evaluate the change of production efficiency achieved by Taiwan's economic sectors, we will use the average production volume produced by each employee to measure this aspect. The historical path of this measure over the past 43 years may provide us a rough idea about how Taiwan has enhanced its production efficiency over time.

Figure 4.7 and 4.8 are created by using the efficiency measure for periods between 1952-1994. Generally speaking, it shows that all sectors have experienced relatively steady increase in production efficiency since 1952. Nevertheless, the efficiency of mining sector, after experienced sharp increase after 1986, suddenly dropped in 1994. The reason for this sharp decrease is mainly due to the sharp decrease in the output of metallic minerals (from 23,333[1] in 1993 to 12,919 in 1994). This sudden decrease in output was the result of government decision to shut down a number of government owned companies that produced metallic minerals. These companies were ordered to stop producing minerals. However, in order to reduce the political impacts, the employees of these companies were not laid off right away in 1994, but to offer opportunities for finding other jobs or early retirement. Hence, although the employees of these government owned companies still registered as employees of mining sector, they did not really produce anything in 1994.

There is another fact that may also reveal the same development. According to the investigation made by Ministry of Economic Administration (MOEA) in 1993, for Taiwan's manufacturing sectors, about 58.3% of total investment in equipment were made in automated equipment. It represents a growth rate of

[1] The outputs are measured in million of NT dollars.

2.23% compared to the figures acquired in 1991. Normally, the investment in automated equipment is associated with improvement in production efficiency.

FIGURE 4.7. TREND OF EFFICIENCY FOR PRIMARY SECTORS AND LESS CREATED-ASSET INTENSIVE SECTORS

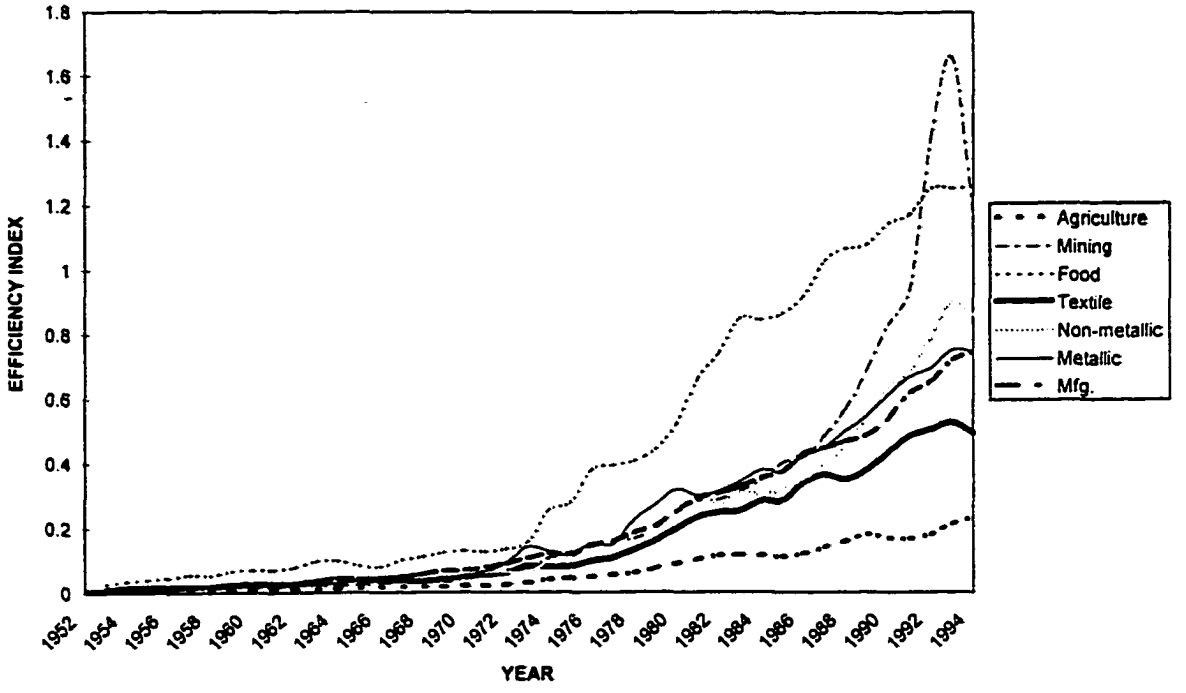
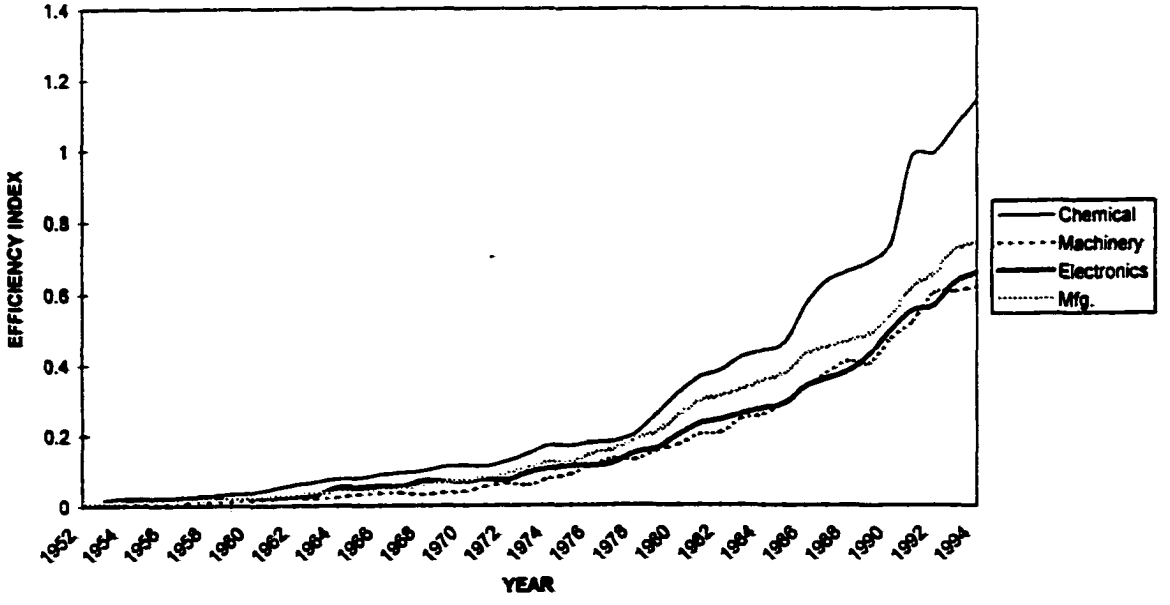


FIGURE 4.8. TREND OF EFFICIENCY FOR CREATED-ASSET INTENSIVE SECTORS



In sum, we may say that, Taiwan's manufacturing sectors have upgraded their methods for performing production activities. The evidence may be captured from the continuous increase in production efficiency and partly from the increasing share of investments in automated production process.

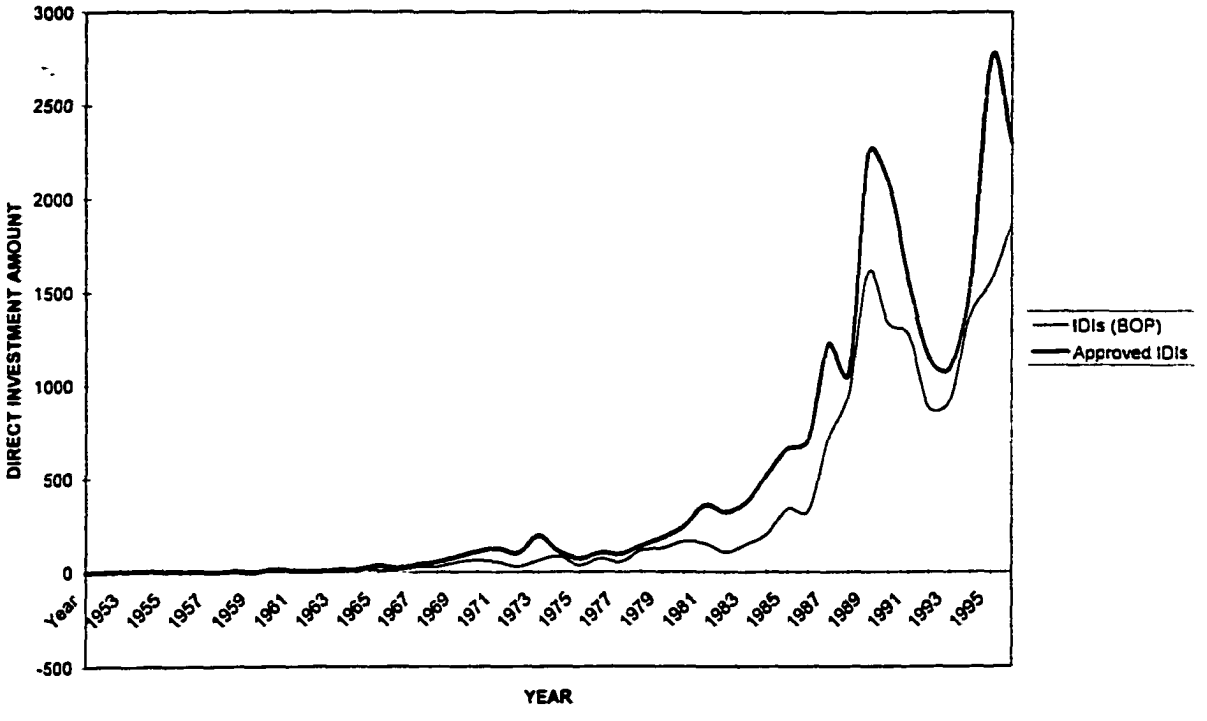
4.3. An Overview of Taiwan's International Business Activities

4.3.1. An Overview of Taiwan's Inward Direct Investment

While trying to analyze the characteristics of Taiwan's IDIs and ODIs, again, we face the problem of the availability of data. The only available data concerning sectoral distribution of IDIs and ODIs, and the regional distribution of IDIs and ODIs are in the publications by the Investment Commission of MOEA. Hence, we will use this data source for analyzing the sectoral and geographical characteristics of Taiwan's foreign direct investments. Other than that, the Central Bank of China (CBC) has collected the historical data for yearly total IDIs and ODIs (as items of balance of payments) from 1952-1994. Although this data source does not give us details about sectoral and regional distribution of yearly IDIs and ODIs, it may still provide us another source for examining Taiwan's total IDIs and ODIs over the past 43 years. One thing we should notice here is that the figures published by the above two government agencies do not match with each other. The reason for this may be that MOEA's figures were produced based on approved cases only, while CBC looked at the actual capital movements related to IDIs and ODIs.

The IDIs of Taiwan have a long history since Japan's colonization of the island. Between 1895-1945, a lot of Japanese companies were encouraged to invest in Taiwan. At first, the IDIs were primarily in rice and sugar processing

FIGURE 4.9. TREND FOR TAIWAN'S INTERNATIONAL INVESTMENT POSITION (FROM BOP AND APPROVED CASES)



for export to Japan. Later, the IDIs shifted to heavy sectors that were meant to support Japan's war efforts. After Japanese were defeated, the KMT government began to record the amounts of inward and outward investments since 1952. From MOEA's data (see Table 4.15 and Figure 4.9), we can understand that, during 1952-1960, Taiwan did not attract too much IDIs. The average annual amount of IDIs was only US$ 3.96 million. During this period, the government pursued import-substitution policy which restricted private foreign investments. Moreover, the limited size of Taiwan's market further deterred foreign investors. The situation improved in the 1960s. Since late 1950s, the government decided to refocus toward industrial promotion through the export of labor intensive goods

(Clark, 1989). This policy change towards export led growth was accompanied by government's actions to attract foreign investors (Gold, 1986). With the help of the US agency for International Development, a package of incentives was introduced at a time when Latin American countries showed growing reluctance at allowing too much Multinational Enterprises in (Wade, 1990). As a result, the average annual amount of IDIs increased to US$52.4 million between 1961-70, and US$215.9 million between 1971-1979. The greatest increases, however, occurred in the 1980s. The average annual IDIs amounted to US$1,053.3 million between 1981-1989. During the second half of the decade, the average annual size of IDIs even reached US$1,618.4 million. This growth is largely due to the emergence of new investors in Taiwan. Japanese firms, faced with high wage levels at home, increasingly shifted production operations to Taiwan, especially in the electronics industry. Also, the European companies began to have substantial investments in Taiwan after 1980. In late 1980s, the government started to promote Taiwan as "regional operation center" for MNEs. The major policy goal is to induce MNEs to establish their regional centers on the island, perform varying kinds of activities such as R&D, manufacturing high-tech products or developing and testing new products. To achieve this goal, the government has initiated ambitious projects to improve its physical infrastructure. Furthermore, in order to attract foreign investment, the government lowered the required minimum investment amount, simplified the application procedures and offered new tax privileges for MNEs in priority sectors. All these efforts seemed to result in the increase of IDIs in 1990s. Till now, the average amount of IDIs into Taiwan from 1990-1996 already reached US$1,911.7 million.

Table 4.15. Taiwan's Inward Direct Investment from 1952 to 1996 (Unit: US$ million)

Period	AIDI[1]	BOPIDI[2]
1952-1960	3.96	7.1
1961-1965	19.81	12.58
1966-1970	84.90	35.75
1971-1975	169.20	51.69
1976-1980	262.63	104.74
1981-1985	488.29	188.98
1986-1990	1618.36	987
1991-1996	1911.69	1310.83

Note: 1. AIDI-Approved Inward Direct Investment
2. BOPIDI-Inward Direct Investment in Balance of Payment

Source: *Statistics on Overseas Chinese & Foreign Investment, Outward Investment, Outward Technological Cooperation, Indirect Investment, Guide to Mainland Industry Technology* (1996), Taipei, Taiwan: Investment Commission, MOEA.

From the yearly IDI data published by CBC (also see Table 4.15 and Figure 4.9), we may also find the same historical path. It shows that the amount of IDIs in 1950s was quite limited (only US$7.1 million). After that, however, the amount of IDIs had significantly grown. The huge growth occurred in the second half of 1980s was especially outstanding. In the beginning of 1990s, the growth of IDIs seemed to stagnate. Nevertheless, due to Taiigwan's efforts toward regional operation center of MNEs, the situation was obviously improved after 1994.

From MOEA's data, we may also examine the sectoral and home-country distribution of IDIs (see Table 4.16 and 4.17). Table 4.16 shows us the sectoral distribution of Taiwan's IDIs over the past 45 years. During 1952-1960, chemicals accounted for the largest share (51.27% of total IDI flows), and to a much lesser extent, textile (14.64%), food & beverage processing (9.6%), services (6.15%) and electronics and electric appliances (2.93%) played some role in IDIs. The importance of IDIs associated with chemicals sector was the result of government's efforts to build up this sector in Taiwan. In 1950s, the government decided to develop its own chemicals sector (including production of plastics

Table 4.16. The Sectoral Distribution of Taiwan's Inward Investment Flows (in US$1,000) from 1952 to 1996

	1952-60		1961-65		1966-70		1971-75		1976-80		1981-85		1986-90		1991-96	
Economic Sectors	Amount	Share[1]	Amount	Share	Amount	Share	Amount	Share	Amount	Share	Amount	Share	Amount	Share	Amount	Share
Agriculture & Forestry	406	1.14	337	0.34	832	0.20	113	0.01	1275	0.10	302	0.01	2738	0.03	810	0.01
Fishery & Animal	229	0.64	2140	2.16	2110	0.50	3586	0.42	3390	0.26	12230	0.50	6887	0.09	1847	0.02
Mining	73	0.20	0	0.00	310	0.07	49	0.01	142	0.01	0	0.00	12499	0.15	2811	0.03
Food & Beverage	3423	9.60	10778	10.88	6851	1.61	8082	0.96	28300	2.16	79848	3.27	472816	5.84	393368	4.06
Textile	5221	14.64	1894	1.91	15036	3.54	43725	5.17	24485	1.86	23420	0.96	131524	1.63	194858	2.01
Garment & Footwear	121	0.34	2376	2.40	15413	3.63	11389	1.35	8588	0.65	11146	0.46	19957	0.25	49267	0.51
Leather & Fur Products	77	0.22	515	0.52	1563	0.37	7147	0.84	1111	0.08	4805	0.20	7657	0.09	40766	0.42
Lumber & Bamboo Prod.	86	0.24	695	0.70	2275	0.54	7112	0.84	12632	0.96	6633	0.27	47677	0.59	34814	0.36
Paper & Printing	739	2.07	116	0.12	3002	0.71	9723	1.15	2601	0.20	12194	0.50	67424	0.83	34302	0.35
Chemicals	18277	51.27	26940	27.19	35742	8.42	87851	10.38	141737	10.79	462676	18.95	1442432	17.83	1044129	10.77
Rubber Products	100	0.28	921	0.93	11415	2.69	24177	2.86	30330	2.31	66870	2.74	267045	3.30	95327	0.98
Non-metallic Minerals	1303	3.65	694	0.70	13551	3.19	63042	7.45	250512	19.08	30625	1.25	159835	1.98	121445	1.25
Basic Metals & Metal P.	98	0.27	2097	2.12	15181	3.58	92259	10.91	66953	5.10	173241	7.10	598012	7.39	375258	3.87
Machinery Equipment	361	1.01	2060	2.08	13118	3.09	99303	11.74	48627	3.70	339041	13.89	554878	6.86	452577	4.67
Electronic & Electric Appliances	1043	2.93	24780	25.01	195531	46.06	222791	26.33	407701	31.05	668968	27.40	1614526	19.95	3100333	31.99
Construction	11	0.03	12643	12.76	10759	2.53	54541	6.45	23321	1.78	4210	0.17	44683	0.55	86426	0.89
Trade	355	1.00	909	0.92	1555	0.37	4219	0.50	1179	0.09	16199	0.66	661347	8.17	1060383	10.94
Banking & Insurance	0	0.00	2499	2.52	7889	1.86	53345	6.31	37372	2.85	130638	5.35	612812	7.57	1165664	12.03
Transportation	642	1.80	577	0.58	12255	2.89	11036	1.30	22375	1.70	13398	0.55	257814	3.19	386387	3.99
Services	2191	6.15	4268	4.31	41610	9.80	30534	3.61	178933	13.63	338192	13.85	1013121	12.52	1041647	10.75
Others	896	2.52	1825	1.85	18516	4.35	11991	1.41	21592	1.64	46795	1.92	96101	1.19	9324	0.10
Total	35652	100	99064	100	424514	100	846015	100	1313156	100	2441431	100	8091785	100	9691743	100

Note: 1. The unit of share is the percentage of total approved inward investment

Source: *Statistics on Overseas Chinese & Foreign Investment, Outward Investment, Outward Technological Cooperation, Indirect Investment, Guide to Mainland Industry Technology* (1996), Taipei, Taiwan: Investment Commission, MOEA.

Table 4.17. The Regional Distribution of Taiwan's Inward Investment Flows (in US$1,000) from 1952 to 1996

	1952-60		1961-65		1966-70		1971-75		1976-80		1981-85		1986-90		1991-96	
Home Country / Region	Amount	Share[1]	Amount	Share	Amount	Share	Amount	Share	Amount	Share	Amount	Share	Amount	Share	Amount	Share
Developed Areas		99.8		94.69		88.98		76.52		84.21		84.38		67.84		66.86
Japan	1681	6.67	8171	12.22	79159	26.03	126861	21.19	241784	31.86	672771	30.15	2552056	34.90	2722231	26.25
USA	23481	93.13	55060	82.32	163657	53.81	228536	38.17	306242	40.36	940048	42.12	1570584	21.48	3022801	29.15
Canada	0	0.00	60	0.09	997	0.33	46986	7.85	148	0.02	974	0.04	24836	0.34	134826	1.30
UK	0	0.00	43	0.06	2728	0.90	1442	0.24	6464	0.85	125810	5.64	274431	3.75	370393	3.57
Germany	0	0.00	0	0.00	1942	0.64	21627	3.61	17318	2.28	26353	1.18	144569	1.98	220631	2.13
Netherlands	0	0.00	0	0.00	21857	7.19	32411	5.41	65403	8.62	47059	2.11	335305	4.59	393078	3.79
Australia	0	0.00	0	0.00	233	0.08	290	0.05	1654	0.22	70160	3.14	58587	0.80	69985	0.67
Developing Areas		0.20		3.62		0.11		3.78		9.43		7.20		10.93		15.93
Hong Kong	0	0.00	216	0.32	297	0.10	19959	3.33	65979	8.70	119454	5.35	624794	8.54	961276	9.27
Singapore	0	0.00	1104	1.65	0	0.00	518	0.09	569	0.07	40611	1.82	156858	2.15	593093	5.72
South Korea	0	0.00	0	0.00	0	0.00	0	0.00	41	0.01	0	0.00	4938	0.07	65004	0.63
South Eastern Asia[2]	0	0.00	1104	1.65	38	0.01	2134	0.36	4957	0.65	625	0.03	12536	0.17	32319	0.31
Others	50	0.20	3550	1.69	33210	10.91	117937	19.7	48241	6.36	187770	8.42	1552993	14.3	1783621	17.21
Total	25212	100	66884	100	304118	100	598701	100	758800	100	2231635	100	7312487	100	10369258	100

Note: 1. The unit of share is the percentage of total approved inward investment

2. The South Eastern Asia Area considered here includes Philippine, Thailand, Indonesia, and Malaysia.

Source: *Statistics on Overseas Chinese & Foreign Investment, Outward Investment, Outward Technological Cooperation, Indirect Investment, Guide to Mainland Industry Technology* (1996), Taipei, Taiwan: Investment Commission, MOEA.

Instruments (a US firm) began its assembly operations in Taiwan in 1964. In the next two years, 24 US firms followed to make production agreements in Taiwan. All these investment effectively enhanced the level of IDIs to Taiwan's electronic & electric appliances. During this period, most IDIs took place in labor-intensive operations (Simon, 1992). This tendency is significantly related to the export-led growth policy pursued by government, the cheap and well-trained labor force, the non-existence of labor strikes and political stability during that period.

During 1966-70, the total IDIs of Taiwan were further encouraged by the opening of the first export-processing zone, where foreign and domestic firms could enjoy unusually unfettered conditions in return for exporting all of their production. Furthermore, in 1966, the government decided to turn Taiwan into an "electronics industry center." As a result, during this period, the IDIs of electronics and electric appliances grew amazingly (8 times larger than last 5 years) and in turn, became the sector that received the largest amount of IDIs (46.06% of total IDIs). Other than this development, most of other sectors also had significant growth of their IDIs during 1966-1970. As part of export-led growth policy, the government's efforts toward attracting foreign investment seemed to be successful. Nevertheless, according to Simon (1992), most of the IDIs in this period, especially those in the EPZs, did not involve too much direct transfer of knowledge. The EPZs are essentially functioned as the assembly bases for foreign investing firms. Hence, the interaction between MNEs and local companies was rather limited. This means that, most of the IDIs in this period were essentially resource-seeking type that aimed at exploiting Taiwan's cheap labor force.

In 1970s, the overall environment was changed. It turned out that Taiwan would be confronted with a gradual erosion of its comparative advantage in labor intensive industries (Wu, 1992). New competition emerged from other

LDCs with low labor costs, while the rising living standards in Taiwan started to push its wage level up (Gold, 1986). Consequently, in the first half of 1970s, the growth of total IDIs tended to slow down (only 2 times increase from last 5 years). The IDIs of electronics & electric appliances grew much slower in 1970s, while other manufacturing sectors grew steadily. Therefore, the share of IDIs by electronics & electric appliances dropped to 26.33% in the first half of 1970s, and then was slightly back to 31.05% during 1975-1980. Chemicals, metal products and machinery equipment sectors, on the other hand, all had share just over 10% of total IDIs. Faced by this situation, the government started to change their policy towards attracting IDIs in more capital and technology intensive sectors. Investment proposals were increasingly evaluated in terms of the extent to which they would open up new markets, bring in new technology and intensify input-output links with local Taiwan companies (Wade, 1990). Due to these requirements, foreign investors needed to fulfill certain obligations, such as to establish a sizable R&D department and train local personnel in advanced technology. These actions greatly enhanced the quality of human resources in R&D which thereafter, became the propelling engine for indigenous firms' technological capabilities.

In 1980s, there was substantial increase in the level of IDI as well as change in the sectoral distribution of IDIs. The size of IDIs, according to BOP records, went from 1980's US$ 166 million to 1989's US$ 1604 million. This growth was largely due to IDIs from Japanese companies, especially in electronics industry. Hence, the major motives behind most of these IDIs from Japan were to find overseas bases for relatively more labor-intensive operations which required less skilled labor force and involved limited technology transfer. These IDIs were mostly resource-seeking type, even though some others might be efficiency-

seeking type aimed at taking advantage of the economies of scale and scope, or of the difference in supply capabilities between Japan and Taiwan.

The sectoral distribution of IDIs also changed in 1980s. Although electronic and electrical appliances remained the most important target sector in the 1980s, its share in total IDI flows dropped substantially (from 27.4% in 1981-1985 to 19.95% in 1986-1990). This was due to the larger growth of IDIs in other sectors. For manufacturing sectors, chemicals and machinery showed significant growth (both were 10 times more from 1970s), especially during the second half of the 1980s. Nevertheless, we should notice that, during the same period, the contribution to total exports from these manufacturing sectors did not increase accordingly. Also, there was increasing growth in IDIs in trade, finance and service sectors. Despite the fact that Taiwan gradually opened its market to foreign firms, these development also implies that the market characteristics of Taiwan had attracted more IDIs to operations targeted at the local market rather than export oriented operations (Lim and Pang, 1991, p.67). In other words, these IDIs were market-seeking type which aimed at acquiring new markets in Taiwan.

In 1990s, Taiwan's economy started to experience a new path of development. Labor intensive production in Taiwan had become too costly. All those sectors or industry segments that were mostly based on labor can no longer be as competitive as before. In order to pursue lower cost structure, indigenous and foreign firms were forced to move labor intensive operations to Southeast Asia LDCs and to Mainland China. Therefore, there was significant growth of ODIs in 1989 and 1990, and the growth of total IDIs clearly slowed down. Apparently, resource-seeking IDIs to Taiwan were no longer profitable for investing firms. Electronic & electric appliances sector was still the most important target for IDIs (31.99% of total IDIs). Meanwhile, the share of total IDIs

from trade, finance and services tend to increase steadily. This could be related to the increasing importance of these sectors to Taiwan's economy (57% of GDP, on the average between 1990-1996).

During 1990s, the nature of IDIs to Taiwan is also changing. As indigenous firms of Taiwan have accumulated certain technological and managerial capabilities, more and more foreign firms seek to acquire certain strategic capabilities from Taiwan. This purpose is not normally achieved by direct investment, but mainly through the international inter-firm or inter-organizational cooperative arrangements, such as joint venture or strategic alliances. It is the major issue that we are going to discuss in section 4.3.3.

The home-country distribution of Taiwan's inward investment flows from 1952-1996 is summarized in Table 4.17. It clearly shows us the importance of IDIs from developed countries. Although the share of total IDIs from developed countries tended to decline over time, it still accounted for at least 60% of Taiwan's total IDIs. Among all developed countries, USA and Japan were most crucial. At least half of the total IDIs were from these two countries. In 1950s and the 1960s, the IDIs from USA almost dominated Taiwan's total IDIs (93.13% in 1950s and 68% in 1960s). After that, the share of IDIs from USA shrank. Nevertheless, US firms were still the most active investors in Taiwan since then. The inward investment from Japanese firms had steadily increased since the first half of 1960s. In the second half of 1960s, the share from Japanese IDIs increased to 26.03%, and then, to 31.86% ten years later. During 1986-1990, the growth was even more significant (34.90% of total IDIs). As we mentioned earlier, this was due to the "increasing factor incongruity" (Ozawa, 1992; 1995) occurred in Japan, which forced Japanese firms to shift their labor-intensive operations to Taiwan and other LDCs. The IDIs from developing countries had been quite limited. The major investors were from Hong Kong and Singapore. In the second half of 1980s

and the first half of 1990s, the share from developing countries tended to increase to over 10%. Nevertheless, it is still far behind the investment from Japan and USA.

4.3.2. An Overview of Taiwan's Outward Direct Investment

Before 1980s, the ODIs from Taiwan for a long time have been very modest (see Figure 4.10 and Table 4.18). The ODI never amounted to more than US$ 10 million each year. Since the second half of the 1980s, ODIs from Taiwan started to grow rapidly. During 1981-1985, only US$113.56 million ODIs was recorded in MOEA data source and US$251.55 million in BOP data source. Later, in the second half of 1980s, both data sources showed big increase in ODIs. The MOEA data source reported US$2861.59 million ODIs, and BOP data source reported US$17084 million ODIs. Till now, Taiwan has become the second largest (after Japan) outward investor in the ASEAN region.

Table 4.18. Taiwan's Outward Direct Investment from 1952 to 1996 (Unit: US$ million)

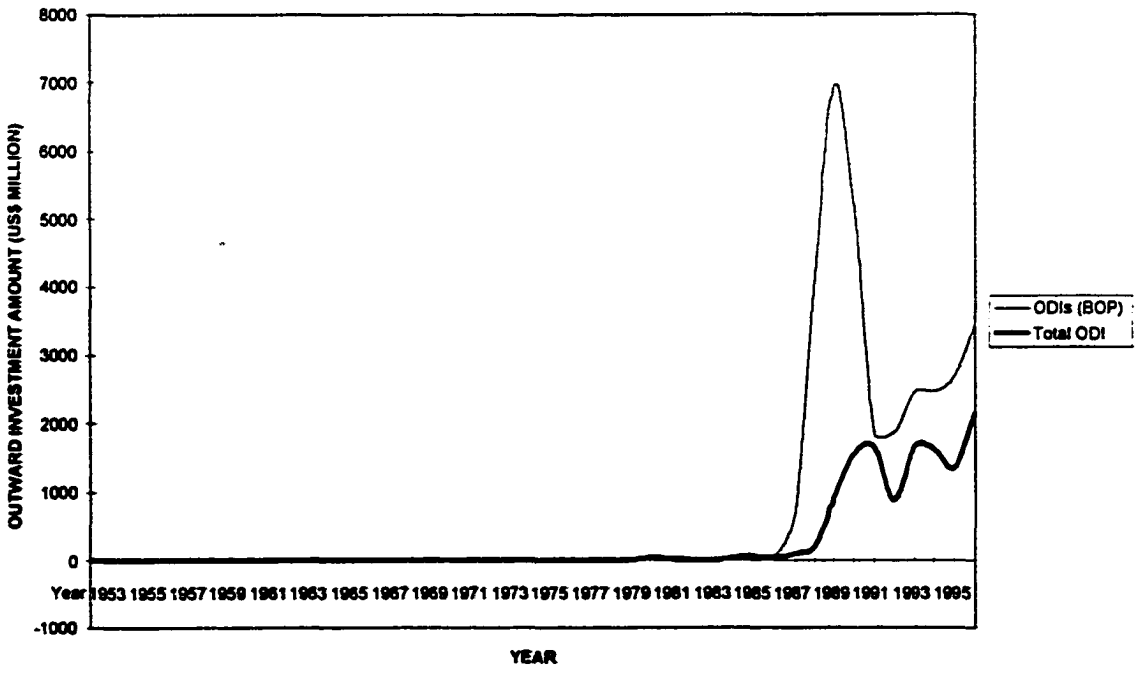
Period	AODI[1]	BOPODI[2]
1952-1960	0.1	0
1961-1965	3.91	0.47
1966-1970	4.10	3.73
1971-1975	18.34	5.37
1976-1980	74.91	59.76
1981-1985	113.56	251.55
1986-1990	2861.59	17084
1991-1996	9343.27	14746

Note: 1. AODI-Approved Outward Direct Investment
2. BOPODI-Outward Direct Investment in Balance of Payment

Source: ***Statistics on Overseas Chinese & Foreign Investment, Outward Investment, Outward Technological Cooperation, Indirect Investment, Guide to Mainland Industry Technology*** (1996), Taipei, Taiwan: Investment Commission, MOEA.

The recent surge of ODIs from Taiwan was essentially the result of the transformation of Taiwan's economy. As we described in last subsection, since 1980, Taiwan has gradually lost its comparative advantages in labor-intensive industries/segments because of rising wage level and shortage of less skilled labor. The enforcement of the Labor Standard Law (LSL) made the situation even worse (San Gee, 1992). Also, due to the large trade surplus Taiwan realized with the United State, the US authorities forced Taiwan to substantially appreciate the New Taiwan Dollar (NT$) *vis-a-vis* the US$. Hence, exporting labor intensive products from Taiwan became less and less profitable. Owing to the above situation, a massive shift of labor intensive production processes to nearby LDCs (including Southeast Asian countries and Mainland China) took place (see Table 4.19). Nevertheless, most Taiwanese firms did not move their headquarters to the

FIGURE 4.10. TREND FOR TAIWAN'S OUTWARD INVESTMENT FLOWS (FROM BOP AND APPROVED CASES)



new production bases at the same time. They still kept R&D function, marketing

Table 4.19. The Regional Distribution of Taiwan's Outward Investment Flows (in US$1,000) from 1952 to 1996

	1952-60		1961-65		1966-70		1971-75		1976-80		1981-85		1986-90		1991-96	
Home Country / Region	Amount	Share[1]	Amount	Share	Amount	Share	Amount	Share	Amount	Share	Amount	Share	Amount	Share	Amount	Share
Developed Areas																
Japan	0	0.00	0	0.00	0	0.00	50	0.27	922	1.23	23	0.02	7657	0.27	110380	1.18
USA	0	0.00	0	0.00	100	2.44	2001	10.91	41865	55.88	73233	64.48	1176782	41.12	1683310	18.02
Canada	0	0.00	0	0.00	0	0.00	25	0.14	0	0.00	0	0.00	44251	1.55	16838	0.18
UK	0	0.00	0	0.00	0	0.00	13	0.07	2328	3.11	891	0.78	12288	0.43	288120	3.08
Germany	0	0.00	0	0.00	22	0.54	0	0.00	10	0.01	0	0.00	13356	0.47	35221	0.38
Netherlands	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	7552	0.26	47650	0.51
Australia	0	0.00	896	22.90	0	0.00	0	0.00	0	0.00	275	0.24	7730	0.27	46633	0.50
Developing Areas																
Hong Kong	0	0.00	446	11.40	1107	26.98	818	4.46	1498	1.99	4266	3.76	53062	1.85	702761	7.52
Singapore	0	0.00	838	21.42	328	7.99	2096	11.43	3834	5.12	2203	1.94	60999	2.13	388162	4.15
South Korea	0	0.00	0	0.00	0	0.00	0	0.00	360	0.48	0	0.00	2611	0.09	9721	0.10
South Eastern Asia[2]	100	100	1732	44.27	2541	61.93	5564	30.34	18230	24.33	25931	22.84	871810	30.47	2385480	25.53
Others																
Total	100	100	3912	100	4103	100	18336	100	74914	100	113556	100	2861590	100	9343270	100

Note: 1. The unit of share is the percentage of total approved outward investment
2. The South Eastern Asia Area considered here includes Philippine, Thailand, Indonesia, and Malaysia.

Source: *Statistics on Overseas Chinese & Foreign Investment, Outward Investment, Outward Technological Cooperation, Indirect Investment, Guide to Mainland Industry Technology* (1996), Taipei, Taiwan: Investment Commission, MOEA.

Table 4.20. The Sectoral Distribution of Taiwan's Outward Investment Flows (in US$1,000) from 1952 to 1996

	1952-60		1961-65		1966-70		1971-75		1976-80		1981-85		1986-90		1991-96	
Economic Sectors	Amount	Share[1]	Amount	Share	Amount	Share	Amount	Share	Amount	Share	Amount	Share	Amount	Share	Amount	Share
Agriculture & Forestry	0	0.00	0	0.00	0	0.00	425	2.32	0	0.00	200	0.18	5638	0.20	21283	0.23
Fishery & Animal	0	0.00	0	0.00	13	0.32	0	0.00	3781	5.05	378	0.33	900	0.03	3675	0.04
Mining	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	14228	0.15
Food & Beverage	0	0.00	620	15.85	1210	29.49	5867	32.00	273	0.36	2250	1.98	170615	5.96	156047	1.67
Textile	0	0.00	1685	43.07	30	0.73	1771	9.66	24	0.03	7170	6.31	92204	3.22	440157	4.71
Garment & Footwear	0	0.00	112	2.86	0	0.00	637	3.47	0	0.00	826	0.73	4745	0.17	76749	0.82
Leather & Fur Products	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	140	0.12	3790	0.13	5264	0.06
Lumber & Bamboo Prod.	0	0.00	147	3.76	0	0.00	1268	6.92	2550	3.40	33	0.03	11288	0.39	90967	0.97
Paper & Printing	0	0.00	0	0.00	0	0.00	0	0.00	1960	2.62	13689	12.05	28742	1.00	186362	1.99
Chemicals	0	0.00	0	0.00	0	0.00	508	2.77	38448	51.32	4253	3.75	530872	18.55	567410	6.07
Rubber Products	0	0.00	0	0.00	508	12.38	979	5.34	6998	9.34	1437	1.27	68431	2.39	138885	1.49
Non-metallic Minerals	100	100	950	24.28	1127	27.47	3311	18.06	2253	3.01	5220	4.60	128151	4.48	244929	2.62
Basic Metals & Metal P.	0	0.00	308	7.87	145	3.53	1165	6.35	1023	1.37	3669	3.23	56320	1.97	544110	5.82
Machinery Equipment	0	0.00	8	0.20	114	2.78	0	0.00	200	0.27	650	0.57	13299	0.46	24888	0.27
Electronic & Electric Appliances	0	0.00	0	0.00	626	15.26	1100	6.00	8918	11.90	56417	49.68	650160	22.72	1180896	12.64
Construction	0	0.00	66	1.69	0	0.00	50	0.27	1107	1.48	758	0.67	42067	1.47	88004	0.94
Trade	0	0.00	16	0.41	325	7.92	1115	6.08	7263	9.70	5931	5.22	93011	3.25	790526	8.46
Banking & Insurance	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1050	0.92	690120	24.12	3153299	33.75
Transportation	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	27537	0.96	326797	3.50
Services	0	0.00	0	0.00	0	0.00	50	0.27	116	0.15	8855	7.80	221125	7.73	606145	6.49
Others	0	0.00	0	0.00	5	0.12	90	0.49	0	0.00	630	0.56	22575	0.80	682651	7.31
Total	100	100	3912	100	4103	100	18336	100	74914	100	113556	100	2861590	100	9343270	100

Note: 1. The unit of share is the percentage of total approved outward investment

Source: *Statistics on Overseas Chinese & Foreign Investment, Outward Investment, Outward Technological Cooperation, Indirect Investment, Guide to Mainland Industry Technology* (1996), Taipei, Taiwan: Investment Commission, MOEA.

function and new or more complex production operations in Taiwan. Hence, the ODIs to LDCs are essentially the strategic actions of Taiwanese firms for carrying out international division of labor that can both exploit other LDCs' cheap natural factors (mainly labor force) or enhance their production efficiency. In other words, these ODIs are essentially resource-seeking type or efficiency seeking type. Through these kinds of ODIs, the investing Taiwanese firms can, thus, maintain their competitiveness in labor-intensive products. This strategy is very crucial for many Taiwanese firms, since they normally use the profits earned from labor-intensive products to finance the upgrading of their process and product technologies. Hence, for Taiwan, the ODIs to nearby LDCs actually assist the economy's transition from labor-intensive products to more created-asset intensive products.

From Table 4.20, we can see that, in 1950s, there was no ODI for almost all the sectors. The only exception was non-metallic minerals which merely had a small amount of ODI. During 1961-65, textile had the largest share of total ODIs (43.07%), while food & beverage and non-metallic minerals also had some share of ODIs (15.85% and 24.28% respectively). In 1966-70, food & beverage became the top sector of ODI. After 1975, chemicals and electronic & electric appliances turned out to be the major sectors that made ODIs. During 1986-1990, the amount of ODIs from all sectors had huge growth. Banking & insurance, especially, had the most rapid growth, and became the sector that had the largest share of total ODIs.

Since 1985, some Taiwan MNEs started to undergo market seeking or even strategic asset seeking ODIs. For example, Taiwan's largest computer manufacturer, Acre Computer Inc. acquired several U.S. firms (including Counterpoint, Service Intelligence, Altos Computer System, etc.) in order to get access to different market segments of U.S. market, and to get access to related

computer technologies. This reflects that certain Taiwan's economic sectors already stepped into new stage of development in which more advanced capabilities rather than cheap labor have become the major concern for their ODIs. Since created asset based sectors are becoming more and more important to Taiwan's economy, we can expect that strategic asset acquiring ODIs from Taiwan will become more and more prevalent as well.

4.3.3. An Overview of Taiwan's International Inter-Firm Cooperation

The emergence of international inter-firm or inter-organizational cooperative arrangements in Taiwan was clearly witnessed after 1990. Most of the cases occurred in information industry, which is also the major sector responsible for Taiwan's exports (30.9% of total exports in 1993). As mentioned in section 4.2, in addition to the superior technological capabilities possessed by Taiwanese firms, several causes may also lead to such development. First, due to the complexity and complementarity existing in information technologies and the huge R&D investment involved, there is increasing needs for major players of this global industry to collaborate with each other. Secondly, in order to reduce the effort and time for upgrading its industrial competitiveness (in terms of marketing, technological and financial capabilities), Taiwanese firms as well as the government strongly sought for the conclusion of strategic alliances with foreign MNEs. There are several forms of such international inter-firm cooperation between Taiwanese firms and foreign MNEs: (1) cooperative agreements (such as technical training/start-up assistance agreement, production/buyback agreement); (2) consortium (such as R&D consortium); (3) joint ventures; (4) strategic alliances; and (5) acquisition and merge (A&M). Since late 1980s, different kinds of international inter-firm cooperation have been concluded between Taiwanese firm and US firm. For example, in semiconductor industry,

at lease 6 Taiwanese firms have concluded joint ventures with Japanese or US firms to produce DRAM. There were many others reported by MOEA's research papers (see for example, the monthly report on information industry published by Taiwan's Institute for Information Industry).

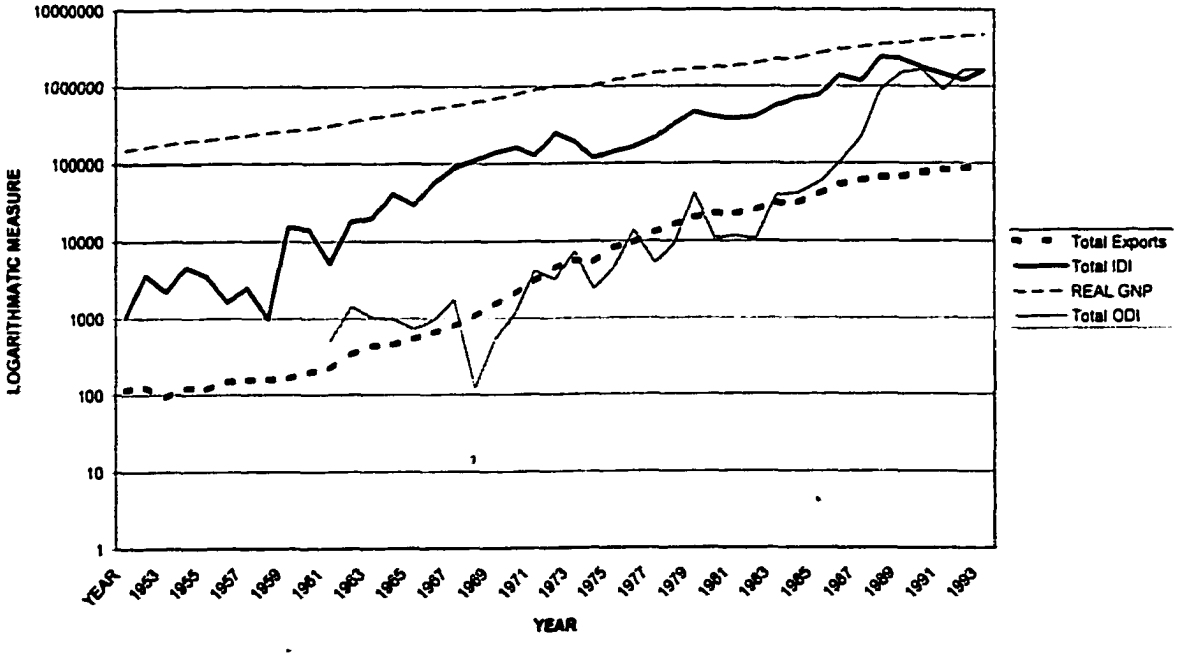
The government also plays an important role in helping Taiwanese firms to conclude international inter-firm cooperation with foreign MNEs. Since 1993, the government strongly promoted Taiwan as a "regional operations center" for MNEs. The major goal of this policy is to encourage foreign MNEs to select Taiwan as their regional operating headquarters, and to collaborate with indigenous firms. Through this process, Taiwan's firms are expected to develop and upgrade their competencies through the help from foreign MNEs. In order to achieve this objective, Taiwan has initiated a number of ambitious projects (such as the building of new international airports and seaport facilities, the installation of information super highway, etc.) to improve its physical infrastructure. Moreover, the MOEA aggressively seeks for the willingness of foreign MNEs (such as AT&T, GM, Philips, Texas Instruments) to establish strategic alliances with Taiwanese firms. Till August 1994, there are already 11 large MNEs (such as AT&T, Philips, Westing House, GM) expressed their wills to establish strategic alliances with Taiwanese firms.

4.4. The Historical Relationship between Taiwan's Economic Development and Its International Business Activities

4.4.1. The Relationship between Taiwan's Economic Growth and Its International Business Activities

Taiwan's economy as a whole has close association with its international business activities. From Figure 4.11, we can see that the trend lines for Taiwan's exports, real GNP, total IDIs and total ODIs all move upward over time, and they seem to move in a parallel way. This implies that, for the past 45 years, Taiwan's export and real GNP did have positive association with its total IDIs and total ODIs, although there were fluctuations in total IDIs and total ODIs. Figure 4.11 provide us preliminary evidence regarding the positive impacts that Taiwan's international business activities had brought to its economic

FIGURE 4.11. RELATIONSHIP BETWEEN TAIWAN'S REAL GNP, EXPORTS AND INTERNATIONAL INVESTMENT



development. In the following section, we will examine the impacts of international business activities upon the development of individual economic sector. This may give us more hints regarding the question whether the impacts from international business activities may vary from one economic sector to another.

4.4.2. The Relationship between the Development of Taiwan's Major Economic Sectors and Its International Business Activities: A Preliminary Review

In order to assess the impacts of international business activities upon the development of Taiwan's individual economic sector, we may need to examine how each sector's past performance was associated with the magnitude of its international business activities. Here, we will have a preliminary review of this association through the graphical presentation of the relationship between Taiwan's international business activities and the development of its major economic sectors. Later in next chapter, we will use statistical methods to assess the relationship between these two aspects in a more rigid way.

To observe each economic sector's development over time, we will use the yearly RCA value, the amount of GDP and the amount of exports created by each sector during 1952-1994 to reflect its development. Also, we will use each sector's yearly total IDIs and total ODIs to represent the magnitude of international business activities occurred in that sector.

From Figure 4.12, we can see that IDIs and ODIs of agricultural sector do not seem to have clear relationship with its GDP, exports and RCA value. Its GDP and exports tend to rise over time, while its RCA value appears to decline after 1970 and then became stable around certain level. These trends were very different from those for IDIs and ODIs, which had significant fluctuation over time. Similar relationship was observed in fish & animal (Figure 4.13), and mining sectors (Figure 4.14). The total IDIs and ODIs of these sectors all seemed to behave in a fluctuating way, which was not consistent with the trends of these sectors' GDP, exports and RCA values.

In food & beverage sector (see Figure 4.15), IDIs appear to have positive association with its GDP and exports. However, from the graph, it seems that the relationship was not very strong. Although the trend for IDIs of food sector did

FIGURE 4.12. TREND FOR THE DEVELOPMENT OF AGRICULTURAL SECTOR

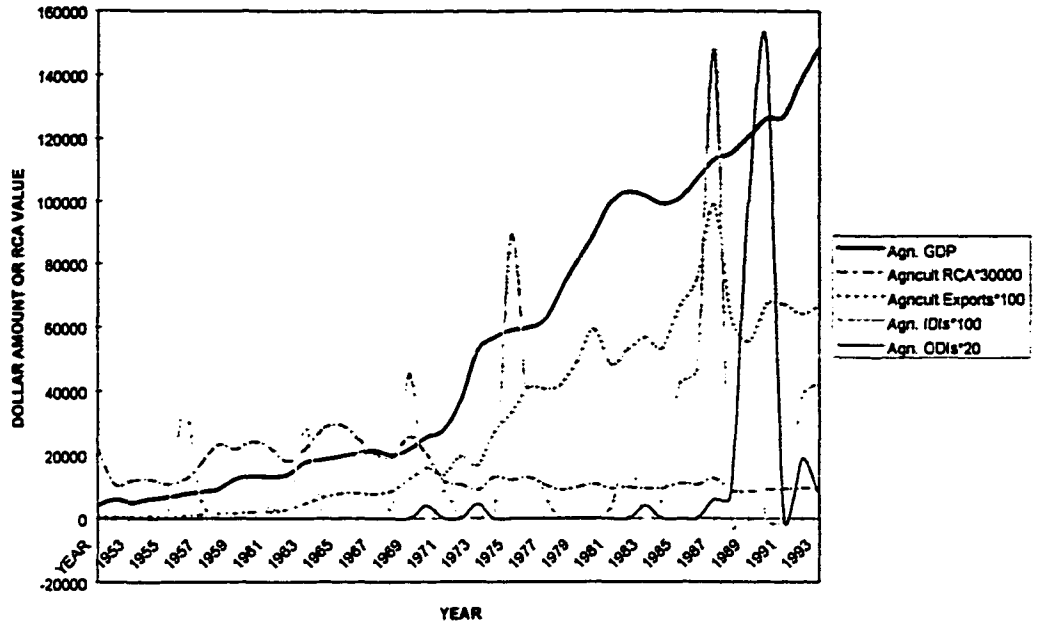
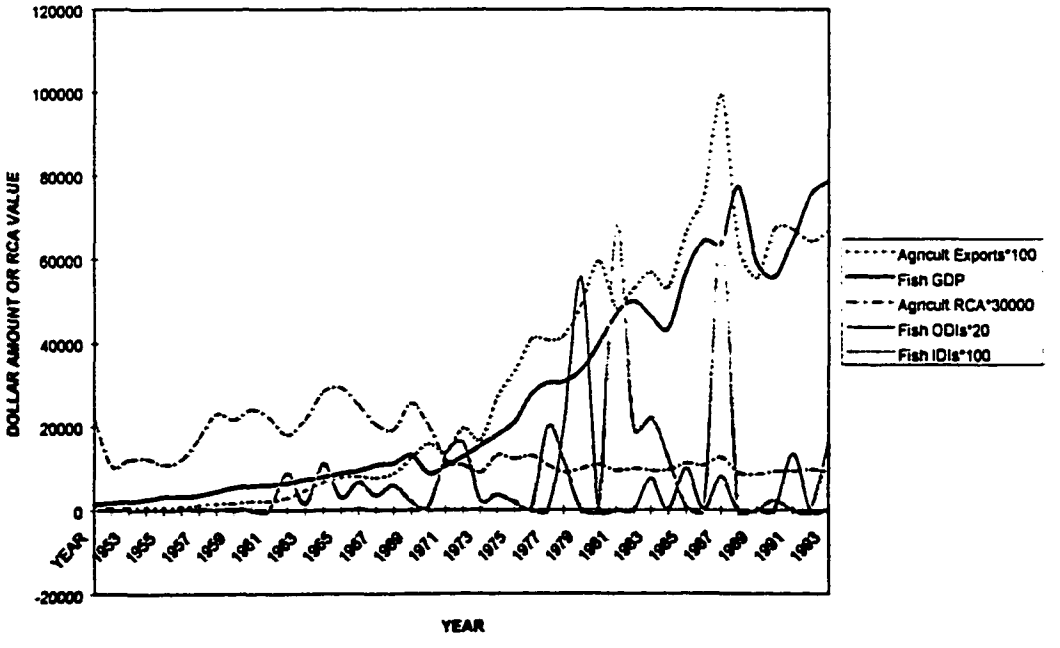


FIGURE 4.13. TREND FOR THE DEVELOPMENT OF FISH & ANIMAL SECTOR



tend to rise over time, nevertheless, there was notable fluctuation between 1985 and 1990. As for ODI in this sector, its association with GDP, exports and RCA value could be rather limited, as shown in the graph.

In textile sector (see Figure 4.16), the association among all the indicators is weak too. The trends for IDIs and ODIs both looked like moving upward, while those for GDP, exports and RCA value also behaved the same way. However,

FIGURE 4.14. TREND FOR THE DEVELOPMENT OF MINING SECTOR

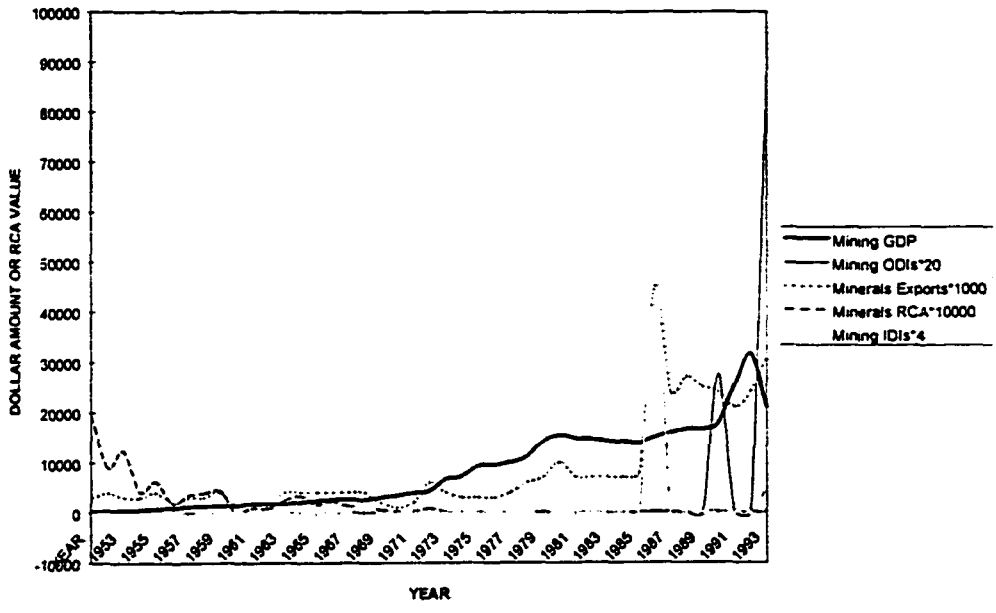
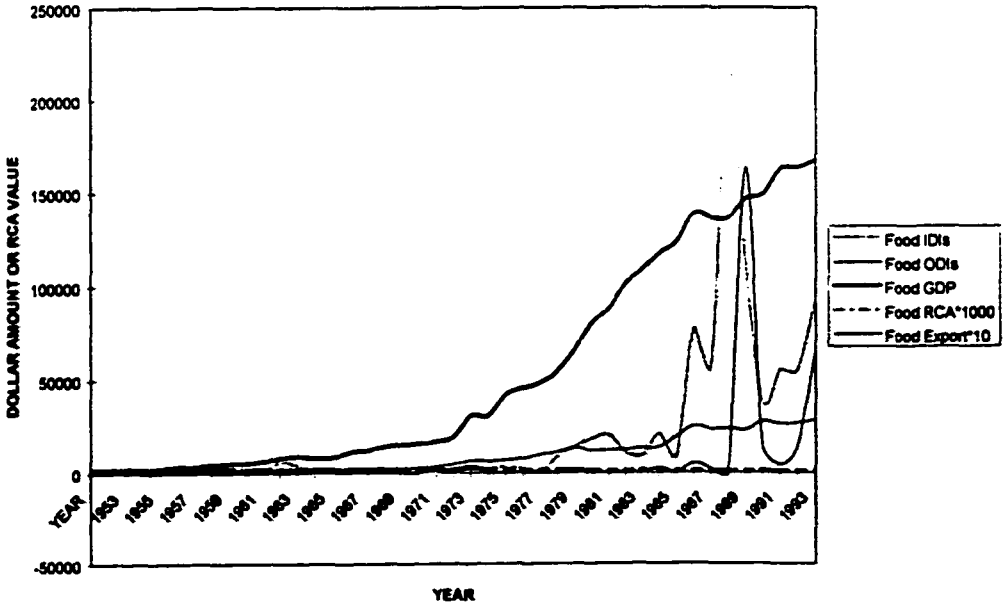


FIGURE 4.15. TREND FOR THE DEVELOPMENT OF FOOD SECTOR



due to the fluctuation associated with IDIs and ODIs, the relationship needs to be examined more rigidly by statistical tests.

For non-metallic products (see Figure 4.17), the relationship between IDIs

FIGURE 4.16. TREND FOR THE DEVELOPMENT OF TEXTILE SECTOR

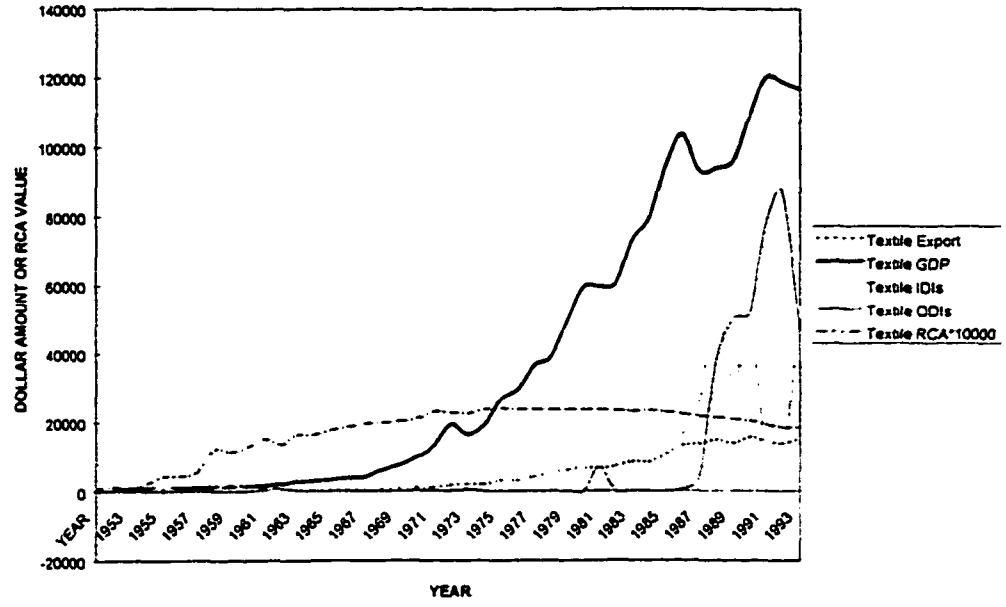
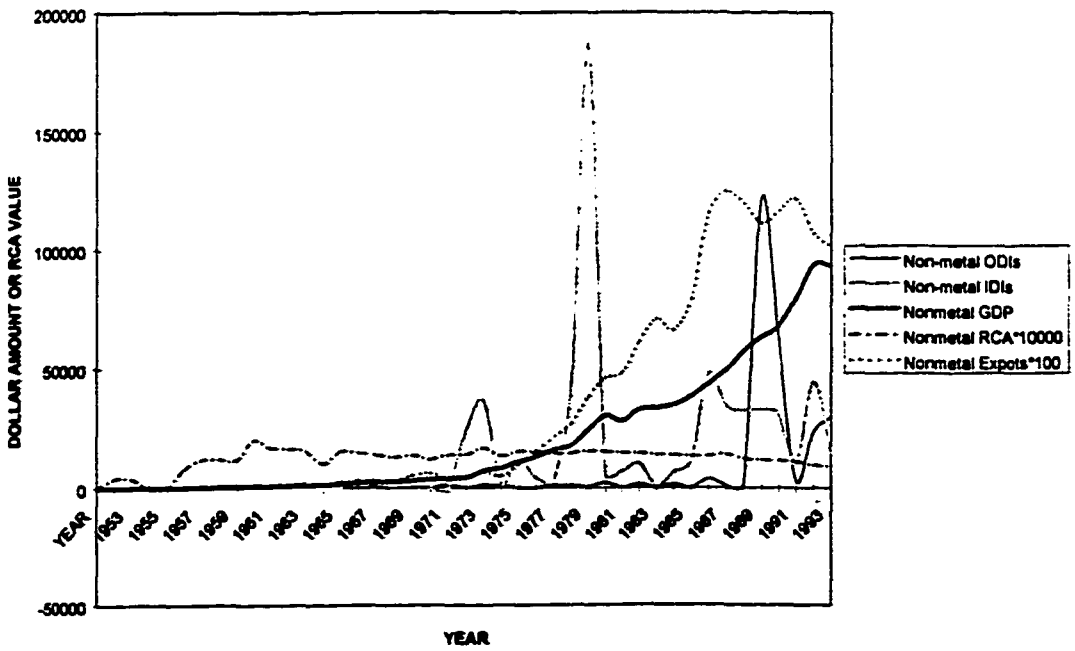


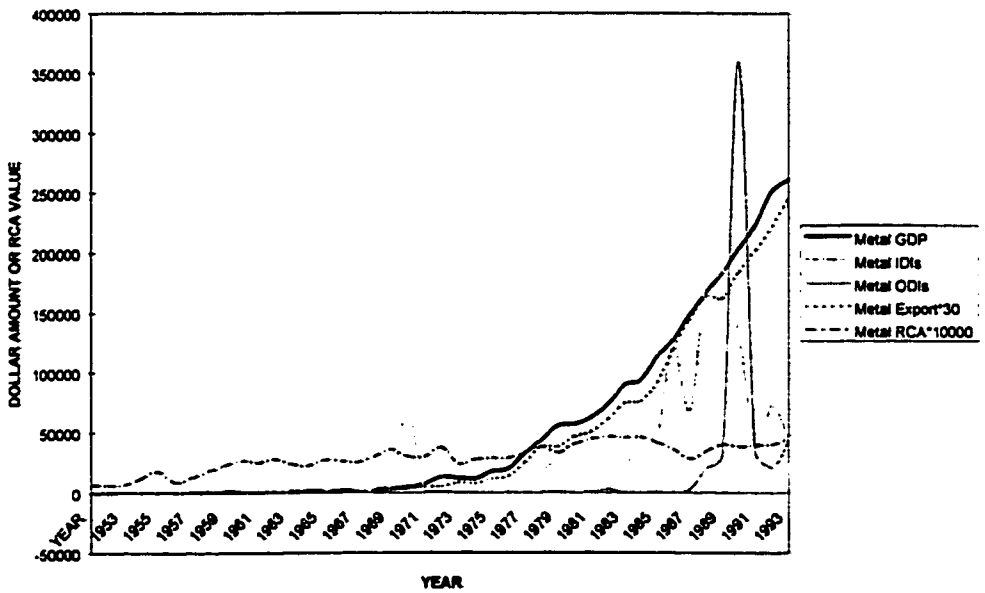
FIGURE 4.17. TREND FOR THE DEVELOPMENT OF NON-METALLIC PRODUCTS



and ODIs and other indicators was not very strong either. This sector's IDIs and ODIs also had clear fluctuation over time, while its GDP, exports and RCA value all moved in a stable way.

For metallic products (see Figure 4.18), the associations among IDIs, GDP, exports and RCA value seem to be positive. Their lines all tend to move upward over time. Nevertheless, due to the fluctuation in IDIs, we also need to use statistical methods to test the relationship. As to ODIs, its impact upon the development of metallic products could be very limited. The levels of ODIs were quite trivial for most of the time.

FIGURE 4.18. TREND FOR THE DEVELOPMENT OF METALLIC PRODUCTS



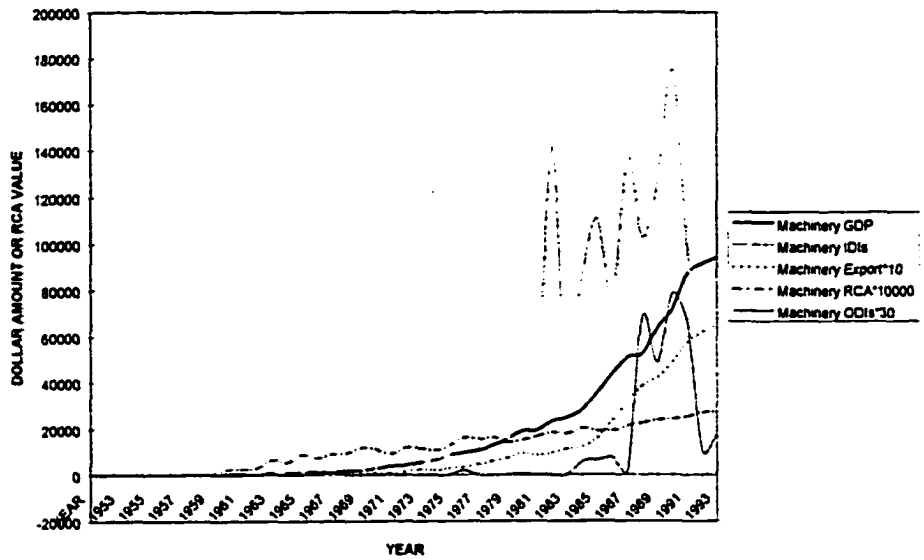
In machinery sector (see Figure 4.19), IDIs also tend to have positive relationship with its GDP, exports and RCA value. They seem to move upward over time. As to ODI, its relationship with GDP, exports and RCA value is not clear from the graph. The values of ODIs fluctuated from time to time. Hence, we need to rely upon statistical methods to find out the nature of their association.

In electronic & electric appliances (see Figure 4.20), the association among all indicators seem to be positive. All of them moved upward over the past 43 years.

In transport equipment (see Figure 4.21), the impact from IDIs and ODIs upon GDP, exports and RCA value should be limited. Most of this sector's international investment did not occur until the late 1980s.

In construction sector (see Figure 4.22), its GDP grows in a stable way. This is very different from the way its IDIs and ODIs behaved. Hence, the association among them should be insignificant.

FIGURE 4.19. TREND FOR THE DEVELOPMENT OF MACHINERY SECTOR



In service sector (see Figure 4.23), the relationship between IDIs and GDP seems to be positive. Although there was fluctuation in IDIs over time, both IDIs and GDP moved upward simultaneously. On the hand, the association between ODIs and GDP is difficult to determine simply by the graph. The amount of its ODIs was quite trivial before 1983, and suddenly jumped up after 1987. Again, we need to count on statistical method to examine the association.

For chemical sector (see Figure 4.24), we find that both its GDP and exports rose steadily since 1952. After 1976, the rise for GDP and exports was even sharper. As to RCA, the value tends to rise steadily in a more smooth way. Hence, in essence, the performance of chemical sector has risen steadily since

FIGURE 4.20. TREND FOR THE DEVELOPMENT OF ELECTRONIC SECTOR

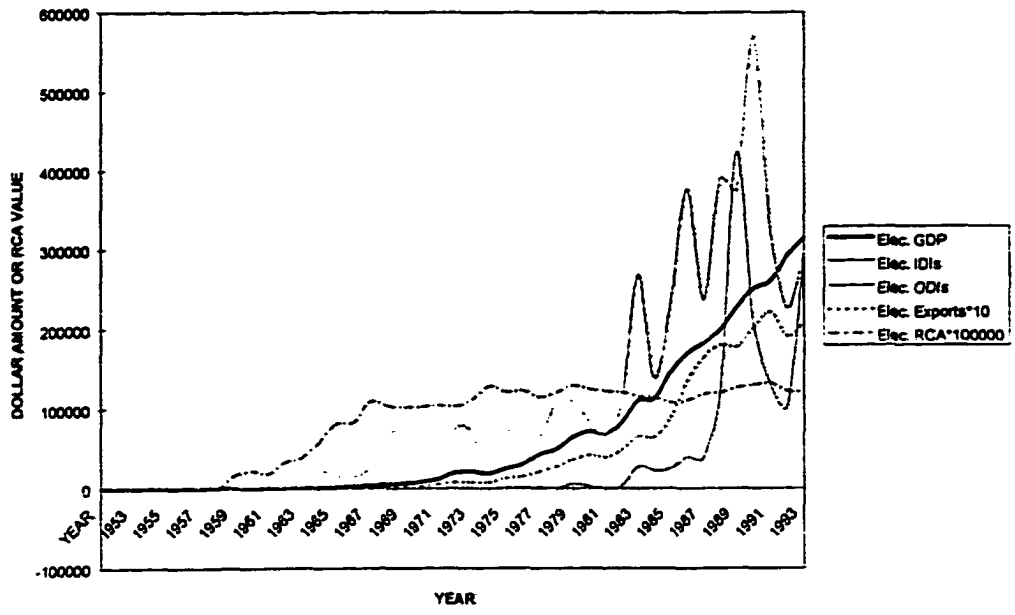
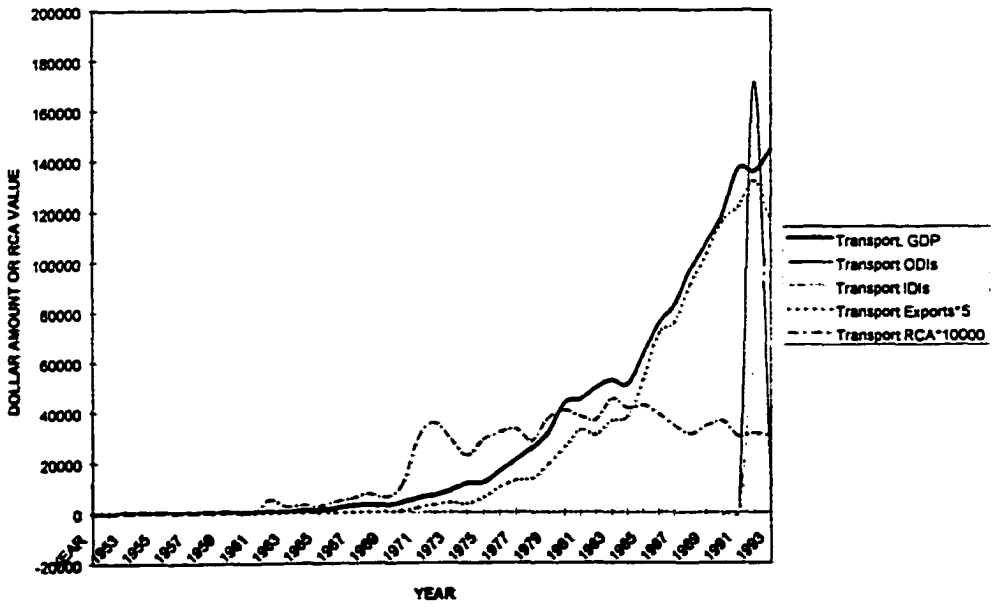


FIGURE 4.21. TREND FOR THE DEVELOPMENT OF TRANSPORT. EQIPMENT



1952. For international business activities of chemical sector, its IDIs also steadily rose since 1952, and also rose quickly after 1976 although there was fluctuation from time to time. For ODIs of chemical sector, the trend is less clear. Basically, the values of ODIs fluctuated rather significantly. Therefore, it seems that, for

chemical sector, IDIs may have positive association with the performance of chemical sector.

FIGURE 4.22. TREND FOR THE DEVELOPMENT OF CONSTRUCTION SECTOR

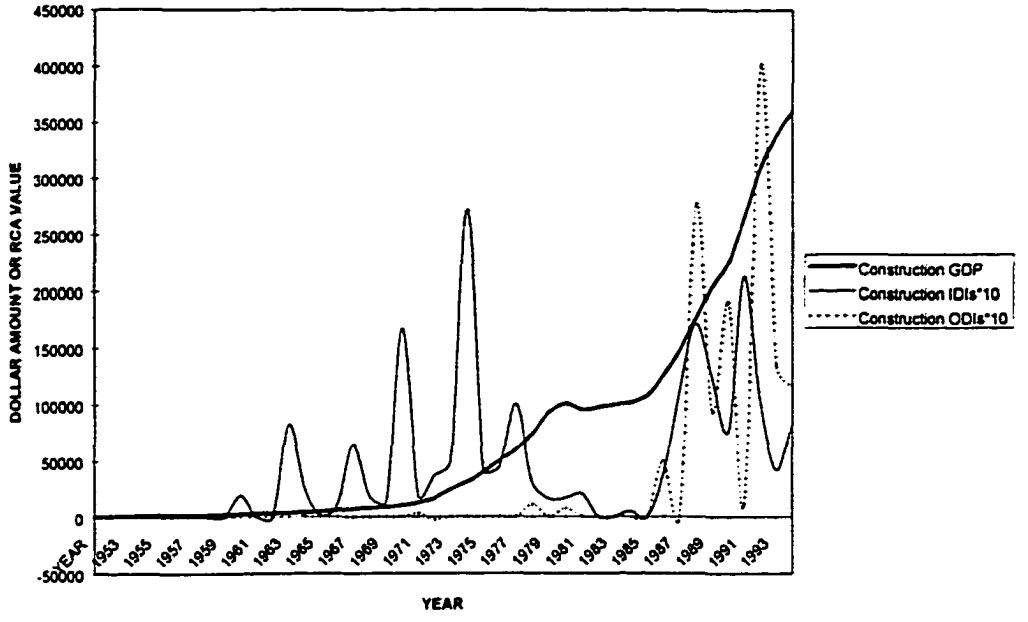


FIGURE 4.23. TREND FOR THE DEVELOPMENT OF SERVICE SECTOR

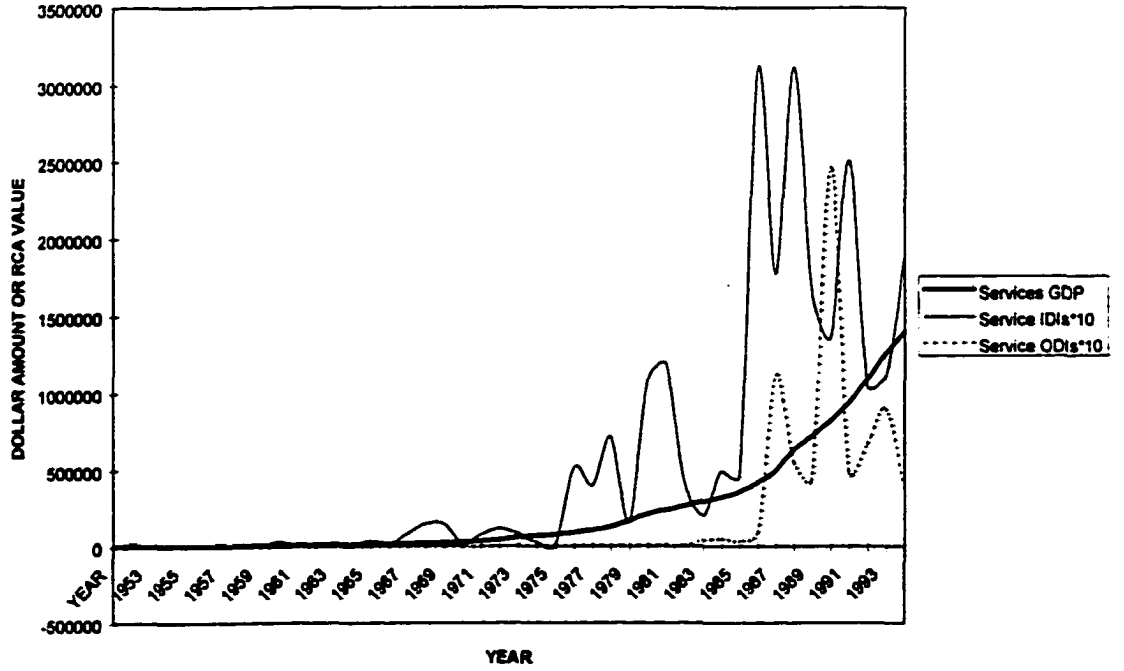
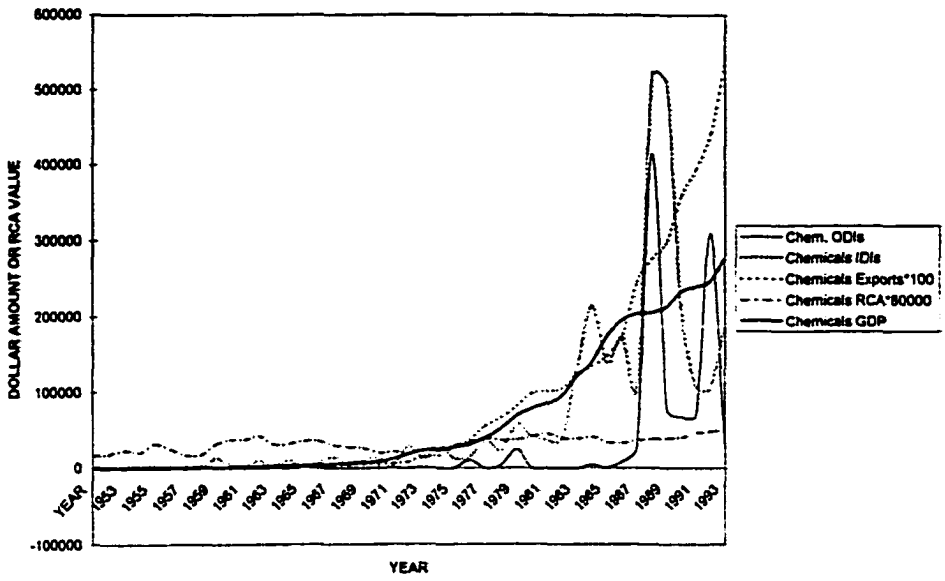


FIGURE 4.24. TREND FOR THE DEVELOPMENT OF CHEMICALS SECTOR



4.6. The Role of Taiwan's Small and Medium-Sized Enterprises in Structural Adjustment

Small and medium-sized enterprises are quite important to Taiwan's economic development (Lin & Kirchhoff, 1996). Therefore, in addition to examining how IBAs might have affected both Taiwan's individual economic sector, and the process of Taiwan's structural adjustment, we also need to pay attention to the role of SMEs in Taiwan's structural adjustment, and how these private enterprises were related to IBAs.

From various economic indicators, it is clear that the contribution of SMEs to Taiwan's economy has been significant (Chou, 1992). Since Taiwan decided to pursue export-led type of economic growth in 1960s, for years, over half of Taiwan's manufacturing exports came from SMEs. In other words, SMEs produced more than 60% of Taiwan's industrial goods. Moreover, Taiwan's SMEs have a higher relative export-intensity than large firms do. This is a

distinctive feature of Taiwan's economic development, and is contrary to the experience of many industrialized countries, such as the U.S., Belgium, France, and Japan (see for example, Rapp, 1976; Acquier, 1980; Jacquemin, 1980). Based on this fact, then, it is important for us to understand how Taiwan's SMEs may be related to the interaction between Taiwan's structural adjustment and IBAs.

Basically, Taiwan's SMEs were the major organizational forms that brought about the realization of Taiwan's structural adjustment from agricultural economy to labor-intensive sectors, or even certain technology-intensive sectors. Through the operations of these SMEs, Taiwanese firms could gradually acquire firm-level capabilities from foreign MNEs.

The dominant position of Taiwan's SMEs can be attributed to the history of Taiwan's environment. In 1949, the Kuomintang (KMT) party took control of Taiwanese government and the administration of the former Japanese industries. The KMT government took over ownership and tightly controlled the former Japanese firms who were large-scale, complex technological businesses and intermediate goods manufacturers. The government assisted these firms through direct intervention and financial support.

On the other hand, in sectors of low capital intensity such as electronics assembly and textile manufacturing, the government intervened less and therefore, offered more opportunities for private enterprises to enter and establish competitive operations. Nevertheless, because state-owned banks controlled most capital, and most available capital was used to support the development of state-owned enterprises, the majority of private enterprises actually had difficulties in accumulating capital for their operations. As a result, most private firms were small or medium-sized.

Another factor that contributes to the proliferation of Taiwanese SMEs in international trade is related to government's encouragement of exports since

late 1950s. After recognizing the rising trend of world trade activities, Taiwanese government refocused its policy towards industrial promotion through the export of labor-intensive goods (Clark, 1989). This development strategy was suited to Taiwan's comparative advantages of that time when Taiwan was rich in low-cost and high quality labor. In response to this policy, new small trading firms formed quickly and linked the manufacturing subcontractors to export trade. This trader-subcontractor relationship has worked very successfully and significantly promoted the growth of Taiwan's exports.

In addition to the above factors, after 1965, Taiwanese government also adopted a policy encouraging MNEs to make direct investment in Taiwan. This policy together with the cheap and well-trained labor force, the absence of labor strike and political stability successfully attracted the inward investment from MNEs. The subsequent establishment of MNE's manufacturing plants in Taiwan contributed to the growth of Taiwanese SMEs in another way. As more Taiwanes became exposed to modern production and management techniques, they gained an accumulation of knowledge which they then carried into the operations of Taiwan's SMEs (Hoesel, 1996).

The above factors explain why SMEs are so popular and important to Taiwan's economic development. From these factors, we could also understand the role of SMEs in Taiwan's structural adjustment.

First, by noticing the demands from foreign buyers, Taiwan's SMEs first introduced the economic sectors that were not adequately considered by government or large firms from the beginning. One example for this is the emergence of Taiwan's industries related to electronic components and computer. Initially, only SMEs entered these sectors by performing assembly operations or simple manufacturing processes. As the market expanded, more and more firms (including large firms and state-owned firms) joined the

production of these products, and the value activities performed by Taiwanese firms were also gradually upgraded to more technology-intensive products or components.

Secondly, through the contacts with foreign purchasers, Taiwan's SMEs progressively improved their technological and managerial capabilities that were crucial for the upgrading of Taiwan's industrial activities. For most Taiwan's manufacturing SMEs, the assistance from foreign firms was not through either technology transfer agreement or any other formal inter-firm cooperative forms. In order to meet the product standards set by foreign buyers, most manufacturing SMEs, from time to time, received product specifications or certain technological assistance from foreign buyers who ordered the products. Then, by working with other SMEs within the same production networks, or sometimes with foreign buyers, SMEs were not only able to meet the standards set by foreign buyers, but also keep accumulating their knowledge of product and process technology. Although the technologies accumulated through this approach may not enable SMEs to produce or design the most advanced products on their own within short time, these technologies were still the basis for them to enter more advanced segments in the long run.

Another approach that Taiwan's SMEs may acquire technological and managerial capabilities from foreign MNEs is through the previous workers of foreign MNEs. Many previous workers of foreign MNEs either established their own businesses (also SMEs) or became employees of SMEs after they left the subsidiaries of foreign MNEs. This is especially popular for manufacturing SMEs in electronics sectors. By applying the knowledge they learned from foreign MNEs to the operations of SMEs they worked for, these experienced professionals gradually transferred some of the advanced capabilities owned by foreign MNEs to Taiwanese firms.

Hence, from the above discussion, it is clear that SMEs were very important for Taiwan's structural adjustment, especially the transition from agricultural economy to an economy that depends more upon manufacturing industrial and consumer goods. Through sub-contracting relationship with foreign buyers and the help from previous workers of foreign MNEs, Taiwan's SMEs successfully built the technological foundation and development path for later stages. However, due to the limitation of financial resources and ways to acquire technological capabilities, Taiwan's SMEs were still unable to compete with foreign MNEs in more advanced segments. In stead, most of these SMEs cultivated competitive advantages in manufacturing processes through either low-cost labor or efficient ways to perform manufacturing value activities.

That's why only after large firms or government agencies were willing to invest in R&D or sophisticated process technology, can Taiwan's economy actually moves to more advanced and higher value-added product segments.

CHAPTER 5

EMPIRICAL EVIDENCE: STATISTICAL TESTS FOR THE IMPACTS OF INTERNATIONAL BUSINESS ACTIVITIES UPON TAIWAN'S ECONOMIC SECTORS AND STRUCTURAL ADJUSTMENT

5.1. Variables and Data Used for the Statistical Analyses

5.1.1. Variables for the Statistical Analyses

In previous chapters, we already identify how international business activities may be related to an economy's economic sectors and the different aspects of an economy's structural adjustment. In this chapter, we will consider the empirical evidence for the impacts of international business activities upon sectoral development and structural adjustment. The main purpose of the empirical tests is to determine if the impact from international business activities upon a country's economic sectors will follow the causal relationship we predicted in Chapter 3.

The sample used in this study consists of data collected from 10 major economic sectors of Taiwan from 1952 to 1994. Again, as we described in chapter 3, these sectors are selected mainly based on the classification used by *World Investment Directory*. The classification is made according to the technological intensity associated with each sector's value activities. Hence, it reveals the importance of technological capabilities in different sector's value activities. Since the effective use of technological capabilities in value activities also demands the use of other complementary created-assets (such as skilled labor force and sophisticated organizational skills), hence, the above classification also shows us the importance of natural assets and created assets to each economic sector. In addition to this classification, the availability of data for FDI, exports and domestic production volume is also taken into consideration. Therefore,

based upon the above consideration, we have the following three groups of economic sectors: (1) primary sectors: including agriculture and mining; (2) less creative-asset intensive sectors (less CA sectors): including food, textile, non-metallic mineral products and metallic products; (3) created-asset intensive sectors (CA sectors): including chemicals, mechanical equipment and electrical equipment. The above classification shows that primary sectors depend mostly on the availability of natural country-level resources. Less CA sectors depend partly upon natural country-level resources, and partly upon country-level and firm-level created assets. CA sectors, on the other hand, depend largely upon the availability and the quality of both country-level and firm-level created assets.

In order to assess the impacts from international business activities upon sectoral development and structural adjustment, three groups of dependent variables are used in the statistical tests. Of these dependent variables, the first three groups are used for measuring the following two aspects: the performance achieved by each economic sector and the efficiency achieved by each economic sector. They are used for analyzing the impacts from international business activities upon the development of an economy's economic sectors. The third group of dependent variables is, on the other hand, used to measure the extent of structural adjustment achieved by an economy over time. They are used for evaluating the impacts from international business activities upon the structural adjustment of an economy.

The first group of dependent variables is to measure various aspects of the performance achieved by each sector. They include: (1) the domestic production volume made by each of the 10 economic sectors selected for our analyses (denoted by DP_i): this measure is to determine the value of outputs produced by each sector; (2) the export volume made by each sector (denoted by EXP_i): this measure is to determine the value of exports created by each sector; and (3) the

revealed comparative advantage of each sector (denoted by RCA_i): this measure is to appraise each sector's international competitiveness in trade. It is defined as: $[1 + (X_i - M_i) \div (X_i + M_i)] \div [1 + (X_t - M_t) \div (X_t + M_t)]$ where X = exports, M = imports, i = a particular sector, t = all sectors.

The second group of dependent variables is concerned with the efficiency achieved by each sector (EFF_i). It is measured by the average production volume produced by each employee, and is defined as: $EFF_i = DP_i \div EMP_i$ where EMP = the number of employees, i = a particular sector.

The last group of dependent variables measures an economy's structural adjustment. Two measurements will be used to evaluate the extent of an economy's transformation from primary sectors to less CA sectors, and from less CA sectors to CA sectors. The first one is concerned with the GDP contribution made by various groups of economic sectors to the whole economy. The second one is related to the export contribution made by various groups of economic sectors to the whole economy. Both measures are used to see how international business activities may affect the importance of primary sectors, less CA sectors and CA sectors over time. The first measurement is related to the GDP contribution made by different sectoral groups ($SGDP_{ij}$). The mathematical definition of this measurement is: ($SGDP_{ij} = GDPR_i \div GDPR_j$) , where $GDPR$ = the percentage of an economy's GDP produced by a sectoral group[1], i, j = a particular sectoral group (which can be primary sectors, less CA sectors or CA sectors). Hence, as an example, when primary sectors are still the major economic sectors in the economy, we can expect that the ratio of $GDPR$ of less CA sectors (or CA sectors) to $GDPR$ of primary sectors will be rather small. As the economy

[1] The percentage of an economy's GDP produced by a sectoral group ($GDPR$) is defined as: $GDPR_i = \sum DP_j + GDP_T$ where i = a specific sectoral group that can be primary sectors, less CA sectors or CA sectors; j = a particular economic sector classified as sectoral group i; T = the whole economy.

gradually transforms from primary sectors to less CA sectors, it means that the GDP contribution by less CA sectors will become more and more important accordingly. As a result, the ratio of *GDPR* of less CA sectors to *GDPR* of primary sectors may turn out to be larger and larger over time. Similarly, when the economy gradually transforms from less CA sectors to CA sectors, the ratio of *GDPR* of CA sectors to *GDPR* of less CA sectors may also turn out to be larger and larger over time. Hence, we can use the above *GDPR* ratio as a proxy to the extent of an economy's structural adjustment from primary sectors to less CA sectors, or from less CA sectors to CA sectors.

Likewise, we may use the ratio concerning export contribution by different sectoral group to measure the extent of an economy's structural adjustment, in particular for those economies that highly depend upon exports for their economic growth. The measurement related to export contribution ($SEXP_{ij}$) is defined as: ($SEXP_{ij} = EXPR_i \div EXPR_j$), where *EXPR* = the percentage of an economy's total export produced by a sectoral group[2], i, j = a particular sectoral group (primary sectors, less CA sectors or CA sectors). Again, based on the same reasoning for $SGDP_{ij}$, we may anticipate that, as an economy gradually transforms from primary sectors to less CA sectors, the ratio of *EXPR* of less CA sectors to *EXPR* of primary sectors may turn out to be larger and larger over time. Also, when the economy gradually transforms from less CA sectors to CA sectors, the ratio of *EXPR* of CA sectors to *EXPR* of less CA sectors may also turn out to be larger and larger over time.

For independent variables, we will use four groups of FDI variables to represent the magnitude and characteristics of Taiwan's international business activities. The first group of FDI variables contains the annual approved inward

[2] The percentage of an economy's total export produced by a sectoral group (*EXPR*) is defined as: $EXPR_i = \sum EXP_j \div EXP_T$ where i = a specific sectoral group that can be primary sectors, less CA sectors or CA sectors; j = a particular economic sector classified as sectoral group i; T = the whole economy.

direct investments to each sector (IDI_i) and the yearly approved outward direct investments from each sector (ODI_i). They reflect the magnitude of each economic sector's inward and outward international business activities. By using this group of FDI variables, we may examine the statistical association regarding how the performance and the efficiency of individual economic sector are related to its international business activities. The second group of FDI variables is related to Taiwan's international business activities from and to developed countries. They include: (1) the annual approved inward direct investments from developed countries (*DCIDI*); and (2) the yearly approved outward direct investments to developed countries (*DCODI*). Both variables are used to measure the magnitude of inward and outward international business activities of which host countries or home countries are developed countries. These variables will be used in analyzing the statistical association concerning how the performance and the efficiency of CA sectors is affected by the economy's international business activities from and to developed countries. The last group of FDI variables include (1) the total approved inward and outward direct investment of primary sectors (*PRIDI* and *PRODI*); (2) the total approved inward and outward direct investment of less CA sectors (*LCIDI* and *LCODI*); and (3) the total approved inward and outward direct investment of CA sectors (*CAIDI* and *CAODI*). They are used to measure the magnitude of inward and outward international business activities taken place in three sectoral groups. By using these variables, we may analyze the statistical relationship between international business activities and an economy's structural adjustment.

Other than the above three groups of FDI variables, we also include lagged FDI variables into the list of independent variables. These lagged variables are produced by taking one-year and 2-year lagged values of all the FDI variables

discussed above. Hence, there are also three groups of lagged FDI variables: (1) one-year and 2-year lagged inward and outward FDI of each sector: They are produced by taking one-year and 2-year lagged values of IDI_i and ODI_i. Hence, they are defined as: $LAG1IDI_i = LAG1(IDI_i)$; $LAG2IDI_i = LAG2(IDI_i)$; $LAG1ODI_i = LAG1(ODI_i)$; $LAG2ODI_i = LAG2(ODI_i)$ where $LAG1()$ is the function for taking one-year lagged values, $LAG2()$ is the function for taking 2-year lagged values, i = a particular sector; (2) one-year and 2-year lagged FDI of which host countries and/or home countries are developed countries: Similarly, these lagged FDI variables are produced by taking one-year and 2-year lagged values of *DCIDI* and *DCODI*. They are defined as: *LAG1DCIDI* = *LAG1*(*DCIDI*); *LAG2DCIDI* = *LAG2*(*DCIDI*); (3) one-year and 2-year lagged FDI of primary sectors, less CA sectors and CA sectors: Again, these lagged FDI variables are produced by taking one-year to four-year lagged values of *PRIDI*, *PRODI*, *LCIDI*, *LCODI*, *CAIDI*, and *CAODI*, which are defined as: *LAG1PRIDI* = *LAG1*(*PRIDI*); *LAG2PRIDI* = *LAG2*(*PRIDI*); *LAG3PRIDI* = *LAG3*(*PRIDI*); *LAG4PRIDI* = *LAG4*(*PRIDI*); *LAG1PRODI* = *LAG1*(*PRODI*); *LAG2PRODI* = *LAG2*(*PRODI*); *LAG3PRODI* = *LAG3*(*PRODI*); *LAG4PRODI* = *LAG4*(*PRODI*); *LAG1LCIDI* = *LAG1*(*LCIDI*); *LAG2LCIDI* = *LAG2*(*LCIDI*); *LAG3LCIDI* = *LAG3*(*LCIDI*); *LAG4LCIDI* = *LAG4*(*LCIDI*); *LAG1LCODI* = *LAG1*(*LCODI*); *LAG2LCODI* = *LAG2*(*LCODI*); *LAG3LCODI* = *LAG3*(*LCODI*); *LAG4LCODI* = *LAG4*(*LCODI*); *LAG1CAIDI* = *LAG1*(*CAIDI*); *LAG2CAIDI* = *LAG2*(*CAIDI*); *LAG3CAIDI* = *LAG3*(*CAIDI*); *LAG4CAIDI* = *LAG4*(*CAIDI*); *LAG1CAODI* = *LAG1*(*CAODI*); *LAG2CAODI* = *LAG2*(*CAODI*); *LAG3CAODI* = *LAG3*(*CAODI*); *LAG4CAODI* = *LAG4*(*CAODI*). These lagged FDI variables are used to further verify the correct causal relationship between international business activities and sectoral development, as well as the relationship between international business activities and structural adjustment.

The purpose is to see if international business activities might have lagged impacts upon an economy's sectoral development and structural adjustment.

The above FDI variables do not cover those for Taiwan's inward and outward inter-firm cooperation. The statistics for Taiwan's inward and outward inter-firm cooperation are not available from either governmental or private publications. Hence, influences resulted from inter-firm cooperation can not be adequately captured from the statistical analyses made in this chapter.

5.1.2. Data Collection

The data on the independent variables and dependent variable were largely collected from the various statistical yearbooks published by Taiwan's government agencies. After considering the availability of data, all data were collected on a yearly basis and covered periods starting from 1952 till 1994. The data on DP_i and Taiwan's GDP are taken from Taiwan's *Statistical Yearbook of National Income* (1991 and 1996). The data on the exports and imports (for both individual sector and totals) were collected from *Taiwan Statistical Data Book* (1980 and 1996). The number of employees in each economic sector (EMP_i) was collected from Taiwan's *Yearbook of Manpower Statistics* (1980, 1996). As to FDI (including IDI_i, ODI_i, *DCIDI* and *DCODI*) data, they were gathered from Taiwan's *Statistics on Overseas Chinese & Foreign Investment, Outward Investment, Outward Technical Cooperation, Indirect Mainland Investment, and Guide of Mainland Industry Technology* (1997).

All other dependent variables (including RCA_i, EFF_i, $SGDP_{ij}$, and $SEXP_{ij}$), and independent variables (including *PRIDI, PRODI, CAIDI, CAODI* and all the lagged independent variables) were constructed on the basis of the above data collected from Taiwan's statistical books.

5.1.3. Statistical Models

The association among dependent and independent variables will be analyzed by using auto-regressive error models[3] and time series cross-sectional (TSCS) regression models[4]. For analyses regarding the association between international business activities and an economy's structural adjustment, we will use auto-regressive error models rather than ordinary least-square error models. The ordinary least-squares (OLS) parameter estimates of regular regression model is not adopted in these analyses because of the autocorrelation revealed by the data. From the generalized Durbin-Watson (DW) statistics and their marginal probabilities derived from ordinary least squares regressive models, it shows that the error terms for the dependent variables measuring an economy's structural adjustment are auto-correlated through time. Therefore, in order to avoid the risk that the efficiency of ordinary least-squares parameter estimates is adversely affected, we will, in stead, use auto-regressive error model to correct auto-correlation problem (Fuller, 1978; Greene, 1990).

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[3] Ordinary least-squares (OLS) regression model is expressed as:

$$y_t = \mathbf{X}_t'\beta + \varepsilon_t$$

Hence, it does not take into account the effects from auto-correlation of the errors. By incorporating the auto-correlation of the error terms, we have auto-regressive model of order p (AR(p) model) as following:

$$y_t = \mathbf{X}_t'\beta + v_t$$

$$v_t = \varphi_1 v_{t-1} + \varphi_2 v_{t-2} + \varphi_3 v_{t-3} + \varphi_4 v_{t-4} + \ldots + \varphi_p v_{t-p} + \varepsilon_t$$

where

y_t = the value of a given time series;

y_{t-p} = the value of the time series in the previous p periods;

φ_p = the p^{th} order auto-regressive (AR) parameter;

ε_t = the random error term uncorrelated over time, typically called *white noise*

[4] In addition to including auto-correlation of the error terms, time series cross-sectional regression model also considers the correlation between the cross sections. Hence, the TSCS regression model is constructed as follows:

$$y_t = \mathbf{X}_t'\beta + v_t + \mathbf{c}_t$$

where

$\mathbf{c}_t$ = the cross-sectional error component

As to the analyses regarding the association between international business activities and the development of different economic sector, we will use time-series cross-sectional regressive models rather than OLS regressive models or auto-regressive models. This is due to the existence of both auto-correlation and cross-sectional correlation in data.

Again, from the generalized Durbin-Watson (DW) statistics, we notice that the time series for the dependent variables measuring different aspects of a sector's development are auto-correlated over time. Hence, the need for auto-regressive models is confirmed. Other than auto-correlation problem, from the Pearson correlation coefficients among economic sectors belonging to the same sectoral group, we are also aware that there is correlation across sectors within the same sectoral group. Hence, in order to avoid the distortion from both auto-correlation and cross-sectional correlation, we will use TSCS regressive models to analyze the causal relationship. In particular, the Park method will be used for the TSCS regression analyses due to the nature of our data. The Park method is more appropriate than other methods for handling data that have auto-regressive error structure with contemporaneous correlations between the cross sections.

In addition to the above issues, due to the near multicollinearity among independent variables and lagged independent variables (for both one-year and 2-year lagging), we will test un-lagged independent variables, one-year lagged independent variables and two-year lagged independent variables separately for both auto-regression and TSCS regression.

Other than the selection of regression models, in order to capture the possible changes of causal relationship along the development path of an economy, we will also divide the data period (namely, 1952-1994) into certain sub-periods, and each regression model will be tested separately for each of the

these sub-periods. In order to divide the data period without distorting our statistical analyses, we need to consider the following two issues. First, the number of years (namely, the number of time series) in each sub-period should be adequate for TSCS analyses to produce meaningful results. After several tests, the results show that, in order to have meaningful results, each sub-period should have at least 10 years of data. Secondly, the division of data period into sub-periods should coincide with Taiwan's development stages to a satisfied extent. From Chapter 4, we understand that, between 1952-1962, Taiwan was largely in early economic development and import-substitution phases. Hence, the economy still mainly relied upon primary sectors, and the industrial activities were still under development. After 1962, Taiwan shifted to export-oriented phases in which industrial activities significantly expanded due to the success of exporting labor-intensive products to international markets. Hence, less CA sectors were basically the dominant sectors during this period. After 1980, particularly in late 1980s, Taiwan began to lose comparative advantages in labor-intensive products, and gradually transformed to created-asset intensive sectors or segments. Therefore, if we take the path of Taiwan's economic development into consideration, it seems that 1952-1962 could be a good proxy for Taiwan's early development stage that largely relied upon primary sectors as its major economic strength. Then, 1963-1980 could be the proxy for stage that less CA sectors were the dominant sectors of Taiwan's economy, and 1981-1994 could be the proxy for stage that CA sectors were the dominant sectors.

Hence, by considering both the requirements for statistical analyses, and the need for dividing data period according to Taiwan's economic development path, we divide the whole data period (1952-1994) into three equal sub-periods: 1952-1966, 1967-1980, and 1981-1994.

5.2. Discussion of Results

5.2.1. Hypotheses 1a to 1h: The Performance and the Efficiency of Primary Sectors and International Business Activities

Hypotheses 1a to 1h are concerned with the causal relationship between international business activities and the performance and efficiency of primary sectors. The expected signs between dependent variables and independent variables are shown in Table 5.1a. The actual results from TSCS regression are summarized in Table 5.1b.

We can have several major results from Table 5.1b. First, for dependent variables concerning sectoral performance, DP_i (namely, the domestic production volume of each economic sector) EXP_i (the export volume made by economic sector) and RCA_i (revealed comparative advantage for each economic sector), we can notice that, during 1952-1966, the early stage of Taiwan's economic development, most independent variables related to lagged inward direct investment have positive association upon the performance of primary sectors. $LAG1IDI_i$ is significantly and positively associated with DP_i (at 10 percent level of significance). $LAG1IDI_i$ and $LAG2IDI_i$ are significantly and positively associated with EXP_i (at 1 percent of significance level). $LAG1IDI_i$ is significantly and positively associated with RCA_i (at 1 percent level of significance). For un-lagged independent variable related to inward direct investment (IDI_i), no performance variable is associated with IDI_i. Hence, from the above results, it is obvious that during the early stage of Taiwan's economic development, inward international business activities of primary sectors had positive association upon the performance of primary sectors, lending support to ***H1a***. Furthermore, during this period, the impact from inward international business activities does not occur right after the investment is made but occur in a lagging manner. For independent variables related to outward IBAs, we find that all the coefficients

Table 5.1a. Expected Signs of Hypotheses 1a to 1h

Period	Dependent Variable	Type of Measurement	IDI_i	ODI_i	$LAG1IDI_i$	$LAG1ODI_i$	$LAG2IDI_i$	$LAG2ODI_i$
Period 1:1952-66	DP_i	Performance	+ (1a)[a]	IS (1e)	+ (1a)	IS (1e)	+ (1a)	IS (1e)
	EXP_i	Performance	+ (1a)	IS (1e)	+ (1a)	IS (1e)	+ (1a)	IS (1e)
	RCA_i	Performance	+ (1a)	IS (1e)	+ (1a)	IS (1e)	+ (1a)	IS (1e)
	EFF_i	Efficiency	+ (1b)	IS (1f)	+ (1b)	IS (1f)	+ (1b)	IS (1f)
Period 1:1967-80	DP_i	Performance	- (1c)	- or IS (1g)	- (1c)	- or IS (1g)	- (1c)	- or IS (1g)
	EXP_i	Performance	- (1c)	- or IS (1g)	- (1c)	- or IS (1g)	- (1c)	- or IS (1g)
	RCA_i	Performance	- (1c)	- or IS (1g)	- (1c)	- or IS (1g)	- (1c)	- or IS (1g)
	EFF_i	Efficiency	IS (1d)	IS (1h)	IS (1d)	IS (1h)	IS (1d)	IS (1h)
Period 1:1981-94	DP_i	Performance	- (1c)	- or IS (1g)	- (1c)	- or IS (1g)	- (1c)	- or IS (1g)
	EXP_i	Performance	- (1c)	- or IS (1g)	- (1c)	- or IS (1g)	- (1c)	- or IS (1g)
	RCA_i	Performance	- (1c)	- or IS (1g)	- (1c)	- or IS (1g)	- (1c)	- or IS (1g)
	EFF_i	Efficiency	IS (1d)	IS (1h)	IS (1d)	IS (1h)	IS (1d)	IS (1h)

Notes: + = positive - = negative IS = insignificant

a. The Hypothesis for the expected sign

Table 5.1b. TSCS Regression Results for Hypotheses 1a to 1h: The Impacts of International Business Activities upon the Performance and the Efficiency of Primary Sectors

Period	Dependent Variable	Constant	IDI_i[a]	ODI_i[b]	$LAG1IDI_i$	$LAG1ODI_i$	$LAG2IDI_i$	$LAG2ODI_i$
Period 1:1952-66	DP_i	15371***	2.174	0[c]				
	DP_i	15858***			3.246*	0		
	DP_i	16551***					0.502	0
	EXP_i	23.345***	0.015	0				
	EXP_i	14.61***			0.046***	0		
	EXP_i	21.052***					0.036***	0
	RCA_i	0.695***	-0.00004	0				
	RCA_i	0.628***			0.0001	0		
	RCA_i	0.626***					0.0003***	0
	EFF_i	8.66***	0.002	0				
	EFF_i	8.183***			0.003**	0		
	EFF_i	8.884***					0.002	0

Notes: *** Significant at the 1% level ** Significant at the 5% level * Significant at the 10% level

a. The IDI_i variables used for this auto-regression model is the yearly total IDIs for sector *i*

b. The ODI_i variables used for this auto-regression model is the yearly total ODIs from sector *i*

c. The coefficient and the standard error are both 0. Hence, the t statistic can not be computed. This is possibly because there are too many ODIs with zero balance during 1952-1966.

Table 5.1b. TSCS Regression Results for Hypotheses 1a to 1h: The Impacts of International Business Activities upon the Performance and the Efficiency of Primary Sectors (continued)

Period	Dependent Variable	Constant	IDI_i	ODI_i	$LAG1IDI_i$	$LAG1ODI_i$	$LAG2IDI_i$	$LAG2ODI_i$
Period 2:1967-80	DP_i	58650***	1.033	6.434				
	DP_i	60682***			2.326	10.067		
	DP_i	65816***					0.112	-10.801
	EXP_i	210.652***	0.007	0.062**				
	EXP_i	236.212***			-0.002	0.089		
	EXP_i	266.677***					-0.008	0.039
	RCA_i	0.573***	-0.00005	-0.00006				
	RCA_i	0.59***			-0.00008	-0.0001		
	RCA_i	0.588***					-0.00006	-0.0006
	EFF_i	33.906***	0.002	0.011***				
	EFF_i	35.207***			0.005**	0.016***		
	EFF_i	44.206***					-0.0004	-0.003

Notes: *** Significant at the 1% level ** Significant at the 5% level * Significant at the 10% level

Table 5.1b. TSCS Regression Results for Hypotheses 1a to 1h: The Impacts of International Business Activities upon the Performance and the Efficiency of Primary Sectors (continued)

Period	Dependent Variable	Constant	IDI_i	ODI_i	$LAG1IDI_i$	$LAG1ODI_i$	$LAG2IDI_i$	$LAG2ODI_i$
Period 3:1981-94	DP_i	173150***	-0.198	-0.346				
	DP_i	176235***			0.155	-1.225		
	DP_i	172879***					-0.156	1.226
	EXP_i	629.768***	0.003*	0.004				
	EXP_i	639.749***			-0.004***	0.003		
	EXP_i	639.955***					0.0003	-0.0002
	RCA_i	0.327***	0.000001**	-0.0000004				
	RCA_i	0.33***			-0.0000008**	-0.000001		
	RCA_i	0.33***					3.51E-8	-7.18E-6
	EFF_i	151.716***	0.0002	-0.002				
	EFF_i	151.43***			-0.0002	0.0003		
	EFF_i	140.69***					-0.0002	0.013**

Notes: *** Significant at the 1% level ** Significant at the 5% level * Significant at the 10% level

turn out to be zero during this period. This result is possibly because, during this period, there were too many ODIs with zero balance. Hence, the computation for parameter estimation seems to reach zero for all independent variables related to outward IBAs. This is also an indication that outward IBAs may have no significant association with the performance and the efficiency of primary sectors, lending support to ***H1e*** and ***H1f***.

Other than the above findings, it is also worthy of notice that IDI_i is negatively associated with RCA_i. This is mostly related to the other result caused by IDI_i. For TSCS regression between IDI_i and imports during 1952-1966, we find that IDI_i also has strong association with imports of primary sectors (significant at 1 percent level). This probably explains why IDI_i would have negative association with RCA_i, although the causal relationship is not significant.

As for the dependent variable concerning the efficiency of economic sector, EFF_i (the average production volume produced by each employee), we find that, during 1952-1966, one lagged independent variable related to inward direct investment has positive association upon EFF_i ($LAGIIDI_i$ is significantly and positively associated with EFF_i). This result supports ***H1b***, and also suggests that during the early stage of Taiwan's economic development, the impacts from inward international business activities upon the efficiency of primary sectors also occur in a lagging manner. Therefore, the above results show that, during early stage of economic development, there seems to be lagged causal relationship between inward international business activities and the performance and efficiency of primary sectors.

Compared to 1952-1966, the causal relationship between international business activities and the performance of primary sectors tends to be weaker during 1967-1980. For dependent variables related to the performance of primary sectors (DP_i, EXP_i and RCA_i), we find that almost all the independent variables

related to inward and outward international business activities have no significant association with DP_i, EXP_i and RCA_i. This suggests that, the impacts from inward IBAs and outward IBAs upon the performance of primary sectors after early stage of Taiwan's economic development seem to be insignificant for most cases. Hence, ***H1g*** is supported by the TSCS regression results for DP_i and RCA_i. The significant and positive association between ODI_i and EXP_i contradicts the prediction made by ***H1g***. This could be the result of market-seeking ODI_i that successfully leads to the increase of exports of primary goods from Taiwan.

For the dependent variable concerning the efficiency of primary sectors, EFF_i, it shows that both inward and outward IBAs have positive impacts upon the efficiency of primary sectors. Hence, both ***H1d*** and ***H1h*** are not supported by the results. It is interesting that the impacts from outward IBAs appear to be quite significant. Both ODI_i and $LAG1ODI_i$ are positively and significantly (at 1 percent significance level) associated with the efficiency of primary sectors. The reason for this association could be the result of competition resulted from resource-seeking type of ODI_i which imports primary goods into local market. Besides, as the average labor costs increased from NT$1,223 in 1967 to NT$8,043 in 1980 (a 660% increase) and more young unskilled or semi-skilled labor forces were attracted to emerging sectors (such as textile and assembly of electronic parts), indigenous suppliers of primary sectors, in general, were forced to enhance their efficiency in order to maintain their production capacity and remain competitive toward imported primary goods. Hence, during this period, we may observe that there is strong and positive association between ODIs and the efficiency of primary sectors. Other than that, $LAG1IDI_i$ is also positively and significantly (at 5 percent significance level) associated with the efficiency of primary sectors. Again, it shows that, during this stage of Taiwan's economic

development, inward IBAs still have positive contributions to the efficiency of primary sectors.

During 1981-1994, the impacts from international business activities upon the performance of primary sectors seem to occur largely through the inter-relationship between trade and inward IBAs. All independent variables related to outward IBAs have no significant association with the performance of primary sectors. Hence, ***H1g*** is supported by the results for 1981-1994. However, from Table 5.1, we also notice that IDI_i is positively and significantly (at 10 percent significance level) associated with the exports of primary sectors, and $LAGIIDI_i$ is, on the other hand, negatively and significantly (at 1 percent significance level) associated with the exports of primary sectors. Therefore, ***H1c*** is partly supported by the results. The reason for the opposite sign between IDI_i and $LAGIIDI_i$ could be related to the purpose of different IDIs occurred in this period. The exports of primary sectors might possibly enhanced by some trade-related IDIs which aim at exporting Taiwan's advantageous primary goods (such as meat and fish products) to foreign markets. As to the negative association between $LAGIIDI_i$ and EXP_i, it could be due to the effects from market-seeking type of IDI_i which imported primary goods and introduced more fierce competition between local produced products and imported products. As a result, the profits from producing primary goods were relatively inferior compared to those from producing other industrial goods. Hence, more and more productive people were attracted to other sectors, leaving old workers still struggling for producing primary goods. This, in turn, adversely affects the competitiveness of primary goods and then, the exports of primary sectors. Therefore, we noticed that both EXP_i and RCA_i are associated with IDI_i and $LAGIIDI_i$ in the same way.

5.2.2. Hypotheses 2a to 2f: The Performance and the Efficiency of Less CA Sectors and International Business Activities

The second group of hypotheses is about the causal relationship between international business activities and the performance and efficiency of less CA sectors. The expected signs between dependent variables and independent variables are shown in Table 5.2a. The major results for TSCS regressions are summarized in Table 5.2b.

During 1952-1966, the early stage of Taiwan's economic development, again, we find that almost all the independent variables related to inward and outward international business activities are positively and significantly associated with DP_i and EXP_i (at 1 percent significance level). This shows that inward and outward IBAs have both current (through current IBAs) and delayed (through lagged IBAs) impacts upon DP_i and EXP_i of less CA sectors. Thus, for dependent variables DP_i and EXP_i, hypothesis ***H2a*** is supported, and ***H2c*** is not supported. The results of Table 5.2b show that the ODIs made by Taiwan's less CA sectors appeared quite early, and to our surprise, these ODIs already had positive impacts upon the performance of less CA sectors since the early stage of Taiwan's economic development. The reason for this could be related to the early market-seeking ODIs made by Taiwanese firms. However, the exact answers may require more detailed analyses regarding the development history of Taiwan's less CA sectors. As to RCA_i, none of the independent variables has significant association with RCA_i. Hence, it seems that, during the early stage of Taiwan's economic development, inward and outward IBAs may only have significant influence over DP_i and EXP_i. For RCA_i, the results show that inward and outward international business activities alone can not decide the trend of RCA_i of less CA sectors.

Table 5.2a. Expected Signs of Hypotheses 2a to 2f

Period	Dependent Variable	Type of Measurement	IDI_i	ODI_i	$LAG1IDI_i$	$LAG1ODI_i$	$LAG2IDI_i$	$LAG2ODI_i$
Period 1:1952-66	DP_i	Performance	+ (2a)[a]	IS (2c)	+ (2a)	IS (2c)	+ (2a)	IS (2c)
	EXP_i	Performance	+ (2a)	IS (2c)	+ (2a)	IS (2c)	+ (2a)	IS (2c)
	RCA_i	Performance	+ (2a)	IS (2c)	+ (2a)	IS (2c)	+ (2a)	IS (2c)
	EFF_i	Efficiency	+ (2b)	IS (2d)	+ (2b)	IS (2d)	+ (2b)	IS (2d)
Period 1:1967-80	DP_i	Performance	+ (2e)	+ (2e)	+ (2e)	+ (2e)	+ (2e)	+ (2e)
	EXP_i	Performance	+ (2e)	+ (2e)	+ (2e)	+ (2e)	+ (2e)	+ (2e)
	RCA_i	Performance	+ (2e)	+ (2e)	+ (2e)	+ (2e)	+ (2e)	+ (2e)
	EFF_i	Efficiency	+ (2f)	+ (2f)	+ (2f)	+ (2f)	+ (2f)	+ (2f)
Period 1:1981-94	DP_i	Performance	+ (2e)	+ (2e)	+ (2e)	+ (2e)	+ (2e)	+ (2e)
	EXP_i	Performance	+ (2e)	+ (2e)	+ (2e)	+ (2e)	+ (2e)	+ (2e)
	RCA_i	Performance	+ (2e)	+ (2e)	+ (2e)	+ (2e)	+ (2e)	+ (2e)
	EFF_i	Efficiency	+ (2f)	+ (2f)	+ (2f)	+ (2f)	+ (2f)	+ (2f)

Notes: + = positive - = negative IS = insignificant

a. The Hypothesis for the expected sign

Table 5.2b. TSCS Regression Results for Hypotheses 2a to 2f: The Impacts of International Business Activities upon the Performance and the Efficiency of Less CA Sectors

Period	Dependent Variable	Constant	IDI_i[a]	ODI_i[b]	$LAG1IDI_i$	$LAG1ODI_i$	$LAG2IDI_i$	$LAG2ODI_i$
Period 1:1952-66	DP_i	2605.02***	0.414***	1.586***				
	DP_i	2736.99***			0.34***	2.232***		
	DP_i	2692.33***					0.031	1.97***
	EXP_i	40.789***	0.012***	0.0423***				
	EXP_i	36.658***			0.013***	0.0427***		
	EXP_i	42.193***					0.005***	0.0189**
	RCA_i	0.854***	1.92E-4	1.21E-4				
	RCA_i	0.931***			-2.96E-4	-0.0002		
	RCA_i	0.842***					6.39E-5	0.0003
	EFF_i	0.0176***	5.43E-5***	1.77E-4***				
	EFF_i	0.021***			2.84E-5***	1.79E-4***		
	EFF_i	0.023***					-1.01E-5	1.72E-4***

Notes: *** Significant at the 1% level ** Significant at the 5% level * Significant at the 10% level

a. The IDI_i variables used for this auto-regression model is the yearly total IDIs for sector *i*

b. The ODI_i variables used for this auto-regression model is the yearly total ODIs from sector *i*

Table 5.2b. TSCS Regression Results for Hypotheses 2a to 2f: The Impacts of International Business Activities upon the Performance and the Efficiency of Less CA Sectors (continued)

Period	Dependent Variable	Constant	IDI_i	ODI_i	$LAG1IDI_i$	$LAG1ODI_i$	$LAG2IDI_i$	$LAG2ODI_i$
Period 2:1967-80	DP_i	69546**	0.041***	0.882				
	DP_i	63932*			0.019	-0.649		
	DP_i	60971**					0.0036	0.613
	EXP_i	3135.177	0.0015***	0.0323**				
	EXP_i	2283.314			0.0016	-0.0093		
	EXP_i	2635.487*					-0.0014	0.0157
	RCA_i	1.674***	6.93E-6	2.52E-4				
	RCA_i	1.661***			1.82E-5*	1.92E-4		
	RCA_i	1.653***					2.9E-5***	3.04E-4**
	EFF_i	0.2118	3.02E-6***	1.81E-5				
	EFF_i	0.1184**			1.92E-6	-2.69E-5		
	EFF_i	0.107*					3.96E-6**	3.14E-5

Notes: *** Significant at the 1% level ** Significant at the 5% level * Significant at the 10% level

Table 5.2b. TSCS Regression Results for Hypotheses 2a to 2f: The Impacts of International Business Activities upon the Performance and the Efficiency of Less CA Sectors (continued)

Period	Dependent Variable	Constant	IDI_i	ODI_i	$LAG1IDI_i$	$LAG1ODI_i$	$LAG2IDI_i$	$LAG2ODI_i$
Period 3;1981-94	DP_i	231856***	0.037	0.02*				
	DP_i	232408***			0.040***	-0.008		
	DP_i	239533***					0.010	0.030
	EXP_i	11096***	0.005***	0.0008				
	EXP_i	11549***			0.0003	0.0006		
	EXP_i	11304***					0.0017	0.0013
	RCA_i	1.535***	-3.59E-6**	-1.26E-6				
	RCA_i	1.495***			-1.51E-6	7.12E-8		
	RCA_i	1.522***					-1.07E-6	-1.74E-6
	EFF_i	0.333***	2.10E-6	1.96E-6**				
	EFF_i	0.353***			1.54E-6	4.45E-8		
	EFF_i	0.332***					3.07E-6*	6.17E-6***

Notes: *** Significant at the 1% level ** Significant at the 5% level * Significant at the 10% level

For the efficiency of less CA sectors, the regression results show that, during 1952-1966, almost all the independent variables have positive and significant association with EFF_i (at 1 percent significance level). Therefore, ***H2b*** is supported by the results, indicating that inward IBAs have positive association with the efficiency of less CA sectors during the early stage of Taiwan's economic development. In addition, we also find that there is positive and significant association between ODIs and the efficiency of less CA sectors, which also contradicts the prediction made by ***H2d***. Again, in order to find out how these early ODIs could help the efficiency of Taiwan's less CA sectors, it might require more detailed analyses of Taiwan's less CA sectors.

During 1967-1980, the causal relationships revealed by the results are different from last period. Fewer independent variables have significant association with independent variables. For dependent variable DP_i, only IDI_i turns out to be positively and significantly associated (at 1 percent significance level) with DP_i. For EXP_i, only IDI_i and ODI_i have positive and significant association with EXP_i. Although these results still largely support the prediction of ***H2e***, they also point out that the impacts from inward and outward IBAs seem to be less significant compared to last period. The positive association between IDI_i and DP_i, IDI_i and EXP_i could be due to two reasons. One possibility is that the firm-level resources transferred from foreign investing firms were not so sophisticated and, thus, could soon be learned by indigenous firms for enhancing the production and exports of less CA sectors. Another possibility is that, up to this stage, indigenous firms had accumulated more advanced firm-level resources since 1952. Hence, they could absorb the firm-level resources transferred from inward IBAs within a relatively short time.

For RCA_i, the pattern of impacts from IBAs is different. Most lagged independent variables have positive and significant impacts upon RCA_i. Un-

lagged independent variables (IDI_i and ODI_i), on the other hand, have no significant association with RCA_i. This shows that the impacts from both inward and outward IBAs upon RCA_i tend to take effect after a relatively longer period of time. Nevertheless, the results are quite consistent with the prediction made by ***H2e***.

For the efficiency of less CA sectors during 1967-1980, only inward IBAs have positive and significant association with variable EFF_i. IDI_i is significantly and positively associated with EFF_i at 1 percent significance level, and $LAG2IDI_i$ is significantly and positively associated with EFF_i at 5 percent significance level. Hence, ***H2f*** is partly supported by the results. It tells us that inward IBAs may have both current and delayed impacts upon the efficiency of less CA sectors.

As the economy became more mature during 1981-1994, the impacts from IBAs upon the performance of less CA sectors also seem to be less significant compared to period 1 and period 2. Moreover, the impacts seem to occur within a shorter period. For production volume of less CA sectors, only ODI_i and $LAG1IDI_i$ have positive and significant association with DP_i. Similarly, for exports of less CA sectors, only IDI_i has positive and significant association with EXP_i. These results largely confirm the prediction of ***H2e***. For RCA_i, the results of Table 5.2b, on the contrary to ***H2e***, show that only IDI_i has significant and negative association with it. This means that, although IDI_i have positive and significant association with EXP_i during the same period, IDI_i seems to bring in more imports from foreign markets (IDI_i is positively and significantly associated with imports at 10 percent significance level). As a result, IDI_i would negatively affect RCA_i of less CA sectors.

For the efficiency of less CA sectors, the results show that ODI_i, $LAG2IDI_i$, and $LAG2ODI_i$ have positive and significant association with EFF_i, essentially lending support to ***H2f***. This seems to indicate that, during 1981-1994, the

impacts from inward IBAs tend to take longer period to affect the efficiency of less CA sectors. It could be due to the more advanced firm-level resources transferred from foreign investing firms which indigenous firms may need more time to absorb and internalize. Similarly, the positive association between EFF_i and $LAG2ODI_i$, EFF_i and ODI_i may also relate to characteristics of the resources acquired from outward IBAs. The results seem to suggest that some resources acquired through outward IBAs need more time for indigenous firms' internal learning process, while others need less.

5.2.3. Hypotheses 3a to 3f: The Performance and the Efficiency of Less CA Sectors and International Business Activities

The third group of hypotheses is about the causal relationship between international business activities and the performance and efficiency of CA sectors. The expected signs between dependent variables and independent variables are shown in Table 5.3a. The major results for TSCS regressions are summarized in Table 5.3b.

During 1952-1966, most inward and outward IBAs have positive and significant association with the performance measures of CA sectors. This confirms hypothesis ***H3a*** which predicts that inward IBAs would have positive association with the performance of CA sectors. What surprise us are the significantly positive association between outward IBAs and the performance of CA sector. The results contradict the prediction of ***H3c***. Again, the possible reason for this association could be the result of successful market-seeking outward IBAs. However, the exact answer may require more detailed analyses.

For the efficiency of CA sectors, it seems that inward IBAs had less significant impacts. Only $LAG1IDI_i$ have positive and significant association with

Table 5.3a. Expected Signs of Hypotheses 3a to 3f

Period	Dependent Variable	Type of Measurement	IDI_i	ODI_i	$LAG1IDI_i$	$LAG1ODI_i$	$LAG2IDI_i$	$LAG2ODI_i$
Period 1:1952-66	DP_i	Performance	+ (3a)[a]	IS (3c)	+ (3a)	IS (3c)	+ (3a)	IS (3c)
	EXP_i	Performance	+ (3a)	IS (3c)	+ (3a)	IS (3c)	+ (3a)	IS (3c)
	RCA_i	Performance	+ (3a)	IS (3c)	+ (3a)	IS (3c)	+ (3a)	IS (3c)
	EFF_i	Efficiency	+ (3b)	IS (3d)	+ (3b)	IS (3d)	+ (3b)	IS (3d)
Period 1:1967-80	DP_i	Performance	+ (3a)	+ (3e)	+ (3a)	+ (3e)	+ (3a)	+ (3e)
	EXP_i	Performance	+ (3a)	+ (3e)	+ (3a)	+ (3e)	+ (3a)	+ (3e)
	RCA_i	Performance	+ (3a)	+ (3e)	+ (3a)	+ (3e)	+ (3a)	+ (3e)
	EFF_i	Efficiency	+ (3b)	+ (3f)	+ (3b)	+ (3f)	+ (3b)	+ (3f)
Period 1:1981-94	DP_i	Performance	+ (3a)	+ (3e)	+ (3a)	+ (3e)	+ (3a)	+ (3e)
	EXP_i	Performance	+ (3a)	+ (3e)	+ (3a)	+ (3e)	+ (3a)	+ (3e)
	RCA_i	Performance	+ (3a)	+ (3e)	+ (3a)	+ (3e)	+ (3a)	+ (3e)
	EFF_i	Efficiency	+ (3b)	+ (3f)	+ (3b)	+ (3f)	+ (3b)	+ (3f)

Notes: + = positive - = negative IS = insignificant

a. The Hypothesis for the expected sign

Table 5.3b. TSCS Regression Results for Hypotheses 3a to 3f: The Impacts of International Business Activities upon the Performance and the Efficiency of CA Sectors

Period	Dependent Variable	Constant	IDI_i[a]	ODI_i[b]	$LAG1IDI_i$	$LAG1ODI_i$	$LAG2IDI_i$	$LAG2ODI_i$
Period 1:1952-66	DP_i	3035.594*	0.0033	8.261***				
	DP_i	5648.285			0.0578***	37.562***		
	DP_i	2886.272**					-0.0025	0[c]
	EXP_i	12.380**	2.95E-3***	0.1332***				
	EXP_i	7.853***			0.0007***	0.9362***		
	EXP_i	9.493***					0.0003*	0
	RCA_i	0.3023***	1.29E-4***	0.0024***				
	RCA_i	0.2910***			1.92E-4***	0.0222***		
	RCA_i	0.3041***					1.42E-4**	0
	EFF_i	0.0565***	-4.03E-8	0.00016**				
	EFF_i	0.0488***			4.78E-6*	0.00039		
	EFF_i	0.0411***					2.16E-6	0

Notes: *** Significant at the 1% level ** Significant at the 5% level * Significant at the 10% level

a. The IDI_i variables used for this auto-regression model is the yearly total IDIs for sector *i*

b. The ODI_i variables used for this auto-regression model is the yearly total ODIs from sector *i*

c. The coefficient and the standard error are both 0. Hence, the t statistic can not be computed. This is possibly because there are too many ODIs with zero balance during 1952-1966.

Table 5.3b. TSCS Regression Results for Hypotheses 3a to 3f: The Impacts of International Business Activities upon the Performance and the Efficiency of CA Sectors (continued)

Period	Dependent Variable	Constant	IDI_i	ODI_i	$LAG1IDI_i$	$LAG1ODI_i$	$LAG2IDI_i$	$LAG2ODI_i$
Period 2:1967-80	DP_i	33701***	0.0588	1.487***				
	DP_i	41281***			0.0561	0.3149		
	DP_i	39297***					0.0247	1.0859
	EXP_i	77.982	0.0026	0.028***				
	EXP_i	79.66*			0.0026*	0.0662***		
	EXP_i	79.250**					0.0025***	0.0827***
	RCA_i	0.3572***	9.85E-8	2.30E-5				
	RCA_i	0.3167***			1.81E-5***	1.22E-4**		
	RCA_i	0.3481***					7.73E-6	4.96E-5
	EFF_i	0.1386***	2.08E-6	3.48E-5***				
	EFF_i	0.1558***			1.78E-6	1.77E-6		
	EFF_i	0.1489***					1.19E-6	3.31E-5

Notes: *** Significant at the 1% level ** Significant at the 5% level * Significant at the 10% level

Table 5.3b. TSCS Regression Results for Hypotheses 3a to 3f: The Impacts of International Business Activities upon the Performance and the Efficiency of CA Sectors (continued)

Period	Dependent Variable	Constant	IDI_i	ODI_i	$LAG1IDI_i$	$LAG1ODI_i$	$LAG2IDI_i$	$LAG2ODI_i$
Period 3:1981-94	DP_i	249608***	0.0119	0.0381**				
	DP_i	256446***			-0.0076	-0.0161		
	DP_i	253056***					0.1819***	0.0648
	EXP_i	2030.009***	0.0004	0.0017				
	EXP_i	1876.015***			-0.0002	0.004**		
	EXP_i	1957.754***					0.0008	0.0027
	RCA_i	0.5046***	-1.34E-8	2.82E-8				
	RCA_i	0.5003***			-2.99E-8	9.53E-8		
	RCA_i	0.5057***					-4.90E-8	7.21E-8
	EFF_i	0.6597***	-1.04E-6*	1.03E-6**				
	EFF_i	0.6429***			1.13E-8	-6.28E-8		
	EFF_i	0.6039***					5.17E-6***	2.88E-6**

Notes: *** Significant at the 1% level ** Significant at the 5% level * Significant at the 10% level

EFF_i. Hence, ***H3b*** is partly supported by the statistical results. As to outward IBAs, we still notice that ODI_i has significant and positive association with EFF_i.

During 1967-1980, the impacts from international business activities upon DP_i tend to be less significant compared to last period. Among all the independent variables, only ODI_i has positive and significant association with DP_i (at 1 percent significance level). This positive association could be the result of asset-seeking type of ODI_i which successfully transferred advanced firm-level resources to indigenous firms so that their production capabilities were upgraded and the production volume of CA sectors could be increased accordingly. Or, it may be the result of successful market-seeking type of ODI_i which find new foreign markets for exports and, in turn, increase both DP_i and EXP_i. The results for DP_i show that ***H3a*** is not strongly supported by the statistical evidence, even though the actual signs for all IDI variables are consistent with the prediction. As to ***H3e***, the statistical results only partially support its prediction. Also, the actual signs for all ODI variables are consistent with the prediction of ***H3e***.

Unlike the results for DP_i, the impacts from international business activities upon EXP_i were still rather strong. Almost all the independent variables are positively and significantly associated with EXP_i. This indicates that, during 1967-1980, both inward and outward IBAs were particularly relevant to the exports of CA sectors. Hence, basically, both ***H3a*** and ***H3e*** are supported by the statistical results for EXP_i.

For RCA_i, its association with international business activities during 1967-1980 was also falling compared to last period. Compared to the results we find for period of 1952-1966, during 1967-1980, only two independent variables, $LAG1IDI_i$ and $LAG1ODI_i$, are positively and significantly associated with RCA_i. Although most independent variables are positively and significantly associated

with EXP_i, their association with IMP_i may the reason for their less significant impacts upon RCA_i. From TSCS regressions, we find most independent variables are also positively and even significantly associated with IMP_i. Hence, the net effect is that, although all independent variables have positive association with RCA_i, only $LAG1IDI_i$ and $LAG1ODI_i$, are positively and significantly associated with RCA_i. Thus, both ***H3a*** and ***H3e*** are partially supported by the statistical results for RCA_i.

For the efficiency of CA sectors, the association between EFF_i and international business activities is also falling during 1967-1980. Among all the independent variables, only ODI_i has positive and significant association with EFF_i. Hence, ***H3f*** is also partially supported, and ***H3b*** is not strongly supported by the statistical results for EFF_i.

During 1981-1994, the impacts from international business activities upon the performance of CA sectors were still less strong compared to the period of 1952-1966. The results are quite similar to those for period of 1967-1980. For DP_i, in addition to the influence from ODI_i, $LAG2IDI_i$ also has positive and significant association with DP_i. This association may possibly indicates the transfer of more advanced firm-level resources through inward IBAs. Hence, it takes longer time for indigenous firms to internalize these resources in their product and process technological capabilities. In sum, both ***H3a*** and ***H3e*** are partially supported by the statistical results for DP_i.

For EXP_i, the influence from IBAs tends to be falling considerably compared to previous stages. Among all the independent variables, only $LAG1ODI_i$ has significant and positive association with EXP_i. Hence, ***H3a*** is partially supported by the statistical results for EXP_i, and ***H3e*** is not supported.

As to RCA_i, none of the independent variables has significant association with EXP_i. It also indicates that, as CA sectors continue their development in

Taiwan's economy, international business activities can no longer determine the trend of RCA_i. Thus, both ***H3a*** and ***H3e*** are not supported by the results.

For the efficiency of CA sectors, the impacts from international business activities are stronger than last period of 1967-1980. Of all the independent variables, ODI_i, $LAG2IDI_i$ and $LAG2ODI_i$ have positive and significant association with EFF_i. Hence, ***H3b*** and ***H3f*** are both partially supported by the results. In addition, we notice that IDI_i, contrary to the prediction of ***H3b***, has negative and significant association with EFF_i. This relatively short-term association could be mostly related to the steady decline of resource-seeking IDI_i (in labor-intensive products or value activities) that used to dominate the inward IBAs in Taiwan. During 1981-1994, owning to the sharp rise of labor costs (from NT$9,564 in 1981 to NT$30,727 in 1994) and the accumulation of firm-level resources by indigenous firms, the resource-seeking type of IDI_i decreases while the efficiency of CA sectors grows steadily at the same time.

5.2.4. Hypotheses 4a, 4b, 4c and 4d: The Structural Adjustment from Primary Sectors to Less CA Sectors and International Business Activities

The fourth and fifth groups of hypotheses are about the causal relationship between structural adjustment and the international business activities of various sectoral groups. The expected signs between dependent variables and independent variables are listed in Table 5.4a. Table 5.4b summarizes the lag auto-regression results for structural adjustment from primary sectors to less CA sectors.

From Table 5.4b, the results show that, from 1952-1994, *LAG3LCIDI* and *LAG4LCIDI* have positive and significant association with $SGDP_{ij}$, the GDP measurement of structural adjustment from primary sectors to less CA sectors. This is consistent with the prediction of ***H4c***. Moreover, it shows that there is

lagged causal relationship between inward IBAs of less CA sectors and structural adjustment measure, $SGDP_{ij}$. This indicates that inward IBAs of less CA sectors would not affect $SGDP_{ij}$ within the same year of which investment was made.

Table 5.4a. Expected Signs of Hypotheses 4a, 4b, 4c and 4d

Independent Variable	*SGDPij*	*SEXPij*
PRIDI	+ (4a)[a]	+ (4a)
PRODI	+ or IS (4b)	+ or IS (4b)
LCIDI	+ (4c)	+ (4c)
LCODI	+ or IS (4d)	+ or IS (4d)
LAG1PRIDI	+ (4a)	+ (4a)
LAG1PRODI	+ or IS (4b)	+ or IS (4b)
LAG1LCIDI	+ (4c)	+ (4c)
LAG1LCODI	+ or IS (4d)	+ or IS (4d)
LAG2PRIDI	+ (4a)	+ (4a)
LAG2PRODI	+ or IS (4b)	+ or IS (4b)
LAG2LCIDI	+ (4c)	+ (4c)
LAG2LCODI	+ or IS (4d)	+ or IS (4d)
LAG3PRIDI	+ (4a)	+ (4a)
LAG3PRODI	+ or IS (4b)	+ or IS (4b)
LAG3LCIDI	+ (4c)	+ (4c)
LAG3LCODI	+ or IS (4d)	+ or IS (4d)
LAG4PRIDI	+ (4a)	+ (4a)
LAG4PRODI	+ or IS (4b)	+ or IS (4b)
LAG4LCIDI	+ (4c)	+ (4c)
LAG4LCODI	+ or IS (4d)	+ or IS (4d)

Notes: + = positive - = negative IS = insignificant
a. The hypothesis for the expected sign

For outward IBAs of less CA sectors, their impacts upon $SGDP_{ij}$ tend to be a little bit short-term. *LCODI* and *LAG1LCODI* have negative and significant association with $SGDP_{ij}$ (all at 1 percent significance level). These results are not consistent with the prediction of ***H4d***. Also, they point out that, within the same year or a year after, the realization of outward IBAs of less CA sectors would deter the accomplishment of structural adjustment from primary sectors to less

CA sectors. The negative impacts from outward IBAs of less CA sectors could be the result of the transplantation of disadvantageous value activities to other countries, which reduce the contributions of less CA sectors to whole economy's GDP.

Table 5.4b. Lag Auto-Regression Results for Hypotheses 4a, 4b, 4c and 4d: The Impacts of International Business Activities upon the Structural Adjustment of Taiwan's Economy (from Primary Sectors to Less CA Sectors)

Independent Variable	$SGDP_{ij}$	$SEXP_{ij}$
Constant	0.5420***	6.6442***
PRIDI	0.00007**	-0.000029
PRODI	0.000237**	-0.000082
LCIDI	3.921E-7	0.00003**
LCODI	-7.72E-6***	-0.000031
LAG1PRIDI	0.000061	-0.000026
LAG1PRODI	0.000167	-0.00015
LAG1LCIDI	7.467E-7	0.00002
LAG1LCODI	-4.86E-6***	-0.000017
LAG2PRIDI	0.000071	0.000138
LAG2PRODI	0.000059	-0.000163
LAG2LCIDI	1.829E-6	0.000018
LAG2LCODI	-1.87E-6	-4.97E-6
LAG3PRIDI	0.0001**	0.000466
LAG3PRODI	-0.00008	-0.000121
LAG3LCIDI	3.637E-6**	0.000024
LAG3LCODI	1.24E-6	6.218E-6
LAG4PRIDI	0.00015***	0.000956
LAG4PRODI	-0.00028	-0.000024
LAG4LCIDI	6.173E-6***	0.000038*
LAG4LCODI	4.473E-6	0.000016
Adj-R^2	0.9465	0.9395
Prob<DW[a]	0.2838	0.1721

Notes: *** Significant at the 1% level ** Significant at the 5% level * Significant at the 10% level

a. Under 5% significance level, if *Prob*<DW is less than 0.05 or greater than 0.95, then there is auto-correlation in time series.

For inward IBAs of primary sectors, the results show that, *PRIDI, LAG3PRIDI* and *LAG4PRIDI* have positive and significant association with $SGDP_{ij}$. This is consistent with the prediction of ***H4a***.

As to outward IBAs from primary sectors, the results show that only *PRODI* had positive and significant impact upon $SGDP_{ij}$. Hence, ***H4b*** is largely supported by this result.

For $SEXP_{ij}$, the results show that, among all the independent variables, only *LCIDI* and *LAG4LCIDI* are positively and significantly associated with the structural adjustment from primary sectors to less CA sectors. Hence, for all the hypotheses, only ***H4c*** is largely supported by the statistical results. It indicates that, for trade measurement of structural adjustment from primary sectors to less CA sectors, international business activities may only have limited impacts.

5.2.5. Hypotheses 5a, 5b, 5c and 5d: The Structural Adjustment from Primary Sectors to Less CA Sectors and International Business Activities

This group of hypotheses is related to the causal relationship between international business activities and the structural adjustment from less CA sectors to CA sectors. The expected signs between dependent variables and independent variables are listed in Table 5.5a. The major results are summarized in Table 5.5b.

From Table 5.5b, we notice that, for IBAs of less CA sectors, only *LAG4LCIDI* and *LAG4LCODI* have positive and significant association with $SGDP_{ij}$, the GDP measure of structural adjustment from less CA sectors to CA sectors. The results are not consistent with the prediction of ***H5a*** and ***H5b***. Moreover, it indicates that, for structural adjustment from less CA sectors to CA sectors, the impacts from IBAs of less CA sectors would not become crucial until several years after the IBAs took place.

Table 5.5a. Expected Signs of Hypotheses 5a, 5b, 5c and 5d

Independent Variable	*SGDPij*	*SEXPij*
CAIDI	+ (5c)[a]	+ (5c)
CAODI	+ (5d)	+ (5d)
LCIDI	- (5a)	- (5a)
LCODI	- (5b)	- (5b)
LAG1CAIDI	+ (5c)	+ (5c)
LAG1CAODI	+ (5d)	+ (5d)
LAG1LCIDI	- (5a)	- (5a)
LAG1LCODI	- (5b)	- (5b)
LAG2CAIDI	+ (5c)	+ (5c)
LAG2CAODI	+ (5d)	+ (5d)
LAG2LCIDI	- (5a)	- (5a)
LAG2LCODI	- (5b)	- (5b)
LAG3CAIDI	+ (5c)	+ (5c)
LAG3CAODI	+ (5d)	+ (5d)
LAG3LCIDI	- (5a)	- (5a)
LAG3LCODI	- (5b)	- (5b)
LAG4CAIDI	+ (5c)	+ (5c)
LAG4CAODI	+ (5d)	+ (5d)
LAG4LCIDI	- (5a)	- (5a)
LAG4LCODI	- (5b)	- (5b)

Notes: + = positive - = negative IS = insignificant
a. The hypothesis for the expected sign

For IBAs from CA sectors, only *LAG1CAIDI* and *LAG2CAIDI* have significant and positive association with $SGDP_{ij}$. It is consistent with the prediction of ***H5c***. As to outward IBAs of CA sectors, the results show that no outward IBAs of CA sectors has significant association with $SGDP_{ij}$. This is inconsistent with the prediction of ***H5d***.

For $SEXP_{ij}$, the causal relationships between IBAs and structural adjustment are different. Among the independent variables related to IBAs of less CA sectors, only *LCODI* and *LAG1LCODI* have significant and negative association with $SEXP_{ij}$. Both are consistent with the prediction of ***H5b***. For inward IBAs of less CA sectors, the results show that no inward IBAs of less CA sectors has

significant association with $SEXP_{ij}$. This is inconsistent with the prediction of ***H5a***.

Table 5.5b. Lag Auto-Regression Results for Hypotheses 5a, 5b, 5c and 5d: The Impacts of International Business Activities upon the Structural Adjustment of Taiwan's Economy (from Less CA Sectors to CA Sectors)

Independent Variable	$SGDP_{ij}$	$SEXP_{ij}$
Constant	0.3818***	0.1906*
CAIDI	1.074E-7	2.558E-7*
CAODI	-3.44E-7	-1.72E-7
LCIDI	1.141E-7	-1.75E-7
LCODI	2.965E-7	-1.1E-6***
LAG1CAIDI	2.596E-7*	1.762E-7
LAG1CAODI	-5.58E-7	4.885E-7
LAG1LCIDI	8.796E-8	5.787E-8
LAG1LCODI	3.026E-7	-1.11E-6**
LAG2CAIDI	2.946E-7**	1.879E-7
LAG2CAODI	-6.53E-7	7.526E-7
LAG2LCIDI	1.247E-7	1.899E-7
LAG2LCODI	2.769E-7	-8.96E-7
LAG3CAIDI	2.124E-7	2.909E-7**
LAG3CAODI	-6.29E-7	6.203E-7
LAG3LCIDI	2.242E-7	2.215E-7
LAG3LCODI	5.192E-7	-4.49E-7
LAG4CAIDI	1.3E-8	4.851E-7*
LAG4CAODI	-4.87E-7	9.816E-8
LAG4LCIDI	3.865E-7*	1.527E-7
LAG4LCODI	7.297E-7**	2.262E-7
$Adj\text{-}R^2$	0.5360	0.7692
Prob<DW[a]	0.3284	0.1413

Notes: *** Significant at the 1% level ** Significant at the 5% level * Significant at the 10% level

a. Under 5% significance level, if *Prob*<DW is less than 0.05 or greater than 0.95, then there is auto-correlation in time series.

As to independent variables related to IBAs of CA sectors, it shows that inward IBAs of CA sectors have strong positive association with $SEXP_{ij}$. *CAIDI,*

LAG3CAIDI and *LAG4CAIDI* have positive and significant association with $SEXP_{ij}$. This is consistent with the prediction of ***H5c***. As for outward IBAs of CA sectors, none of them has significant association with $SEXP_{ij}$.

5.2.6. Hypotheses 6a, 6b, 7a and 7b: The Assistance from Developed Countries through International Business Activities and the Performance and the Efficiency of CA sectors

This group of hypotheses is about the causal relationship between the geographical distribution of IBAs and the performance and efficiency of different sectoral group. The expected signs between dependent variables and independent variables are listed in Table 5.6a. The results from TSCS regression are summarized in Table 5.6b.

From Table 5.6b, we notice that, during 1952-1966, all independent variables regarding inward IBAs from developed countries are positively and significantly associated with DP_i. This lends support for ***H6a***. Moreover, for independent variables related to outward IBAs to developed countries, we also find that $LAG1DCODI_i$ is positively and significantly associated with DP_i. This shows us that even during the early stage of Taiwan's economic development, outward IBAs to developed countries already had impacts upon the production of CA sectors.

For exports of CA sectors, again, we find that all independent variables related to inward IBAs from developed countries have positive and significant association with EXP_i during 1952-1966. On the other hand, no independent variables regarding outward IBAs to developed countries is significant. Thus, ***H6a*** and ***H7a*** are both supported by the statistical results for exports.

For comparative advantages of CA sectors, we also find that all independent variables related to inward IBAs from developed countries have positive and significant association with RCA_i. Hence, ***H6a*** are supported. As to outward

Table 5.6a. Expected Signs of Hypotheses 6a, 6b, 7a and 7b

Period	Dependent Variable	Type of Measurement	$DCIDI_i$	$DCODI_i$	$LAG1DCIDI_i$	$LAG1DCODI_i$	$LAG2DCIDI_i$	$LAG2DCODI_i$
Period 1:1952-66	DP_i	Performance	+ (6a)[a]	IS (7a)	+ (6a)	IS (7a)	+ (6a)	IS (7a)
	EXP_i	Performance	+ (6a)	IS (7a)	+ (6a)	IS (7a)	+ (6a)	IS (7a)
	RCA_i	Performance	+ (6a)	IS (7a)	+ (6a)	IS (7a)	+ (6a)	IS (7a)
	EFF_i	Efficiency	+ (6b)	IS (7b)	+ (6b)	IS (7b)	+ (6b)	IS (7b)
Period 1:1967-80	DP_i	Performance	+ (6a)	+ (7a)	+ (6a)	+ (7a)	+ (6a)	+ (7a)
	EXP_i	Performance	+ (6a)	+ (7a)	+ (6a)	+ (7a)	+ (6a)	+ (7a)
	RCA_i	Performance	+ (6a)	+ (7a)	+ (6a)	+ (7a)	+ (6a)	+ (7a)
	EFF_i	Efficiency	+ (6b)	+ (7b)	+ (6b)	+ (7b)	+ (6b)	+ (7b)
Period 1:1981-94	DP_i	Performance	+ (6a)	+ (7a)	+ (6a)	+ (7a)	+ (6a)	+ (7a)
	EXP_i	Performance	+ (6a)	+ (7a)	+ (6a)	+ (7a)	+ (6a)	+ (7a)
	RCA_i	Performance	+ (6a)	+ (7a)	+ (6a)	+ (7a)	+ (6a)	+ (7a)
	EFF_i	Efficiency	+ (6b)	+ (7b)	+ (6b)	+ (7b)	+ (6b)	+ (7b)

Notes: + = positive - = negative IS = insignificant

a. The Hypothesis for the expected sign

Table 5.6b. TSCS Regression Results for Hypotheses 6a, 6b, 7a and 7b: The Assistance from Developed Countries through International Business Activities and the Performance and the Efficiency of CA sectors

Period	Dependent Variable	Constant	$DCIDI_i$[a]	$DCODI_i$[b]	$LAG1DCIDI_i$	$LAG1DCODI_i$	$LAG2DCIDI_i$	$LAG2DCODI_i$
Period 1:1952-66	DP_i	1898.892*	0.0229***	-0.0175				
	DP_i	2249.331**			0.0347***	0.3735**		
	DP_i	2756.163					0.0201**	0.2903
	EXP_i	7.3697***	0.00037***	-0.00055				
	EXP_i	7.6474***			0.00037***	0.0017		
	EXP_i	9.3094***					0.00026**	0.0034
	RCA_i	0.2914***	6.83E-6***	0.00012***				
	RCA_i	0.2992***			7.83E-6***	6.85E-5		
	RCA_i	0.3106***					1.05E-5***	1.84E-5
	EFF_i	0.0384***	1.01E-6***	7.51E-6*				
	EFF_i	0.0371***			9.76E-7***	1.29E-5***		
	EFF_i	0.0434***					7.76E-7**	1.15E-5

Notes: *** Significant at the 1% level ** Significant at the 5% level * Significant at the 10% level

a. The $DCIDI_i$ variables used for this auto-regression model is the yearly total DCIDIs for sector *i*

b. The $DCODI_i$ variables used for this auto-regression model is the yearly total DCODIs from sector *i*

Table 5.6b. TSCS Regression Results for Hypotheses 6a, 6b, 7a and 7b: The Assistance from Developed Countries through International Business Activities and the Performance and the Efficiency of CA sectors (Continued)

Period	Dependent Variable	Constant	$DCIDI_i$	$DCODI_i$	$LAG1DCIDI_i$	$LAG1DCODI_i$	$LAG2DCIDI_i$	$LAG2DCODI_i$
Period 2:1967-80	DP_i	45097**	0.0579*	0.3473*				
	DP_i	27795			0.0897**	8.1321***		
	DP_i	37332***					-0.0017	10.7558***
	EXP_i	-67.2915	0.0024**	0.0071				
	EXP_i	-79.8345			0.00245***	0.00736***		
	EXP_i	123.5784*					-0.000738	0.1950***
	RCA_i	0.3371***	3.66E-7	4.21E-7				
	RCA_i	0.3000***			3.72E-7	5.14E-5***		
	RCA_i	0.3225***					2.28E-7	4.23E-5**
	EFF_i	0.1353***	2.76E-7*	1.45E-6**				
	EFF_i	0.1181***			2.91E-7***	3.11E-5***		
	EFF_i	0.1314***					1.11E-7	3.92E-5***

Notes: *** Significant at the 1% level ** Significant at the 5% level * Significant at the 10% level

Table 5.6b. TSCS Regression Results for Hypotheses 6a, 6b, 7a and 7b: The Assistance from Developed Countries through International Business Activities and the Performance and the Efficiency of CA sectors (Continued)

Period	Dependent Variable	Constant	$DCIDI_i$	$DCODI_i$	$LAG1DCIDI_i$	$LAG1DCODI_i$	$LAG2DCIDI_i$	$LAG2DCODI_i$
Period 3:1981-94	DP_i	258880***	0.01257	0.03029				
	DP_i	259890***			0.01759	0.04649*		
	DP_i	270156***					0.01438	0.04892
	EXP_i	1594.658**	0.00107	9.25E-5				
	EXP_i	1025.96*			0.0014**	0.00244**		
	EXP_i	582.743					0.00244**	0.00260
	RCA_i	0.4867***	1.23E-8	4.42E-8				
	RCA_i	0.4774***			2.72E-8	7.63E-8		
	RCA_i	0.4909***					-4.04E-9	1.65E-7
	EFF_i	0.5858***	7.83E-8	2.27E-7**				
	EFF_i	0.5620***			8.18E-8	3.21E-7***		
	EFF_i	0.5561***					1.18E-7**	2.09E-7

Notes: *** Significant at the 1% level ** Significant at the 5% level * Significant at the 10% level

IBAs to developed countries, it shows that only $DCODI_t$ has positive and significant association with RCA_t. Again, this shows that during the early stage of Taiwan's economic development, there were already outward IBAs to developed countries that could assist the performance of CA sectors. Thus, the results are inconsistent with ***H7a***.

For efficiency of CA sectors, it shows that almost all independent variables have positive and significant association with EFF_t. This indicates that, during the early stage of Taiwan's economic development, both inward IBAs from developed countries and outward IBAs to developed countries have strong impacts upon the efficiency of CA sectors. Hence, ***H6b*** is supported by the results but ***H7b*** is not.

During 1967-1980, the impacts from outward IBAs to developed countries were apparently stronger. For production of CA sectors, all independent variables related to outward IBAs to developed countries have positive and significant association with DP_t. Hence, ***H7a*** is supported by the results for DP_t. As to inward IBAs from developed countries, it shows that $DCIDI_t$ and $LAG1DCIDI_t$ also have positive and significant association with DP_t. Thus, ***H6a*** is largely supported by the statistical results for DP_t.

For exports of CA sectors, the results are similar to those for production. It shows that $DCIDI_t$ and $LAG1DCIDI_t$ have positive and significant association with EXP_t, and $LAG1DCODI_t$ and $LAG2DCODI_t$ have positive and significant association with EXP_t. Hence, again, ***H6a*** and ***H7a*** are largely supported by the statistical results for EXP_t.

For comparative advantages of CA sectors, we find that the impacts from IBAs to and from developed countries are less significant compared to those for production and exports. None of the inward IBAs from developed countries has significant association with RCA_t. Nevertheless, two independent variables

related to outward IBAs to developed countries, $LAG1DCODI_i$ and $LAG2DCODI_i$, have positive and significant association with RCA_i. Hence, basically, ***H7a*** is largely supported by the statistical results for RCA_i. However, ***H6a*** is not supported by the statistical results for RCA_i.

For the efficiency of CA sectors, IBAs from or to developed countries also show strong association with EFF_i. All independent variables related to outward IBAs to developed countries have positive and significant association with EFF_i. As to inward IBAs from developed countries, $DCIDI_i$ and $LAG1DCIDI_i$ have positive and significant association with EFF_i. Hence, both ***H6b*** and ***H7b*** are supported by the results.

During 1981-1994, the impacts from inward IBAs from developed countries and outward IBAs to developed countries upon the performance and the efficiency of CA sectors tend to be less significant compared to previous periods. For production of CA sectors, it shows that only $LAG1DCODI_i$ has positive and significant association with DP_i. This partially supports the prediction of ***H7a***. Other than $LAG1DCODI_i$, all other variables have no significant association with DP_i. Hence, the results do not support ***H6a***.

For exports of CA sectors, the impacts from inward IBAs from developed countries tend to take effect after the investments were made a year or two. For inward IBAs from developed countries, only $LAG1DCIDI_i$ and $LAG2DCIDI_i$ have positive and significant association with EXP_i. As to outward IBAs to developed countries, it shows that only $LAG1DCODI_i$ has positive and significant association with EXP_i. Hence, both ***H6a*** and ***H7a*** are partially supported by the results for EXP_i.

For comparative advantages of CA sectors, the results show that both inward IBAs from developed countries and outward IBAs to developed

countries have no significant association with RCA_i. Hence, for RCA_i, both ***H6a*** and ***H7a*** are not supported by the statistical results for RCA_i.

For the efficiency of CA sectors, it shows that IBAs related to developed countries still have impacts upon EFF_i. For inward IBAs from developed countries, only $LAG2DCIDI_i$ has positive and significant association with EFF_i. For outward IBAs to developed countries, $DCODI_i$ and $LAG1DCODI_i$ have positive and significant association with EFF_i. Therefore, based upon the results for EFF_i, ***H6b*** and ***H7b*** are both largely supported.

5.2.7. Summary of the Results

From the statistical analyses, we have the following results:

a. **IBAs and different sectoral group**: The results show that, for almost all the significant associations between IBAs and the performance or the efficiency of each sectoral group (including primary sectors, less CA sectors, and CA sectors), they are positive. Hence, it largely supports our argument that IBAs may have positive impacts upon the development of economic sectors. Moreover, compared to the associations between IBAs and other sectoral groups, the results also show that IBAs seem to have less impact upon Taiwan's primary sectors. Hence, it supports our prediction that, for economies that are not well endowed with natural country-level resources, IBAs may have limited impacts upon the primary sectors of these economies.

b. **IBAs and different sectoral group at different development stage**: From the statistical results, it is clear that, for all three groups of economic sectors, the positive association between international business activities and their performance and efficiency is relatively stronger during the early stage of Taiwan's economic development. This confirms our argument that, during early stage of a nation's economic development, at which time indigenous

firms still do not have adequate firm-level resources, the positive contributions from IBAs to the development of economic sectors are normally significant. As for period corresponding to later development stages, the results show that the associations between IBAs and the performance and the efficiency turn out to be much less significant. Again, this confirms our expectation that, as indigenous firms accumulate more firm-level resources and the economy begins to loose some of its L advantages in country-level resources, the impacts from IBAs will become less significant.

c. **IBAs and different dependent variables of sectoral performance and efficiency**: From the statistical results, we can see that for most cases, IBAs have weak association with revealed comparative advantages of different sectoral group. This may indicate that IBAs do not have strong effects on the revealed comparative advantages of economic sectors. As to production, exports and efficiency of economic sectors, IBAs normally have pretty strong association with these variables.

d. **IBAs and structural adjustment**: For structural adjustment from primary sectors to less CA sectors, the statistical results show that, both IBAs of primary sectors and IBAs of less CA sectors did have impacts (most are positive) upon this important aspect. However, the results are quite different for adjustment in terms of production and adjustment in terms of exports. For structural adjustment from less CA sectors to CA sectors, the statistical results also show that, both IBAs of less CA sectors and IBAs of CA sectors did have certain impacts upon this important aspect. Again, the results are quite different for adjustment in terms of production and adjustment in terms of exports. However, no matter which adjustment measure used for analyses, inward IBAs from CA sectors all turn out to have positive association with measure of structural adjustment.

e. **IBAs from developed countries and CA sectors**: From statistical results, we find that almost all the measures for the performance and the efficiency of CA sectors are positively associated with IBAs from and to developed countries. This strongly supports our prediction that IBAs from and to developed countries may have significant impacts upon CA sectors. Nevertheless, just as the results we found for individual sectoral group, the results here also show that IBAs from and to developed countries have less significant association with revealed comparative advantages, and have less significant association with all the dependent variables during 1981-1994.

Other than the above discussion, we should also be aware of a limitation faced by this research. This limitation comes from the scope of our studies. From the statistical results, it is clear that the values of constant terms for our regression models are all too large compared to other regression coefficients. Apparently, if our model could incorporate more variables into the models, the values of constant terms should be able to decrease to some extent. However, since our main interest is the sign of regression coefficients, the values of constant terms may not a serious concern for our conclusions.

CHAPTER 6

GETTING HELPS FROM INTERNATIONAL BUSINESS ACTIVITIES FOR UPGRADING: THE CASE OF TAIWAN'S ELECTRONICS INDUSTRY

The internationalization of Taiwan's electronics industry and its transformation into one of the most successful industries on the island was realized in a relative short period. At first, the industry began by making simple transistor radios and black and white TVs in the 1950s and 1960s. After 40 years of development, Taiwanese firms had challenged the market leaders in PCs (30% of world's totals), mice (80% of world's totals), color monitors (51% of world's totals) and other computer products.

This development experience has clearly demonstrated the interaction between international business activities, technology diffusion and changing comparative advantages (Riedel, 1992). In order to explain the interaction, we will first examine the different phases that Taiwan's electronics industry has gone through. Then, by using Dunning's OLI framework and Porter's national diamond, we will focus upon how Taiwan's electronics industry has interacted with international business activities over the past 40 years.

6.1. The Historical Path of Taiwan's Electronics Industry

The origins of Taiwan's electronics industry go back to the late 1940s, and gradually become Taiwan's most important industry. Its successful development clearly shows the role of international business activities in a country's industrial structural adjustment. Roughly speaking, the development of Taiwan's electronics industry can be divided into 3 stages; namely, the start-up stage (1950s and 1960s), the take-off stage (1970s) and the growth and sophistication stage (1980s and 1990s).

6.1.1. Start-up Stage (1950s and 1960s)

Taiwan's electronics industry originated in the late 1940s when local job shops began to assemble radios using imported parts from Japan (Wade, 1990 p.93-4). Other firms that had transferred from Mainland China began to make simple electrical equipment such as transformers, wire and light bulbs. In 1950, the government restricted the import of finished radios in order to protect local manufacturers and provide incentives to local assemblers. According to the first Four Year Plan (1953-1956), protection and other incentives would be given for the production of radios, fans, meters, fluorescent lights, low-voltage transmitters, and cables. The result of this policy encouraged the emergence of foreign owned subsidiaries and joint ventures between Taiwanese firms and MNEs from other countries. Due to Taiwan's historical links with Japan and Taiwan's role as a counter to Chinese communism, there were a number of foreign inward investments from Japan and US during this period. For example, in 1953, a technology license agreement, for electric watt-hour meters, took place between Tatung and a Japanese firm. Because of this agreement, Tatung was able to send its engineers to Japan for training. In 1954, National Cash Register (NCR) established its subsidiary in Taiwan, and in 1956, IBM, following NCR, set up its subsidiary in Taiwan. In late 1950s, foreign inward investments in Taiwan were further advanced due to the wage pressure in US and Japan. Furthermore, more US firms and Japanese firms were encouraged to start their operations in Taiwan because of US aid programs, Taiwan's low-cost skilled labor force and government incentives. Therefore, a number of Japanese firms began seeking local partners for electrical assembly in 1950s, and seven joint ventures had been successfully formed by 1963. As to US firms, General Instruments, Texas Instruments and DEC also entered Taiwan during the same period.

Meanwhile, in 1961, the Stanford Research Institute, which had been asked by the government and USAID to help identify sectors and products of interest to foreign investors, urged that electricals should be one of seven priority industries. In 1962, Taiwanese government imposed local content requirements for the production of televisions, refrigerators, air conditioners, automobiles, diesel engines, and several items. This represented the government's response to a problem that much of the incoming Japanese investment only intended to make items for sale on the domestic market with components shipped in from Japan. At about the same time, the government also revised the rules regarding foreign investment, to facilitate joint ventures and technical cooperation agreements with foreign firms. As a result, several more technical agreements on production of electrical appliances and consumers electronics were signed between Taiwanese and Japanese firms in 1963.

On the other hand, the Taiwanese government also aggressively sought out foreign investments for electronics industry, especially those from US firms. In 1966, the government published a plan to turn Taiwan into an "electronics industry center." The planning agency (Council for International Economic Cooperation and Development, CIECD) formed an electronics working group to assist in marketing, coordinating production with the demands of foreign buyers, procuring raw materials, training personnel, improving quality, and speeding up bureaucratic approval procedures. It also arranged two major exhibitions in 1967 and 1968 to bring foreign investors together with local producers.

Although aggregate FDI flows into Taiwan were small, foreign companies took the lead in electronics through wholly owned subsidiaries and joint ventures. The investment made by General Instruments in 1964 initiated the making of consumer electronics in Taiwan, and later transferred production of

transistors, diodes and integrated circuits from the US (Chaponniere and Fouquin, 1989, p.29-31). In the following two years, 24 more American companies began to make simple electronics components and other products for exports.

By contrast, Japanese firms tended to supply the local market through joint ventures. By 1963, at least seven formal joint ventures had been agreed between local and Japanese electrical appliance manufacturers (Wade, 1990 p.94), mostly producing transistor radios, black and white TVs and simple components. In 1963, Sanyo formed a joint venture with the Taiwanese importer of its goods to supply the local market and by 1970 the company began exporting. This venture initiated production of white goods, air-conditioners, audio products, TV sets and, later, VCRs (Chaponniere and Fouquin, 1989 p.47). Other Japanese firms soon began exporting after setting up in Taiwan.

While the MNEs provided opportunities, the source of Taiwan's explosive growth in electronics was local companies. These sub-contractors inundated the MNEs with offers of manufacturing services. Many Taiwanese technicians gained work experience and later left MNEs, setting up their own businesses to supply market niches and services, sometimes to their former employers. Larger firms such as Tatung supplied the MNEs as sub-contractors and then learned to imitate and compete with them. As other NIEs, Taiwan's local entrepreneurs eagerly exploited opportunities for export growth, first in food processing, then textiles, and later electronics.

Export orders from foreign buyers caused a rush of new domestic firms into radio production in the mid-1960s and later, TVs, TV games and computers. Growth was stimulated as the larger electrical firms such as Tatung and Taco diversified into electronics in the mid-1960s (Chaponniere and Fouquin, 1989

p.30). Between 1966 and 1971, Taiwanese electrical and electronics exports together grew at an average rate of 58 percent per annum (Wade, 1990 p.95).

During the start-up phase, many Taiwanese companies learned the art of manufacture. They relied heavily on foreign firms for training and licensing agreements. Between 1952 and 1988, the government approved more than 3,000 such agreements; many were for technology transfer in electronics (Dahlman and Sananikone, 1990 p.78). Technology was also acquired by copying, reverse engineering and foreign training and education. Later on, many Taiwanese nationals returned from abroad after studying and working in foreign companies, which led to a reverse of the brain drain.

6.1.2. Take-off stage (1970s)

During the 1970s, consumer electronics experienced significant growth, which provided Taiwanese firms great opportunity for penetrating international markets. Meanwhile, computer industry started up and with the help from government, some Taiwanese firms also began designing semiconductors. All these developments are directly related to Taiwan's future success in electronics industry. Furthermore, through alliances with foreign MNEs and buyers, Taiwanese firms were gradually able to exploit successive waves of product innovations in the West. Hence, new product lines were added, which included color TVs, digital watches, calculators, push-button telephones and TV video games.

During this period, most Taiwanese firms still continued to rely on original-equipment manufacture (OEM) and foreign buyers for technical assistance, although some already mastered the production technology for these goods. In the early 1970s, IBM began purchasing large quantities of sub-assemblies and components from Taiwanese companies. This deal made Taiwan become the

second largest procurement center for IBM in the 1970s. Other US computer firms followed helping local companies learn about an increasingly sophisticated array of components and systems.

By the mid-1970s, electronics had become the second largest export industry after textiles. Many MNEs and hundreds of local small and medium sized enterprises (SMEs) made contributions to this growth. Philips began making black and white TVs in 1970 and then color TVs in Kaohsiung in 1976. Later on, Philips became one of the largest MNEs in Taiwan, producing TV monitors, compact disc players and many other products. RCA, which began making memory circuits in 1969, also started producing black and white TV sets and tuners in 1971. As for indigenous firms, they tended to concentrate on manufacturing simple products under OEM and other sub-contracting arrangements. Nevertheless, after years of operating as OEM manufacturers, many Taiwanese firms progressively accumulated know-how in both technological and managerial capabilities (Lin and Kirchoff, 1996). Due to this knowledge transfer process, in late 1970s, a number of Taiwan's high technology start-ups appeared with product innovation and/or the so-called "own-design manufacturing" (ODM) capabilities. The best-know example is ACER, which was established in 1976 by Stan Shih and 11 engineers (mostly US trained) under the name Multitech International Corporation.

On the other side, the government also tried to upgrade Taiwan's industrial activities from assembly stage of production. Therefore, the government controlled and, in some cases, discouraged labor-intensive MNE investments, and imposed more export and local content targets on foreign companies. Moreover, in order to encourage jointly owned ventures for components, the government also protected local market and strictly controlled imports. Another important action taken by government during this period was its decision to

expand Taiwan's electronics industry to more high-tech segments. Certain government officials made plans for Taiwan to acquire semiconductor design and production capability as early as 1972. In 1974, they formed the public owned Electronic Research and Service Organization (ERSO) under ITRI (Industrial Technology Research Institute), with responsibility to recruit a foreign partner to help develop and commercialize the technology. In 1976, ERSO opened the country's first demonstration factory for wafer fabrication, and a year later signed a technology transfer agreement with RCA (a US firm) in integrated circuit design. ERSO also proposed that the future development for Taiwan's integrated circuit industry should rest upon the capacity in custom-tailored chips (application-specific integrated circuits, or ASICs), because ASICs provided a source of innovation across the whole electronics industry from data processing to consumer electronics to telecommunications. Besides, ERSO believed that ASICs also differentiated Taiwan from Korea which pursued high-volume products such as memory chips. ERSO hoped that an ASIC capacity would allow Taiwan to keep a competitive edge over Korea by accelerating the number of new models of any one electronics-dependent product.

In addition to the responsibility for guiding the development of core technologies and new products, ERSO was also responsible for training microelectronics engineers, some of whom would then move to enterprises in the private sector. Hence, in order to transfer the technology to private sector, United Microelectronics Corporation (UMC), a subsidiary of ERSO (with a 45 percent equity share held by five private local firms), was established in September 1979 to transfer and commercial the advanced microelectronics technology developed in ERSO.

By the late 1970s, although the industry remained at the packaging stage, the manufacturing technology for CMOS was already well developed. Government

officials had then begun to envisage an integrated information industry for Taiwan, linking semiconductor, computers, computer software, and telecommunications. They gave it very high priority. A newly formed information industry task force headed by two senior cabinet ministers was made responsible directly to the premier. A comprehensive approach to the information industry was spelled out in the Information Industry Development Plan for 1980-1989. All these actions were crucial to the prosperity of Taiwan's information industry during 1980s and 1990s.

6.1.3. Growth and Sophistication stage (1980s and 1990s)

During the 1980s and into the 1990s, Taiwan's electronics industry experienced rapid growth and technological deepening. Large numbers of small firms entered the professional electronics area, making computers, sub-assemblies, monitors, printed circuit boards, printers and keyboards. Moreover, a number of Taiwanese firms consolidated their expertise in chip design while some companies (such as UMC) began to make semiconductors in medium volumes, relying on technological support from the government-funded research institutes. To encourage technology deepening, the state invested in its own research laboratories and organized collaborative R&D ventures among local firms.

By the late 1980s, wages had considerably risen and Taiwan's competitive advantage had progressed from cheap labor to low-cost, productive, high-quality engineering. As in the other NIEs, production required increasingly complex precision engineering and electro-mechanical interfacing.

The PC industry took off in the 1980s as IBM, Wang, Hitachi and others purchased huge quantities of finished goods and sub-assemblies. By 1990 the export value of computers and related goods was more than double that of

consumer electronics. Often through companies in Hong Kong, Taiwanese firms transferred much of their low-end production into neighboring regions of China, stimulating the rapid growth of the Chinese economy.

In the latter part of the 1980s, companies increased their exports of precision-engineered goods such as hard disk drives, color display terminals, video graphic adapters, TV monitors and computer peripherals. Taiwanese firms increasingly competed at the early phase of the product life cycle, introducing new improved designs in anticipation of market needs. Unlike the *chaebol* of South Korea, Taiwanese companies targeted high value-added niche markets, rather than scale-intensive production.

Semiconductor design and manufacture also took root in 1980s. Philips began a joint venture with the Taiwanese government in 1987, forming the Taiwanese Semiconductor Manufacturing Corporation (TSMC) to make special circuits for local design firms. In 1991, TI and ACER formed a partnership to make memory circuits for the local computer industry. The fast-growing demand for microprocessor led Mitac (Taiwan's second largest computer maker) to discuss an alliance with Intel of the US in 1992 to make the 80586 central processing chip.

By the early 1990s, Taiwanese firms had more than proved their reputation as innovative designers of finished PCs, notebook computers and printed circuit boards. Some small or medium-sized firms, mostly unknown in the West, grew to become fairly large companies. Datatech, for example, which was founded in 1981 by four friends from college, began assembling printed circuit boards in a converted apartment building (Johnstone, 1989 pp. 50-51). By 1993, the company sold more than US$200 million worth of motherboards, PCs and clones of Sun Microsystems workstations and operated out of a modern, automated factory.

In semiconductor, after growing at rates of around 50 percent per year, Taiwan surpassed U.K. to become the fifth largest producer worldwide in 1993. One of the industry leaders (UMC) even contended that Taiwan would soon become the world's third largest semiconductor producer.

6.2. The Dynamic Interaction between Taiwan's Electronics Industry and Its International Business Activities

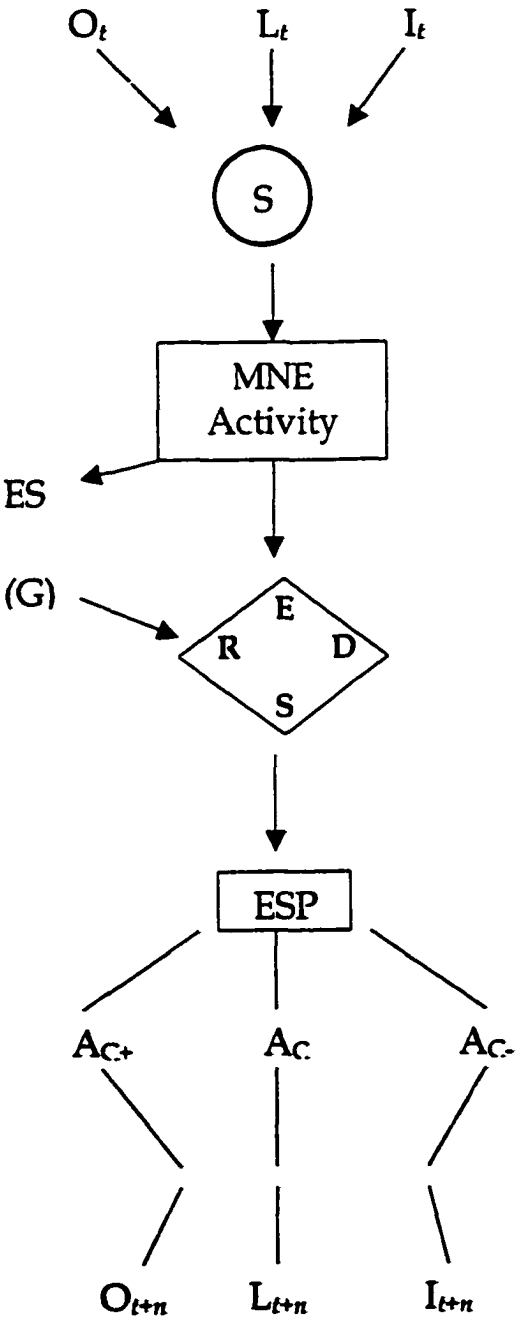
6.2.1. Some Theoretical Consideration

In chapter 2, we already mentioned that a country's industrial structural adjustment is a dynamic process, and we also pointed out that the accomplishment of this process is mainly determined by the changing configuration of the country's OLI variables, which include the upgrading of indigenous firms' competitive advantages and the country's factor condition.

To understand more about the nature of this dynamic process and how international business activities may have impact upon this process, we need to further observe and analyze how exactly these OLI configuration has interacted with international business activities, and how this interaction has contributed to the accomplishment of structural adjustment from one period of time to another. In other words, we need to trace what events have occurred during this dynamic process. According to Dunning (1993a), there is a possible sequence of events following an initial or sequential change in MNE activity (as shown in Figure 6.1). It shows that, the impact of IBAs upon a country's industrial structural adjustment consists of three components. First, under existing OLI configuration, how IBAs may occur in the economy. Secondly, after IBAs occur in the economy, how can these IBAs affect each element of the economy's national diamond. Thirdly, how new national diamond may influence the ESP configuration of the economy, and in turn, shape the new OLI configuration of the economy. This

sequence will continuously take place as the economy continues the dynamic process for industrial structural adjustment.

Figure 6.1. The dynamic interaction between MNE activity and the economies in which they operate: a possible sequence of events



Source: Dunning, J.H. 1993. ***Multinational Enterprises and the Global Economy***, pp. 268.

By using Dunning's concepts, we may now analyze the dynamic transformation of Taiwan's electronics industry since 1950s.

6.2.2. The Start-up Stage of Taiwan's Electronics Industry (late 1940s to 1960s)

During the start-up stage of Taiwan's electronics industry, Taiwan's national diamond of competitive advantages was largely based upon the possession of natural resources. In particular, there were cheap skilled labor forces available for both agricultural sectors and manufacturing sectors. This L advantage originated from three sources. First, when Taiwan was under Japan's colonial rule, Japan put a lot of effort on setting up Taiwan's education system. Hence, when KMT took control over Taiwan in 1945, there was already a well-established educational system in Taiwan, and as a result, Taiwan already had many educated people necessary for its further economic development. Another source for Taiwan's L advantages in labor force also developed during Japan's colonial period. Many native Taiwanese gained expertise in technical professions and management due to their works in previously Japanese-owned companies. Later, they become an important source of industrial entrepreneurs. Thirdly, after KMT retreated to Taiwan in 1949, a number of technicians, managers and entrepreneurs immigrated to Taiwan from Mainland. They were also crucial to Taiwan's industrial expansion.

On the other hand, during this period, Taiwanese firms had very few O advantages. Especially, they were lack of technological, managerial and financial capabilities. Hence, most industrial activities at that time were concentrated in primary product sector (food processing) and labor-intensive manufacturing sectors supplying relatively simple consumer products, mostly to local market.

In addition, the value activities performed by local companies did not involve sophisticated technological and managerial knowledge at that time.

The above macro environment also affected the development of Taiwan's electronics industry during this period. Again, the L advantages of Taiwan during this phase were largely based on the availability of cheap unskilled labor, and the domestic market was small since most people still could not afford most of the electronics products. In addition, the O advantages of indigenous firms were almost negligible, as there was little indigenous technology accumulation in electronics products. Under such circumstance, during the late 1940s and early 1950s, most indigenous Taiwanese firms in electronics industry could only count on foreign companies (especially Japanese firms) to provide the core created assets (through selling key components or parts to Taiwanese firms) for producing electronics products. Therefore, at this stage, Taiwanese firms either did the final assembly operations by using imported parts, or manufactured simple products (such as transformers, wire and light bulbs) that required either little product technology or process technology that was inexpensive and widely available. At the same time, there was very limited inward direct investment realized. Although there was abundant cheap and semiskilled labor force, the political instability prevented many MNEs from actively investing in Taiwan. Hence, the impact from international business activities to Taiwan's economy was restricted too. Most of them were not in electronics industry and merely aimed at exploiting Taiwan's cheap labor force and trade-supportive activities.

In sum, during late 1940s and early 1950s, although Taiwan enjoyed L advantage in cheap and semiskilled labor force, the international business activities were hindered mainly due to the political risk associated with Taiwan. Hence, the development of Taiwan's electronics industry during this period was not significantly affected by international business activities. Indigenous

Taiwanese firms could only count on foreign companies to purchase components and parts for supplying domestic market.

In 1950, the macro environment of Taiwan began to change due to Taiwan's gradual political stabilization and government's desire to build up Taiwan's "infant industries." The Taiwanese government aggressively promoted "import substitution" in a variety of light consumer industries by sealing off the domestic market. Various devices were used to discourage imports and expand its industrial base from primarily food processing to other nondurable consumer goods. In electronics industry, protection and incentives were given for the production of radios, fans, meters, fluorescent lights, low-voltage transmitters, and cables. The result of this policy greatly encouraged the emergence of foreign owned subsidiaries and joint ventures between Taiwanese firms and MNEs from other countries in 1950s. Moreover, due to US government's plan to replace its aid program to Taiwan and the pressure to cut cost, there were a number of foreign inward direct investments from Japan and US during this period. In particular, the American MNEs' move to Taiwan after mid-1960s represented an oligopolistic reaction to cut costs in order to remain competitive.

Hence, since late 1950s, the manufacturing of electronics products in Taiwan was no longer limited to assembling imported parts by local companies, and/or producing simple electrical equipment. Due to foreign MNEs' increasing appearance in Taiwan's electronics industry, although the main value activities remained to be assembly type during late 1950s and 1960s, there was already some new development. First, certain subsidiaries of American MNEs began to make intermediate components for local assembly operations on the island. Secondly, the electronics products manufactured in Taiwan were no longer restricted to supplying domestic market. Most American MNEs exported their finished electronics products from Taiwan's subsidiaries back to U.S. market for

which they were initially designed. Thirdly, since mid-1960s, a number of local companies (most of them were small or medium-sized) began to manufacture electronics goods as well. Essentially, there were 2 groups of local companies that jumped into electronics industry. One group of them was those set up by Taiwanese technicians or managers who formerly worked for foreign MNEs' subsidiaries. This type of local companies normally started their business by supplying export orders from foreign buyers, sometimes to their former employers. Another group of firms was larger firms such as Tatung and Taco that diversified their business into electronics. These firms initially supplied the MNEs as sub-contractors and then learned to imitate and compete with them.

In addition to the above development, since early 1960s, the products manufactured in Taiwan were no longer limited to simple electrical equipment. The strong demand in U.S. market led to active production of more sophisticated products, such as air-conditioners, audio products, TV sets and refrigerators.

The emergence of foreign owned subsidiaries and joint ventures effectively upgraded Taiwan's O and L advantages through the following ways. First, when American and Japanese companies bought large quantities of low-cost consumer electronics for resale in their home markets, they normally provided Taiwanese suppliers product specifications, manufacturing process information and training to Taiwanese employers. Secondly, while working in joint ventures or subsidiaries of foreign MNEs, Taiwanese engineers were able to receive training from foreign companies for product technology and process technology. Thirdly, through employment in foreign owned subsidiaries, Taiwanese employers could learn the management system and production system performed by famous foreign companies. Fourthly, although most products were developed at foreign MNEs' R&D facilities at headquarters, engineers on Taiwan, either local or expatriate, carried on research to improve production efficiency. This process

provided Taiwanese engineers in-deep knowledge and practical experience about the product technology and process technology.

Another important development that affected Taiwan's L advantage after late 1950s is Taiwanese government's change of policy from import-substitution to export-led growth policy. Between 1958 and 1962, the government introduced a series of incentives to promote exports and domestic investment and industrialization. Among them, two policy measures were most related to the emergence of inward foreign investment in Taiwan's electronics industry; namely, the Statute for the Encouragement of Investment, and the establishment of Export Processing Zones (EPZs). Both measures provided various incentives for foreign investors, such as cheap credit and rebates on imported components and raw materials. As a result, a number of electronics producers were attracted to invest in EPZs. Most of these foreign investors took advantage of Taiwan's inexpensive labor force to assemble low-cost consumer electronics for resale in their home markets.

In sum, we can understand that, during the start-up stage of Taiwan's electronics industry, it is the location-specific factors that mainly determine the importance of international business activities to the whole industry. The firm-specific assets possessed by Taiwanese firms were so limited. Hence, the indigenous firms alone could not effectively stimulate the development of the industry. In late 1940s, the scale of Taiwan's electronics industry was significantly restricted by Taiwan's location-specific assets (political environment in particular) and firm-specific assets (the capabilities and resources possessed by indigenous firms). Due to lack of adequate human resources and technological know-how for producing electronics products, there were only few local companies in this sector that highly relied upon Japanese firms for assembly operation or producing simple products. In addition, due to the political

instability and poor infrastructure at that time, foreign MNEs were also unwilling to actively invest in Taiwan. Therefore, during late 1940s and early 1950s, we could hardly identify any influence from international business activities to the development of Taiwan's electronics industry.

Nevertheless, with changes in Taiwan's location-specific factors, the above situation was changed accordingly later in 1950s. First, the import-substitution policy forced some Japanese firms to conclude joint ventures with their Taiwanese partners. Then, later in late 1950s, the export-led growth policy encouraged a number of foreign MNEs to invest in Taiwan. Moreover, this policy also attracted a lot of export orders from foreign buyers that tried to utilize Taiwan's cheap labor force. This, in turn, led to the significant increase of new Taiwanese firms in electronics sector. Although the firm-specific assets possessed by these new indigenous firms were still limited to those related to organizing assembly operations, they began to notice the great opportunities available in electronics sector, and learned capabilities from foreign companies.

On the other hand, the O advantage possessed by indigenous firms also began to improve as more foreign firms entered Taiwan's electronics industry after 1950s. The key to this improvement is the technology transfer realized through various inward international business activities. As we mentioned earlier, no matter what entry mode chosen by foreign MNEs, there was always some extent of technology transfer occurred. This could possibly occur between foreign buyers and local sub-contractors, or between investing firm and indigenous firm, or through the Taiwanese who were employed by MNE's manufacturing plants and learned the expertise for production and management. As a result, the indigenous firms gradually accumulated the O advantages for performing certain upstream value activities (including managing assembly operations and production of simple components) in electronics industry. This

became an important basis for the growth of Taiwan's electronics industry in 1970s in which period the development of the whole sector relied heavily upon OEM relationship with foreign buyers, and the network relationship among Taiwanese firms.

6.2.3. The OEM Stage of Taiwan's Electronics Industry (1970s and early 1980s)

In OEM stage, due to changes in O advantages and L advantages, Taiwan's electronics industry had significant growth and evolution at this stage. At the same time, the nature of international business activities in this sector changed accordingly. As a result, it further upgraded the O advantages of indigenous firms as well as the competitiveness of Taiwan's electronics industry in next stage. Moreover, based on the O advantages accumulated from consumer electronics, Taiwan was well prepared for its success in computer industry.

The upgrading of Taiwan's country-level resources and firm-level resources was greatly achieved in previous stage, as mentioned in last section. In OEM stage, both types of assets were continuously advanced. This was achieved by both government's actions and private sector's efforts toward higher value-added products.

Since 1970s, Taiwanese government had tried to upgrade Taiwan's industrial activities from assembly stage of production to more value added products. Therefore, the government controlled and in some cases, discouraged labor-intensive MNE investments, and imposed more export and local content targets on foreign companies. As a result, foreign investors were forced to extend their value activities from pure assembly operations to manufacturing of parts or components. Some of them even began to invest in R&D-intensive products

(such as semiconductor). Indigenous firms, thus, had more chance to absorb advanced firm-level resources from foreign companies.

Another important action taken by Taiwanese government during this period was its decision to expand Taiwan's electronics industry to more high-tech segments. In particular, Taiwanese government attempted to shift the focus of its electronics industry from low value added consumer electronics to higher value added electronics, such as computer-related products.

In early 1970s, consumer electronics began to grow rapidly in Taiwan. A number of firms (including subsidiaries of foreign companies and indigenous firms) already began to manufacture a variety of consumer electronics in Taiwan. For example, in TV segment, Philips and RCA both produced black and white and color TVs in Taiwan. Large indigenous firms, such as Tatung, Sampo and Teco, also produced certain electrical parts and components, and assembled consumer electronics for foreign companies and domestic market. Small or medium-sized indigenous firms, through the help from foreign purchasers, focused upon producing a variety of electronics components and parts. In 1973, three companies (mostly joint ventures between Taiwanese firms and foreign MNEs) were formed to produce TV tube (a core component of TV sets) in Taiwan. As a result, Taiwanese firms acquired most of the technology necessary for producing black and white TV. Similar achievement was also made in other consumer electronics, such as calculators, refrigerators, and home audio products. Consequently, Taiwanese firms were rather competitive in consumer electronics during early 1970s, and electronics became one of the largest export sectors in early 1970s (Chao, 1988).

The success in consumer electronics, in turn, provided a solid foundation for Taiwan to upgrade its electronics sector to computer-related segments. Essentially, this was achieved through the following aspects. First of all, after

years of experience in consumer electronics, indigenous firms already accumulated certain technological capabilities for producing electrical parts and components. Based on these capabilities, Taiwanese firms were able to upgrade their major products from consumer electronics to computer-related segments without too much difficulty. Secondly, due to the success in consumer electronics, government also realized the potential strength that Taiwanese firms may have in electronics sector. Hence, government officials were willing to put considerable resources in cultivating the created assets (in particular, R&D efforts and education) for electronics sector. In universities and colleges, new academic departments related to electrical engineering and computer engineering were established to cultivate more high-quality engineers and technicians. Also, Taiwanese government offered more funding for these departments to do research in advanced technology related to electrical engineering and computer engineering. Thus, a lot of excellent graduates from high school were willing to choose electrical engineering and computer engineering as their future career. In addition to efforts in education system, Taiwanese government also actively pursued building up Taiwan's technological capabilities in electronics sector. In September 1974, a government-sponsored research unit named Electronic Research and Service Organization (ERSO) was founded. The goal of this research unit has since been concentrated on the research and development of electronics technology. Through collaboration with foreign and local electronics firms and universities, ERSO has been responsible for introducing most recent technologies to Taiwanese firms. Due to the efforts made by ERSO, local electronics firms were capable of catching up the technological advances achieved in developed nations. Moreover, ERSO has been an important source of scientists and technicians who later left ERSO and established their own businesses. Through this kind of spin-offs and formal technology transfer from

ERSO, private sector was able to acquire the most advanced technological capabilities from ERSO.

As a result, when Taiwan began to enter computer-related segments in late 1970s, there were already abundant human resources available for both indigenous firms and foreign MNEs. Also, indigenous firms were capable of producing products that were more complicated and higher value-added.

On the other hand, private sector also made a lot of efforts to compete in international markets. In order to capture the opportunities from international markets, small or medium-sized indigenous firms worked closely with local traders to export their products. This relationship was very important for them to penetrate international markets, since almost all of these firms did not have their own marketing channels. Through cooperation with traders, these firms not only competed successfully in international markets, but also built up their strength in electronics products. They gradually formed unique production networks that were flexible and cost-effective. This kind of production networks was very popular in Taiwan's personal computer industry during OEM stage. Through the operations of these production networks, Taiwanese firms gain competitive advantages in organizing the value activities related to production stage (Lin and Kirchhoff, 1996).

Based on the above development, Taiwan's electronics sector gradually progressed from consumer electronics to two major computer-related segments: integrated circuit (IC) and personal computer (PC). For integrated circuit, due to its scale and technology-intensive nature, most private Taiwanese firms at that time did not have the resources or technological capabilities to enter this segment solely on their own. Hence, this segment was largely built up through government's efforts. As to personal computer, due to its technological relevance

to consumer electronics, private firms had more active roles in the emergence of Taiwan's PC industry.

The Evolution of Taiwan's IC Industry

Taiwan's IC industry had its beginning in the Modern Engineering Technology Symposium (METS)[1] held in 1970. At the first of METS in 1966, scholars already realized the potential of the electronics industry. In 1970, at the Third Symposium, the possibility of developing an IC industry in Taiwan was vigorously discussed. In 1974, participants of the Fifth Symposium agreed that Taiwan's electronics industry could not afford to remain in the assembly stage of production. They also came to the conclusion that, in order for Taiwan to develop its own IC industry, appropriate technology would have to be acquired as quickly as possible. To achieve this goal, they suggested that Taiwan should begin manufacturing ICs. This proposal received full support from the Minister of Economic Affairs, who immediately called a special meeting to adopt and implement the proposal. Later in 1974, ERSO was assigned the responsibility to recruit a foreign partner to help develop and commercialize semiconductor technology. Among others, ERSO's most important tasks were to set up an IC manufacturing demonstration factory, and to acquire technology from abroad for eventual transfer to the domestic private sector. In 1976, ERSO decided to choose RCA as their foreign partner who agreed to provide CMOS technology for ERSO's demonstration factory. Right after this decision, ERSO began to build its demonstration factory. The facilities for manufacturing ICs must meet the strictest standards of environmental control to maintain product quality.

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[1] METS was initiated by Taiwanese government officials in 1960s. The purpose of this body is to gather engineers from both home and abroad to help government identify the latest engineering technology that would most benefit Taiwan's industrial sectors. It has been held every four years since 1966.

Therefore, the design and construction of control systems were rather sophisticated. To accomplish this, ERSO had to overcome its lack of technicians and skills to build such facilities. As a partner to this project, RCA was asked to supply the necessary designs and materials, and to provide training for local technicians. Moreover, with RCA's assistance, ERSO enlisted many scholars with advanced degrees from US universities to assist their efforts. Due to the participation and assistance from RCA, ERSO successfully set up the demonstration factory. Also, the IC manufacturing technology was transferred to local technicians at ERSO. From the second half of 1978 to the first half of 1979, ERSO had tested the technology used in the demonstration factory. Not only the production efficiency of the factory exceeded original expectation, but also production costs were competitive by marketplace standards. Hence, foreign sales were progressing smoothly. Based on this success, in late 1979, ERSO began to transfer the newly acquired IC technology to private sector. The first company that received this new technology was United Microelectronics Corporation (UMC) which, with ITRI's leadership, was established in September 1979. Basically, the technology transfer process involved three major tasks: the choice of major products for UMC, the construction of manufacturing factory for UMC, and the transfer and training of manpower for UMC.

For major products of UMC, UMC not only acquired RCA's technology via ERSO, but also received technical advice from ERSO about the future trend of IC products. Because the technology acquired from RCA was soon becoming out-of-date, ERSO helped UMC making the decisions to produce a four-inch chip. This decision ensured UMC's healthy development. As to the construction of manufacturing factories, specialists at ERSO and at ZhongXin Engineering Consultants, Inc. had worked closely with UMC to complete this project. With their assistance, the design of UMC's factory surpassed the design of ERSO's

demonstration factory. After completion, UMC's factory even achieved a much higher level of cleanliness and, therefore, better product quality. The transfer of manpower from ERSO to UMC was another effective way for technology transfer. In the early stage of UMC's development, Taiwan's only organization with IC manufacturing experience was ERSO. Without experienced personnel, it would have been difficult for UMC to absorb the IC technology. Hence, in order to solve this problem and hasten private sector's entry into the market, Taiwanese government supported UMC's requests for manpower transfer from ERSO. Furthermore, in order to cultivate more manpower for UMC, ERSO also provided UMC an intensive training program. ERSO contributed 65 engineers (1/3 of its engineering staff) to support this training. As a result of the above efforts, UMC began to produce various kinds of IC products in 1980. Later in mid-1980s, 4 more companies were established to manufacture VLSI (very large scale integrated). It indicates that, Taiwanese government's efforts to transfer IC manufacturing technology to private sector had been very successful.

In addition to IC manufacturing, Taiwanese government also established the Common Design Service Center to help indigenous firms develop their IC design technology. The purpose for this policy was to build up a segment solely focused upon designing application specific ICs (ASICs) for customers. Thus, a number of indigenous firms would be able to enter IC industry with little investment as well as enjoy a distinct advantage. Moreover, with the establishment of Taiwan's IC design houses, Taiwan's IC industry could better serve various needs from customers.

The growth of Taiwan's IC industry was even more encouraging in 1980s. Since early 1980s, more IC-related companies were established. In mid-1980s, there were already more than 20 design houses established in Taiwan. Many ERSO engineers who had received several years of training in IC design were

transferred to these private companies, or began their own IC design houses. Other than IC design industry, IC manufacturing segment also gradually migrated to more complicated products. Until 1984, overseas Taiwanese further established three more VLSI manufacturing companies that could produce CMOS of 1.5 μ and 16K, 64K SRAM, CMOS EPROM and HMOS. This greatly enhanced Taiwan's IC industry to higher level. On the other hand, facing the maturity in traditional CMOS technology, Taiwanese government also decided to upgrade Taiwan's IC manufacturing industry to production of VLSI. Again, this mission was assigned to ERSO. In addition to its own research in VLSI and acquisition of more accurate E-Beam MASK manufacturing technology, ERSO, after receiving the approval from government, invested U.S. $400 million jointly with Phillips to build a high-precision IC manufacturing company named Taiwan Semiconductor Manufacturing Corporation (TSMC). TSMC was to produce foreign-designed ASICs as well as specialist chips for both local firms and Phillips's own internal use. Under the venture, ERSO/ITRI arranged with Phillips to transfer static random access memory (SRAM) technology used in consumer electronics. After training from Phillips, ERSO spun off nearly 200 personnel, mostly engineers, to join the new company. TSMC set up two leading-edge fabrication lines located at Hsinchu Science Park and later became one of the first companies in the world to offer foundry-only (i.e. fabrication with no design) services, mostly for Silicon Valley and Taiwanese chip design companies.

The establishment of TSMC did much to spur the development of Taiwan's IC design houses. Also, its establishment benefited Taiwan's IC industry as a whole in the following ways. First, it motivated UMC to begin planning for a U.S. $200 million expansion factory to be built in the next 5 or 6 years. Secondly, it raised the image and the standards of Taiwan's IC industry as it attracted the attention of the world's IC industry, which was impressed by Phillips's large

investment and by the involvement of the director of the board, Morris Chang, and general manager James E. Dykes, both of whom are well-known in the industry.

Hence, until mid-1980s, Taiwan's IC industry already became more clearly differentiated with distinct divisions among down-, mid-, and upstream. The IC products manufactured and designed in Taiwan were able to supply foreign markets, and the increasing demands from Taiwan's personal computer industry and consumer electronics for OEM orders.

The Evolution of Taiwan's Personal Computer Industry

Unlike IC industry, Taiwan's PC industry was initially established mostly through private sector's efforts. Now, it already becomes a major economic sector of Taiwan.

The origin of PC industry began in US since 1974. At that time, both Intel and Motorola already developed microprocessors for professionals. There were few software packages for these microprocessors, and the functionality of these microprocessors was quite limited too. Hence, only few professionals knew how to use them. In 1976, Zilog announced Z80 microprocessor, and Digital Research developed CP/M operating system for microprocessors. This development significantly transformed microprocessors into more acceptable products for average users. Hence, based on this development, in 1977, Apple Computers Inc. further devised and marketed 8-bit Apple II PCs in the US. In addition, Commodore and Tandy (Radio Shack) also marketed their PCs in the same year. Their products were successfully sold in US markets. As a result, more companies were attracted to PC industry. Till the end of 1977, there were already 200 companies in this new industry. Facing this unexpected success in PC industry, in 1980, IBM, for the first time, plunged itself into PC market and

started to produce 16-bit IBM PC. By using Microsoft's MS-DOS, IBM PC rapidly became the standard of PC industry. In turn, the market for IBM PC grew considerably in US.

In 1979, a few trading companies in Taiwan noticed the growing popularity of the Apple PCs in US and introduced PCs manufactured by US companies into domestic market. However, the size of the local PC market was very small at that time due to the high price and customers' unfamiliarity with PCs. Its growth was further hindered by the scarcity of application software and by the importers' inability to provide satisfactory after-sale services to their customers. Hence, the early users of PCs in Taiwan were largely limited to research institutes and universities. PCs were used mainly for research, teaching, and data processing purposes.

On the other hand, because of the high market uncertainty, the lack of adequate technological capabilities, and the lack of capital to enter PC industry, there were very few local producers in this sector between 1975 and 1978. However, some video game producers, using imported parts and reverse engineering techniques, began to imitate the Apple II PC to replace the imported brands. The price for this kind of imitated Apple II PCs was only about third of the imported Apple II PC.

In 1979, Taiwanese government decided to choose information industry as one of Taiwan's strategic sectors. Hence, ERSO was assigned the responsibility to develop hardware technology, and another government agency, Institute for Information Industry (III), was in charge of promoting the use of computers in Taiwan. Due to this policy, more indigenous firms (including large consumer electronics companies) were attracted to produce imitated Apple II PCs. Hence, PC industry was gradually established thereafter.

In March 1982, a nationwide governmental ban on the manufacturing of video game machines further drove many manufacturers to produce the Apple PC. These small-scale firms soon found little difficulty in imitating the Apple PC because of easy accessibility to the production techniques, the small amount of capital required, and the availability of inexpensive key components from US and Japan. Hence, in a very short time, the number of indigenous firms that aimed at producing imitated Apple II PCs increased sharply. In addition, due to the low price offered by these firms, the imitated Apple II PCs were also actively exported to US market. This action caused serious trade conflict between Taiwan and US. Hence, at the end of 1982, Taiwanese government decided to prohibit the exportation of any imitated Apple II PCs. As a result, there was fierce competition among indigenous firms that produced imitated Apple II PCs. In order to avoid accusation from US firms again, and to shorten the technological lag between Taiwan's PC manufactures and those abroad, in September 1982, ITRI, in cooperation with 8 local firms, started the project designated to develop IBM-compatible PCs, and the mission was successfully accomplished in April 1983. Also, as soon as IBM launched its PC/XT in 1983, ITRI aligned itself again with five domestic enterprises to work on IBM PC/XT-compatible products and had succeeded in its aim by the end of 1983. Hence, till then, a number of Taiwanese firms already possessed the capability to imitate the current design of IBM compatible PC.

On the other hand, the world markets for PC also began to evolve. The triumph of the IBM 16-bit PCs allured many competitors to rush into this industry by producing IBM-compatible PCs. Marketed at a price 20% lower than that of the IBM PC, the IBM-compatible products encroached on the market once dominated by the IBM PC. To regain the leading market position, IBM repositioned its PC as a home-use computer and priced it below US$1,000.

Besides, IBM actively developed its PC with more powerful functions for multiple users. In August 1984, IBM launched its first PC/AT. The high processing speed and excellent features, the attractive price (just a bit higher than that of the PC/XT), and heavy promotion soon made PC/AT the industry's new standard. Within a short time, the IBM PC/AT succeeded in replacing the PC/XT. Followed by this trend, the markets also started to swarm with IBM compatibles, which had almost identical functions but sold at a much lower price.

In order to catch up with this market development, Taiwanese firms had largely decided to follow the dominant design that IBM had established. Moreover, in order to compete with foreign companies in international markets, they also pursuit two types of strategies. First is to develop their own technological capabilities in making PCs. This strategy was greatly assisted by Taiwan's government agency ITRI. The second strategy is to create cost advantages in production (especially in assembly operations) value activities by utilizing Taiwan's high-quality and cheap skilled labor.

In September 1984, a month after IBM introduced the PC/AT, ITRI was already cooperating with several leading PC manufacturers to develop IBM PC/AT compatible products. In July 1985, their efforts contributed to the creation of Taiwan's own IBM PC/AT compatibles. This achievement proved that Taiwan's PC manufacturers already possessed the technological capabilities for making key components necessary for PC products. Later on, after successful technology diffusion from ITRI and these leading PC manufacturers, the technological capabilities of Taiwan's average PC companies were also enhanced. As a result, after mid-1980s, Taiwan's PC industry was able to upgrade from low value added products or purely labor-intensive products to higher value added products or more technology-intensive products.

In addition to developing their own technological capabilities in making PC products, a lot of Taiwanese PC companies also focus upon creating their competitive advantages in production value activities. For these companies, their major value activities were assembly of PCs or making simple PC parts, and their major concern was how to reduce the production costs while maintain a certain level of quality. As to key components, these firms relied upon imports from the United States and Japan.

Both strategies had successfully helped to build up the competitiveness of Taiwan's PC industry. Although the PC/AT compatible products made by joint efforts of ITRI and Taiwan's leading PC manufacturers did not actually become the leading products in international markets, the development process for these PC products helped to strengthen the product technology of Taiwan's PC industry. Hence, based on this technology diffusion and the success of upgrading their process technology through improving their production efficiency and quality control, Taiwanese PC firms gradually established their reputation in production of cost-effective IBM PC-compatibles. Consequently, as the competition for PC market became more and more fierce, many foreign IBM-compatible PC manufacturers sought to contract out their orders to PC firms in Taiwan through OEM or offshore orders. Within a short period of time, Taiwanese firms became the largest suppliers of OEM products to the United States. However, the orders from OEM not only provided Taiwanese firms accumulation of financial resources, but also helped to improve their technological capabilities. With the provision of designs and requirements regarding quality standards from foreign buyers, a substantial transfer of knowledge regarding recent developed product and process technology was realized between Taiwanese firms and foreign buyers.

Hence, till the end of 1980s, although over 40 percent of total production were still OEM products, Taiwanese firms had accumulated more advanced firm-level resources for the competition in higher value-added products. They were in excellent position to shorten their technological lag behind the leading firms. For example, two Taiwanese PC firms announced their success in developing the same 32-bit PC in November 1988, only two months after Compaq's introduction of its 32-bit PC.

Nevertheless, as Taiwan's PC industry became more and more prosperous, indigenous firms also began to feel more pains from the fluctuation in the supply of certain key components, such as memory chips and microprocessors. Some large PC companies thus attempted to invest in the production of key components and to established ASIC design centers in order to ensure their ability to secure the supply of components. Furthermore, in order to cut production costs, an increasing number of Taiwanese firms started to invest in automatic equipment, and contract out orders at low-profit margins to smaller PC companies.

In addition to the development of technological capabilities, there was also indication of advancement in international marketing capabilities. In 1970s and 1980s, most Taiwanese PC firms had benefited from the implementation of the no-brand policy. Due to this policy, they did not have to spend money on establishing distribution networks or on consumer-oriented promotion to develop brand preference. Nor do they have to maintain a strong internal R&D base to develop new products. Also, orders from OEM buyers not only guarantee satisfactory utilization of the companies' capacities, but also provide essential financing for their operations. Nevertheless, during the late 1980s, this situation began to change. More and more PC companies tried to develop their own brands. The proportion of total exports made up by manufacturer-brand

PCs increased from 9 percent in 1985 to 40 percent in 1988, whereas that of OEM has continuously declined (MIC, 1990). This change indicates that more PC firms had gradually transformed from OEM suppliers to OBM suppliers.

As a summary, during OEM stage, through assistance from government and the foreign buyers of computer products, there was significant advance in O advantages of Taiwan's electronics industry. At the beginning of OEM stage, Taiwanese firms had quite limited firm-level resources. Most of them just migrated from less CA sectors and could only perform labor-intensive (mainly assembly type) operations sub-contracted by foreign investors. Similarly, for large indigenous firms, nor could they produce more technology-intensive products. Almost all the core components essential to consumer electronics were provided by foreign firms, or manufactured under the direction of foreign partners. However, since early 1980s, through the technology transfer between foreign firms and local producers, localization of foreign technologies, and the assistance from government's efforts in R&D, Taiwan's indigenous firms gradually accumulate their own firm-level resources (especially technological capabilities). Hence, in 1980s, not only indigenous firms began to produce core components of consumer electronics on their own, but also established their position in higher value added segments of electronics sector. As a result, Taiwan's higher value added electronics (ICs and PCs) experienced significant growth during OEM stage (see Table 6.1 and 6.2).

In addition to the upgrading of O advantages, the improvement in L advantages was also substantial during OEM stage. Due to government's actions in promoting electronics industry, not only Taiwan's R&D and technological capacities in electronics were enhanced by the establishment of ITRI, but also the human resources available for electronics sector were greatly increased through

Table 6.1. Taiwan's IC Industry Production and Sales, 1976-1988

Year	Amount of Production[a]	Sales Amount[b]	Sales Value[c]	Share of foreign sales	Design phase	Manufacturing phase	Packaging phase
1976	308,600	309,363	3,443,210	--	--	--	--
1977	314,900	314,083	3,502,689	--	--	--	--
1978	442,400	426,641	4,667,794	--	--	--	--
1979	531,000	495,399	4,784,532	--	--	--	--
1980	622,100	611,984	7,938,090	--	--	--	--
1981	703,200	665,564	8,718,681	--	--	--	--
1982	734,139	723,399	12,130,709	--	--	--	--
1983	927,833	916,718	13,451,764	--	--	--	--
1984	1,331,100	1,324,490	18,628,250	--	--	--	--
1985	1,073,068	1,068,557	15,674,507	83.7%	2.1%	10.0%	87.9%
1986	1,537,261	1,513,676	21,735,380	79.3%	2.0%	15.0%	83.0%
1987	1,779,099	1,788,511	22,803,347	78.6%	3.0%	14.3%	82.7%
1988	1,930,370	1,956,861	26,256,844	73.8%	7.3%	16.2%	75.6%

Source: Industrial Production Statistics Monthly, Taiwan Area and 1988 Economic Book of the Year, Economic Daily News Company.

a. Thousands of units.
b. Thousands of units.
c. Thousands of NT dollars.

the setting up of more academic departments related to electronics, and the engineers cultivated in ITRI.

Table 6.2. The Growth of PC during 1980s

Year	Share of Total Export	Export Value[a]
1982	3%	2.0
1983	4.1%	12.0
1984	15.1%	152.2
1985	19.7%	240
1986	19%	393
1987	20.5%	759
1988	23%	1151

Source: Analyses of Information Industry, MIC,various issues.
a. Value in US$1,000,000

Owing to the above advancement, the nature of international business activities occurred in this sector was affected too. For inward direct investment, the role of their assistance to the economy is changed. At the beginning of OEM stage, FDI mainly aimed at exploiting Taiwan's low-cost labor. Hence, the major contribution by FDI was to show new opportunities existing in several export-oriented industries and to transfer technology and provide markets for the growth of Taiwan's electronics sector. After that, FDI helped stimulate Taiwan's electronics producers and raise the standard of exports. Although, foreign MNEs no longer controlled all the product and process technologies as they did before, these MNEs still transferred technology to local firms and linked them into larger foreign markets. Moreover, the product technology and the value activities performed by foreign subsidiaries were also more complicated than the beginning of OEM stage.

As to outward investment, Taiwanese firms began making considerable amount of outward investment since OEM stage (from US$59,000 in 1971 to US$121,852,000 in 1989). A major portion of these outward FDI were resource-

seeking type induced by the motives of reducing production costs (Hoesel, 1997). These outward FDIs basically made Taiwanese firms capable of accumulating more financial resources necessary for upgrading their products at home.

6.2.4. The ODM and OBM Stage of Taiwan's Electronics Industry (early 1990s)

In ODM and OBM stage, Taiwanese firms continue their success in computer-related products. In early 1990s, Taiwanese firms already gained large market shares in certain computer-related products (as shown in Table 6.3). Particularly, in 1993, motherboards made by Taiwanese firms were used in roughly 40 percent of PCs sold throughout the world (Electronics, 10 January 1994, p.11). Furthermore, Taiwan was the largest producer of PC mice, monitors, image scanners and keyboards. In 1993 and 1994, computer hardware production grew at around 15.5 percent and 14 percent respectively to reach an estimated output of US$10 billion. In 1994, Computers (including notebooks and desktop PCs) even surpassed peripherals to become the leading export item, a further step forward in the industry's technological advance. Another fact worthy of notice is that, in 1993, 77% of the PCs exported by Taiwanese firms were own-design and manufacture (ODM) (55%) or own-brand and manufacture (OBM) (22%). Only 9% of PC exports were OEM. This strongly indicates that Taiwanese firms are becoming more capable of developing their computer products through their own technological capabilities (ODM and OBM) and selling their products through their international marketing efforts.

Besides, facing the consistent threats from the fluctuating price and shortage of core components (for example, LCD, DRAM and CPU), Taiwanese firms also attempted to develop their own product and process technologies related to core components.

The basis for all the above progress is the continuous efforts by Taiwanese firms to upgrade their O advantages, further assisted by government's policy to upgrade Taiwan's economic structure through the helps from MNEs. In particular, there has been significant progress achieved by two different types of producers[2]: the small and medium-sized firms of production networks for electronics sector, and large PC components firms and IC firms.

Table 6.3. The Production and Market Share of Taiwan's Leading Computer Products, 1993

Product Item	Production (million of units)	Market share (% world)
Monitors	17.5	51
Desktop PCs	2.3	8
Notebook PCs	1.3	22
Motherboards	12.3	83
Cathode ray tubes	1.4	24
Graphics cards	7.1	31
Switching power supplies	21.2	30
Image scanners	1	55
Lan cards	3.8	27
Mice	22.1	80
Keyboards	18.8	49

Source: Analyses of Information Industry, MIC,Taipei: Taiwan, various issues.

Since mid-1980s, numerous production networks for PC components have gradually formed in Taiwan due the growth of PC exports. The participants of these production networks are largely small and medium-sized manufacturers of PC components. Their products are mainly used by PC companies for final assembly of PCs. Hence, the competitive edge of PC companies largely depends

[2] There are few authors mentioned about this distinction between large firms and the production networks created by small and medium-sized firms. Nevertheless, both groups of suppliers are equally important to the development of Taiwan's computer industry. For more discussion about this issue, see Chou (1992) and Lin and Kirchhoff (1996).

upon how these small and medium-sized firms produced their products. The emergence of production networks among these small and medium-sized manufacturers had provided them an effective way to advance their O advantages without spending too much money on their own.

For each production networks, normally, there are few leading firms responsible for taking orders from foreign buyers and coordinating the production activities among participating firms. As to other participating firms, on the other hand, their major concern is to concentrate most of their efforts on specializing the production of certain components or parts. Thus, they could circumvent the need for investing in marketing, distribution and after sale services. Furthermore, in order to ensure the quality of products, reduce the costs for production, and keep up with the timing for delivery, these leading firms, normally with the assistance from foreign buyers[3], would also worked with participating firms to improve their product and process technologies. Alternatively, through the help from other participating firms, each firm may gradually accumulate the technological capabilities for product and production. Consequently, as years of operating in this manner, Taiwanese firms have been able to produce a lot of the PC components on their own. However, as PC exports rapidly expand in early 1990s, there were also growing concerns about controlling the supply of certain core components (such as LCD, large-capacity memory chips, etc.) that are still imported from Japan and United States at that time. Hence, since early 1990s, a number of large Taiwanese manufacturers of PC components began to search the possibility about setting up the production

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[3] The assistance from foreign firms may include: (1) send technical staff to advise the production activities subcontracted to Taiwanese firms; (2) provide training of local engineers, managers or technicians; (3) provide technical documents regarding the products sub-contracted to Taiwanese firms; (4) assign technical experts or managers to work for sub-contractors in order to improve the quality and costs of production. For more details, see Chen (1994).

facilities for core components in Taiwan (Analyses of Information Industry, February 1992). The most common approach for Taiwanese firms to build up such production capacities is to cooperate with foreign firms that already possessed the necessary product and process technologies. Hence, in the early 1990s, we could see a lot of joint ventures and strategic alliances were concluded between Taiwanese firms and foreign leading companies. For example, Phillips formed a joint venture with several Taiwanese firms to produce high-resolution color cathode ray tube (CRT) in Taiwan. Formosa Plastics, Taiwan's largest manufacturer of plastic products, formed a joint venture with GEC to produce LCD for notebook computer. Also, existing major manufacturers of semi-conductors and new companies that are eager to enter IC industry formed strategic alliances with Japanese firms or US firms to build 8-inch, 6-inch or even 4- or 5-inch wafer fabrication plants. The total investment amount from these projects is expected to be over 1 billion of US dollars (TIER, 1994).

On the other hand, in order to develop Taiwan into an Asia-Pacific Regional Operations Center, Taiwanese government also actively seeks to attract foreign investors and joint-venture partners so as to help Taiwan's structural transformation from labor-intensive sectors to capital- and technology-intensive sectors. Hence, the Ministry of Economic Affairs (MOEA) not only worked on easing the bureaucratic procedures and changing the regulations to create more incentives for foreign investors, but also aggressively persuaded MNEs to sign letters of intent (LOIs) for the formation of strategic alliances with Taiwanese firms. From February 1993 to July 1996, the MOEA had successfully signed LOIs for the formation of strategic alliances with 41 global multinational (25 from United States, 4 from Germany, 3 from Switzerland, 3 from France, 2 from Italy, and one from Netherlands, Australia, Denmark, and Canada). Most of these companies (such as IBM, GM, GE, Philips, ABB, Siemens, Du Pont, Bayer, Ciba-

Geigy, DEC and HP) are listed among the world's 100 largest MNEs (for more details, see MOEA 1996). Following these LOIs, substantial cases of foreign investment, technical transfer and cooperation, and operation centers were realized. Till October 1996, there had been 24 investment cases involving an accumulated total of approximately US$2.1 billion. Two thirds of these investment projects (14 out of 21) are related to electronics. For technical transfer and cooperation, 38 cases had been implemented by MNEs. Half of these cases (19 out of 38) are related to electronics. As to operations centers, MNEs had established 21 centers. 9 out of 21are related to electronics (MOEA, 1996).

Owing to the above efforts, the export share from Taiwan's major electronics products, including office machines and electrical machines & parts (mainly related to PCs), jumped from 19.2% in 1990 to 31.8% in 1996.

On the other hand, the outward IBAs by Taiwanese firms of computer industry during 1990s were also crucial for the development of this industry. On one hand, there were outward IBAs for relocation of disadvantageous production activities. On the other, there were outward IBAs aimed at exploring new market opportunities or acquiring advanced product and process technologies.

Since early 1980s, Taiwan already began to lose its L advantages in labor-intensive products. Hence, as a response to this potential threat, a number of large firms started making outward IDIs in other Asian countries (Hoesel, 1996). The main motive for their investment was to maintain their competitiveness in labor-intensive products by using cheap labor force of other Asian countries.

In 1990s, the threats from rising labor costs, labor strikes and new law for labor welfare become so strong. Hence, more Taiwanese firms of electronics sectors actively made outward direct investment to other Asian countries. As a result, a significant portion of Taiwan's computer-related products were

produced in other countries. For example, in 1993, the share of overseas production for monitor is 20.1%, 11% for mice, 23.9% for motherboard, 69.1% for keyboard, and 41.3% for power supply. All these products are major products for Taiwan's computer industry (among the top-10 list of computer products). For the production of whole computer industry, the data also shows that 17.9% of total production was produced in other countries (MIC, 1994).

However, because the growth of outward direct investment was largely associated with low value added and labor-intensive products, it also maintained the ability of Taiwanese firms to accumulate their financial resources for product upgrading at home (TIER, 1994). Normally, the ODI investing firms would move disadvantageous products to Mainland China or other South Asian countries and continue value activities regarding product planning and design, marketing and R&D for core components at home. Therefore, although the share of overseas production steadily increases during 1990s, the exports from Taiwan still remain pretty strong (14% growth rate in 1994).

Other than outward IBAs for resource-seeking or efficiency-seeking, there were also market seeking type and asset-seeking type of outward direct investment from Taiwanese electronics firms. In particular, the investment in United States and Europe are most important. For example, Taiwan's largest computer manufacturer, Acer Computer Inc., acquired several U.S. firms (including CounterPoint, Service Intelligence, Altos Computer System, etc.) in order to get access to different market segments of U.S. market as well as certain computer technologies. Also, several computer manufacturers set up marketing branch and/or production plants in Germany, East Europe and UK to explore the potential markets in Europe and to circumvent the possible blockage that may caused by the emergence of EU (MIC, 1995).

Therefore, in sum, during ODM and OBM stage, Taiwanese firms had possessed more advanced firm-level resources from foreign partners and from internal resource-accumulation process. This change in O advantages results in the rise of ODM and OBM as well as the decline of OEM. It clear shows that, in 1990s, Taiwanese firms are already capable of making product design and innovation by themselves. Hence, their importance to the international markets of computer industry rise accordingly.

Furthermore, due to the changes in O advantages and in L advantages related to cheap labor costs, the resource-seeking and efficiency-seeking type of outward IBAs to other Asian countries were even more prevalent during 1990s. However, at the same time, asset-seeking type of inward and outward IBAs also become more and more common for large Taiwanese computer manufacturers. This indicates that Taiwanese firms might already begin another round of upgrading that could make them capable of competing in most advanced segments of computer industry.

6.3. Summary and Conclusions from Case Study

The case study of Taiwan's electronics sector shows that, in order for a country to transform from an economy based upon primary sectors for economic growth into an economy based on CA sectors for economic growth, its country-level resources and firm-level resources have to be transformed simultaneously.

Before the transformation, Taiwan only had L advantages in low-cost unskilled labor force that was mainly employed by primary sectors. As to firm-level resources, there were hardly any technological capabilities for CA sectors. Most private firms could only produced simple electronics products or assembled electronics products. Therefore, the critical issue is how could Taiwan

upgrade its country-level resources and firm-level resources to the level demanded by CA sectors?

From the analyses we made in case study, it shows that the interaction among Taiwanese government, foreign MNEs and indigenous firms provides a healthy mechanism for this continuous process for upgrading.

Essentially, in order to build up electronics sector in Taiwan, Taiwanese government has taken numerous actions to achieve this goal. These efforts can be roughly divided into two parts. First, the government has continuously improved Taiwan's macro environment that is favorable to the growth of electronics sector. In particular, in 1960s, Taiwan selected electronics sector as one of Taiwan's strategic sectors. Due to this choice, government has kept modifying the regulations in order for promoting the investment and production in electronics sector. Also, since 1960s, various teams were formed to serve the needs of firms of electronics sector and to coordinate the actions of different government agencies for stimulating more investments in electronics sector. Furthermore, Taiwanese government also provided different set of incentives to foreign MNEs to induce their willingness to make direct investments in Taiwan's electronic sector, or conclude joint ventures with Taiwan's electronics firms. Through these efforts, Taiwanese government wished that indigenous firms might gradually acquire advanced technology and management skills from foreign MNEs.

Secondly, in order to facilitate the growth of Taiwan's electronics sector, Taiwanese government also recognized the needs for improving the L advantages of Taiwan's country-level resources that are particularly crucial for higher value added sectors like electronics. Hence, since 1960s, Taiwanese government made a lot of investments for building up the infrastructure critical to electronics sector. Four of the achievements are most critical to the growth of

Taiwan's electronics sector. First, in 1960s, Taiwan established several Economic Processing Zones (EPZs) for exporting labor-intensive products. Owning to the generous tax deduction and exemption applicable to exports of electronics products, a lot of foreign electronic MNEs were attracted to EPZs. This had successfully provided many opportunities for technology transfer from these foreign MNEs to indigenous firms. Second, in 1974, Taiwanese government formed ERSO, a government-owned research institute for electronics. The main contribution made by this organization is the acquisition of advanced technological capabilities from foreign sources. Normally, the acquisition could not be possible if done by private sector. A lot of ERSO's projects (such as projects related to semi-conductors) often involved large investment from government to acquire the technological capabilities (including setting up the experimental facilities necessary for absorbing the new technology and the large amount of patent fees paid to foreign firms or organizations). In addition to learning the technologies transferred from foreign firms or organizations, through the acquisition process, ERSO also successfully produced a lot of high-quality engineers available for use by private sector. Moreover, after thoroughly absorb the technology from foreign firms or organizations, ERSO further sought to diffuse the technological capabilities to private sector. Hence, since 1970s, ERSO had become the most important source for human resources and technological capabilities needed by electronics sector. Thirdly, by investing in higher education, Taiwanese government established a number of new academic departments related to electronics sector. These departments produced a lot of high-quality human resources for electronic sector. Fourthly, in order to have better service to firms of electronics sector and other hi-tech sectors (such biotechnological sector), Taiwanese government established Hsin-Chu Scientific Park for these firms. The tax incentives offered by this scientific park attracted

both indigenous firm and subsidiaries of foreign MNEs. By working more closely with each other (no matter competitors or partners), the technological information could be diffused more efficiently, and synergy is more likely to be created within the park. Hence, since late 1980s, Hsin-Chu Scientific Park has become the most important center for Taiwan's electronics sector.

Due to government's actions and the changes in Taiwan's L advantages, MNEs of electronics sector were gradually attracted to Taiwan and produce electronics in Taiwan. As we mentioned earlier, the transfer of advanced firm-level resources from foreign firms to indigenous firm was largely accomplished through the following approaches. First, the advanced firm-level resources were transferred through the former employees of foreign subsidiaries in Taiwan. Secondly, the inter-firm cooperation (including joint ventures, sub-contracting agreement and alliances) between foreign firms and indigenous firms or organizations would also lead to the transfer of advanced firm-level resources to or from foreign firms. Both approaches are important to the development of Taiwan's electronics sector. For the initial development of consumer electronics, joint ventures between Japan or U.S. firms and Taiwanese firms played most crucial role for transferring the advanced firm-level resources. For PC industry, the former employees of foreign firms, sub-contracting agreement are most critical to the initial growth of indigenous firms of electronics sector. As to IC industry, the alliances between ERSO and foreign firms started the growth whole IC industry. Till now, as the firm-level resources accumulated by Taiwanese firms are already comparable to foreign MNEs, Taiwanese firms are no longer the recipients of advanced firm-level resources all the time. For more and more cases, Taiwanese firms will exchange their certain firm-level resources with those of foreign firms. Moreover, the approach for resource transfer between foreign

firms and indigenous firms also gradually changes to strategic alliances established by both indigenous firms and foreign firms.

As a summary to this chapter, the interaction between government assistance, IBAs, O and L advantages and the competitive strength of Taiwanese firms is shown in Table 6.4.

Table 6.4. The Interaction among International Business Activities, Government and Competitive Strength of Firms in Taiwan's Electronics Sector

Period	Major Advantages	Government Policy or Assistance	Nature of Inward IBAs	Nature of Outward IBAs	Competitive Strength of Taiwanese Firms
1950s/ 60s	L advantages in low-cost unskilled labor	1.Chose electronics as one of strategic sectors 2.Seeking FDI for electronics	1.Resource-seeking 2.Joint-Ventures for low level products	Few (escape investments possible)	1.Subcontractors of foreign firms 2.Simple assembly
1970s	1.L advantages in low-cost unskilled/semi-skilled labor 2.O advantages in less technology-intensive products	1.R&D investments (ERSO) 2.Infrastructure investments	1.Resource-seeking 2.Efficiency seeking 3.Sub-contracting	Few resource-seeking	1.Sub-contractors of foreign firms 2.Reverse engineering 3.OEM
1980s	1.L advantages in skilled/high-quality labor 2.O advantages in less technology-intensive products	1.R&D investments 2.Government-sponsored start-ups of core components	1.Resource-seeking 2.Efficiency-seeking 3.Strategic alliances for asset-seeking	1.Resource-seeking 2.Efficiency-seeking 3.Few market-seeking and asset-seeking	1.Product planning and design for foreign firms 2.OEM 3.ODM
1990s	1.L advantages in skilled/high-quality labor 2.O advantages in less technology-intensive products 3. O advantages in technology-intensive products	1.Infrastructure investments 2.Encouragement of international strategic alliances (especially technology-based)	1.Efficiency-seeking 2.Strategic alliances for asset-seeking	1.Resource-seeking 2.Efficiency-seeking 3.Market-seeking and asset-seeking	1.Product R&D 2.International marketing capabilities 3.OEM 4.ODM 5.OBM

Note: OEM – Original Equipment Manufacture; ODM – Own-Design and Manufacture; OBM – Own-Brand Manufacture

CHAPTER 7

CONCLUSIONS AND POLICY IMPLICATIONS

7.1. Summary of the Research Issues and Literature Review

The main purpose of this study is to examine the interaction among the development of an economy's economic sectors, structural adjustment and the economy's international business activities. In order to understand the possible causal relationships involved, three major questions were formulated in Chapter 1 to serve as the guideline for the study:

(1) What theoretical aspects do we need to consider when we examine the development of a country's economic sectors and its structural adjustment?

(2) What are the determinants for the development of a country's economic sectors and its structural adjustment?

(3) How international business activities may affect the development of a country's economic sectors and its structural adjustment?

Based upon these research questions, the theoretical literature related to economic development and structural adjustment was reviewed in Chapter 2. From the literature review, it shows that the main theoretical aspects of a country's structural adjustment are "what to produce" and "how to produce." "What to produce" is concerned with the way in which resources are distributed among alternative uses. Hence, it refers to the structure of a country's production at a certain time. "How to produce" is related to the manner in which resources are used in any given activity. It refers to the efficiency achieved by an economy's economic sectors.

Both aspects, according to the literature, are dynamically adjusted over time. The adjustment process starts from the transformation of both country-level resources and firm-level resources. Due to the interactions among determinants

of national diamond and the resource accumulation accomplished by indigenous firms, the availability and the quality of both country-level resources and firm-level resources for each economic sector will change accordingly. This, in turn, will result in the rise of certain economic sectors in the economy, as well as the decline or stagnation of some other sectors in the same economy. Also, there could be impact upon the efficiency achieved by various economic sectors. All these changes then lead to the transformation of "what to produce" and "how to produce" aspects that account for a country's structural adjustment.

For the above adjustment process, the role of international business activities is discussed in Chapter 3. From literature, it shows that international business activities may not always benefit the success of a country's structural adjustment. The basis for international business activities to have impact upon an economy's economic activities rests upon what economic policy and resource environment can induce the operations of international business activities, and what resources can be transferred from international business activities. Hence, it implies that the development of different economic sectors/segments will be affected differently by international business activities. This is mainly because the existing resources available to each of the economic sectors may or may not induce the occurrence of IBAs. Also, different types of IBAs will bring different set of resources and capabilities to the economy, which may or may not benefit the development of the sector in which the IBAs operate. In addition, each economic sector has its unique environment that may or may not favor the operations of international business activities.

Therefore, based upon the literature review, a number of hypotheses were proposed to testify the exact causal relationships among international business activities, sectoral development and structural adjustment.

To verify the validity of these hypotheses, three parts of analyses were done for this purpose. First, a concise overview of the stages of Taiwan's economic development was presented, and a preliminary analysis of the possible causal relationships among sectoral development, international business activities and structural adjustment was done in Chapter 4. Secondly, econometric analyses of the causal relationships among sectoral development, structural adjustment and international business activities were done in Chapter 5. Thirdly, the development of Taiwan's electronics sector was examined in more details by means of case study analysis in Chapter 6. The results of these various analyses are further interpreted in next section.

7.2. Interpretation of the Findings

From the overview of Taiwan's economic development, it shows that throughout the development path of Taiwan's economy, because of government's encouragement, foreign MNEs has been quite active in Taiwan. By examining the trend lines for real GDP, real exports and inward and outward foreign direct investments, there is also strong indication that international business activities have positive association with the growth of Taiwan's real GDP and real exports. This indicates that international business activities may have positive impacts upon Taiwan's economic development.

However, when we examine the historical paths for the development of individual sector and its international business activities, the causal relationships turn out to be quite vague for a number of sectors (especially for primary sectors). The FDIs of these sectors fluctuated too sharp such that any serious conclusion is unable to make simply from examining the historical paths. For some CA sectors (machinery and electronics, in particular), the causal relationships are, on the other hand, more clear. The historical paths for the

development of individual sector and its international business activities show that there is positive association between these two aspects.

The results from econometric analyses provide us more rigid evidence about the causal relationships among international business activities, sectoral development and structural adjustment. First, the statistical results show us that international business activities do have positive impacts upon sectoral development. However, the results also indicate that international business activities seem to have less impact upon Taiwan's primary sectors. This supports our argument that, for economies that are not well endowed with natural country-level resources, IBAs may have limited impacts upon the primary sectors of these economies.

The second result we have from statistical analyses is that the impacts from international business activities seem to be stronger during the early stage of Taiwan's economic development. This confirms our argument that, as indigenous firms accumulate more firm-level resources and the economy begins to loose some of its L advantages in country-level resources, the impacts from IBAs will become less significant.

The third result from statistical analyses is related to the relationship between structural adjustment and international business activities. It shows that the impacts from different sectoral group are quite different. However, for all cases, inward IDIs from less CA sectors have positive impacts upon the adjustment from primary sectors to less CA sectors. IDIs and ODIs of CA sectors also have positive impacts upon the adjustment from less CA sectors to CA sectors.

The fourth result we have from statistical analyses show that international business activities have positive association with the development of CA sectors. This largely confirms our argument that, due to the resource complement

between developed countries and less developed countries, IBAs from and to developed countries may also provide more assistance to the development of CA sectors in less developed countries.

From the case study of Taiwan's electronics sector, we have more knowledge about how IBAs may actually provide assistance to the development of CA sectors in less developed countries. Essentially, this assistance is carried out through the transfer of advanced firm-level resources from foreign MNEs to indigenous firms. However, in order to induce the investments or joint ventures from foreign MNEs, the macro environment and country-level resources has to be transformed to benefit the operations of foreign MNEs. Thus, due to these two aspects, government plays a key role in affecting the contributions made by IBAs. In addition, from case study, we also notice that, in order to absorb the advanced firm-level resources from foreign MNEs, the indigenous firms may also need human resources and technological assistance from government agencies.

7.3. Policy Implications, Limitations of the Study and Suggestions for Future Research

7.3.1. Policy Implications

The experience of Taiwan's economic development clearly shows the potential benefits that may be provided by international business activities. Nevertheless, from case study, it is clear that international business activities alone can't provide the desired outcomes related to economic upgrading.

Above all, the macro environment and the L advantages of country-level resources are still largely controlled by government's policies and actions. Hence, while we are considering the impacts from international business activities, government is always an aspect that should be taken into account.

Moreover, from the case study of Taiwan's electronics sector, we also understand that the impacts from international business activities also depend upon how government chooses to get support from foreign companies. For Taiwan, the government properly identified the sectors in which foreign firms might be most helpful in providing the advanced firm-level resources. Also, by setting certain limits to the activities of foreign firms (such as local content requirements and restraints on investments in labor-intensive products), Taiwanese government successfully forced foreign firms to upgrade the firm-level resources used in Taiwan. In turn, indigenous firms may constantly accumulate new firm-level resources from cooperating with foreign MNEs.

7.3.2. Limitations of the Study and Suggestions for Future Research

As with all research, the scope of this study was necessarily limited. To thoroughly investigate the causal relationships among sectoral development, international business activities, and structural adjustment, more empirical work is needed.

First of all, more research into other newly developed countries can be done to verify if the same conclusions can hold. Secondly, the case study of interaction among sectoral development, international business activities, and structural adjustment can be done to other economic sectors. Thirdly, if data permit, the analyses of impacts from international inter-firm cooperation (such as strategic alliances) should also be considered.

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