



Chapter 2

The Review of Related Literature on the Semiconductor Industry

This chapter will be divided into four sections. The first section will be a review of related semiconductor literature. The second section will provide the hypothesis of the study. The third section will provide the methodologies of this study and thesis data will be provided in the fourth section.

2.1 Literature Review

From a review of previous studies it was found that, a few researches on the semiconductor industry focused on the movement of the industry towards developing countries. Among these were studies of the semiconductor industry dealing with Transnational Corporations, Movement of Product Base, and Comparative and Competitive Strategies Across the Firm.

When the semiconductor industry was first introduced in 1986, the United Nations (UN) conducted a study on Transnational Corporations in the International Semiconductor Industry. The report examined the world-wide operations of semiconductor transnational corporations and gave specific consideration to their operation in developing countries or areas. At a different time and place, Sriyook (1992), studied the cycles in a semiconductor industry. This thesis reported mainly on the movement of production bases of the semiconductor industry by using the product life cycle theory to explain the invention, marketing, and production base of the industry. Both the UN and Sriyook employed the descriptive analysis with theoretical support toward the industry. With a similarity in results, the UN and the

Sriyook studies found that developing countries have comparative advantages in terms of domestic supply and competitive labor cost.

The UN investigation revealed that technology transfer to developing countries, which is the most sophisticated phase of semiconductor production, has not been highly remarked. Sriyook divided the semiconductor, Dynamic Random Access (DRAM), into three groups according to marketing strategy. The first group consisted of 1kbit, 4kbit, 16 kbit, and 64 kbit; the second group included 256 kbit, 1 mbit, and 4 mbit; and the last group included 16 mbit, 64 mbit, and 256 mbit. The study concluded that product life cycle accounts for the movement of product base to gain the benefit of cheap labor in the first group. By contrast, product life cycle cannot explain the second and third groups because they are involved with more complicated factors. The products must be produced by highly sophisticated machines with a sufficiently high technology environment. In such a case, the product life cycle theory cannot explain the movement of a production base in order to gain benefit from low wages in developing countries. From an economic point of view, the development of an indigenous semiconductor industry need not be considered a priority by every developing country, irrespective of its level of industrial development.

Under the competitive strategic positioning across the firm, Kimura (1988), attempted to identify the structural and behavioral forces giving rise and economic performance across these firm in the Japanese Semiconductor Industry. While Kimura started with a premise that the structural and behavioral conditions of an individual firm in an industry are not necessarily homogeneous, Pattapeesin(1995), started with the development of the electronic industry from 1984-1993 in Japan, Korea, and China. Kimura's premise is based on the theory of mobility barriers and strategic groups, Pattapeesin's analysis is based on the trade theory of comparative advantages in the electronic industries in Japan, Korea, and China by using descriptive

style with some support from the Revealed Comparative Advantage Index Analysis. Timing and locations will not generate different results, both Kimura and Pattapeesin's results reported that R&D is needed for the semiconductor industry. Kimura found that the competitive strategies of Japanese semiconductor firms distinctly differ along the key structural and behavioral dimension, forming the persistent systematic strategic grouping of firms in the industry. The strategic groups of firms were found to be distinctive in the product segment focus of the firm, the semiconductor technologies focused on R & D and its leadership in those technologies, the breadth of its product offering, and the nature and degree of internalized vertical linkage of its semiconductor operation. Furthermore, Kimura found that the persistent, systematic distinction of the competitive strategies between the groups of firms indicated the presence of the mobility barrier along these structural and behavioral dimensions. That the production segment focused on the firm delineates the competitive strategies suggests that mobility barriers tend to be product segment specific and that the competitive structure considerably differs from one segment to another in this industry. Kimura indeed found that the determinant of competitive advantages, varied substantially from product segment to product segment.

On the other hand, Pattapeesin (1995), discovered that due to both Korea's and China's lack of strong R&D capability and thriving capital goods sector in electronic components, their technology roots remain shallow. Also, Japan has a comparative advantage in high technology products, whereas South Korea has comparative lower technology and lower value-added products.

Much literature has concentrated on the comparative advantage theory over various industries. The methodology differs between the "Revealed" Comparative Advantage (R.C.A.) and Constance Market Share (C.M.S.) analysis. These are the

principal methodologies used to investigate the trade theory of comparative advantage.

In 1996, the TDRI studied the Effect of Macro Economy and FDI toward ASEAN. The TDRI investigated ASEAN's comparative advantage over all commodities in all of the industries by using the Revealed Comparative Advantage (RCA) calculation for every digit of HITC (trade statistic). The TDRI's conclusion relating to the semiconductor industry was that Thailand had a comparative disadvantage in its Semiconductor Industry under all the trade digits for HICT integrated circuits and parts. Also at a disadvantage is Indonesia. However, Thai RCA had a decreasing trend over time. Malaysia had a comparative advantage in its semiconductor industry under HICT trade statistics in integrated circuit and parts.

In 1991 Kunsorn studied the comparative advantage of Thai's product exports to the US when compared with other countries by using the Constant Market Share model (CMS) and the analysis of " Revealed" Comparative Advantage (RCA). While Kunsorn used both the RCA and CMS methodologies, both Pattapeesin (1995), and Sumpattanawarachai (1988) used only the RCA. First, Sumpattanawarachai aimed at analyzing the factors contributing to the export growth of the industry, specifically toward Thailand's Gemstone and Jewelry exports. Second, Pattapeesin studied the electronic industry of Japan, Korea, and China. By the same token with a similar concept, methodology and result, Kunsorn's and Sumpattanawarachai's premise show that Thailand exported to countries with a growing demand for Gems and all exporting goods namely the USA, Hong Kong, and etc. The Thai share in these markets had also been increasing. Kunsorn's analysis under the concept of comparative advantage is that of exported products to the USA. The following products have a great potential for being a Thai export: canned seafood, frozen fishes, shrimps & crabs; rice, artificial flowers, ceramics, furniture and parts, jewelry,

gemstones, fabrics and yarns, footwear, rubber products, leather products, integrated circuits, and toys. In addition, these following products have average export potential: roll-bearing plastic products, wood products, canned pineapple, garments, iron tubes & pipes, rubber, coffee and tropical products. Tin, sugar, and tobacco are among those with a lower-than-average export potential.

Sumpattanawachai's analysis showed that Thailand exported the types of gemstones which enjoy a growing demand, by using the RCA methodology in investigating Thailand's export of Gemstones. The resulting RCA interpretation is that Thailand has enjoyed the export of Gemstones.

Under the same methodology and theory, Pattapeesin concluded differently for products of the electronic industry, that even with under high technology products would not be efficiently produced by developing countries because of a lack of R&D capabilities.

By contrast, the combination of the trade theory in comparative advantage, and the extension of the trade theory in competitive advantage, this study "A Comparative and Competitive Advantages of the Semiconductor Industry: A Case Study of Thailand, Malaysia, and Indonesia" will investigate the comparative advantages and competitive advantages of the semiconductor industry among Thailand, Malaysia, and Indonesia by using the two types of methodologies as follows:

- 1) Comparative Advantage (RCA) by Bela Ballassa
- 2) Competitive Advantage (Diamond Model) by Michael E. Porter.

2.2 Hypothesis of this Study

The study "A Comparative and Competitive Advantages of the Semiconductor Industry: A Case Study of Thailand, Malaysia, and Indonesia" will investigate the

comparative and competitive advantages of the semiconductor industry among Thailand, Malaysia, and Indonesia. This study will combine both theories of comparative and competitive advantages and will examine whether both theories exist within the countries mentioned. First of all, the comparative advantages will be investigated in particular industries of the three mentioned countries, according to the optimum of resources allocation in those countries. When comparative advantage is found to exist in the particular countries, the theory of competitive advantage will be applied to the particular industry to ascertain whether these three countries are competitive in their particular industry.

Once it has been established whether or not the comparative advantage exists in a particular country in a particular industry, the competitive advantage in the same industry needs to be analyzed to ascertain whether this industry in a particular country is competitive toward the world industry.

2.3 Methodology

This study “A Comparative and Competitive Advantages of Semiconductor Industry: A Case Study of Thailand, Malaysia, and Indonesia” will use two methodologies in order to investigate both the comparative and competitive advantages among the three countries. First, the comparative advantage will be investigated by using the Revealed Comparative Advantage by Bela Balassa. Second the competitive advantage will be investigated by using the SWOT analysis applied with the Diamond Model: the Determinant of National Competitive Advantage by Michael E. Porter.

Revealed Comparative Advantage Index

The concept of “revealed” comparative advantage, introduced by Bela Balassa over a decade ago, pertains to the relative trade performances of individual countries

in particular commodities. The assumption of Bela Balassa is that the commodity pattern of trade reflects inter-country differences in relative costs as well as in non-price factors, which is assumed to “reveal” the comparative advantages of the trading countries.

The export specialization ratio, RCAX, refers to the ratio of the share of a commodity in the total merchandise exports of a country divided by a commodity's share in world merchandise export. The export specialization ratio is defined as:

$$RCAX_{ij} = (X_{ij}/X_i)/(X_{wj}/X_w)$$

when X_{ij} = country i's export of commodity j

X_i = country's total exports of all commodities

X_{wj} = world export of commodity j

X_w = world total export of all commodities

The RCA index may take values from zero to infinity with those above unity indicating the country has a comparative advantage. The RCA has a fairly simple interpretation as follows:

$RCA > 1$: a value greater than one indicates that a particular country has competitiveness in that particular commodity or has a comparative advantage in the increase of production because the share of a given product in a country's total exports captures the good's share in total world exports by manufacturers. An increasing trend of RCA indicates gaining comparative advantage relative to the world market in that commodity.

$RCA < 1$: a value less than one implies that a country has competitive disadvantage in the commodity or deteriorating comparative advantage because the

share of a given product in a country's total exports does not capture the good's share in the total world exports by manufacturers.

RCA = 1: a value equal to one could imply that a country has her comparative advantage in that particular commodity in exporting the particular goods.

SWOT Analysis

SWOT is an acronym for the internal Strengths and Weaknesses of an industry and the environmental Opportunities and Threats facing that industry. The SWOT analysis is a systematic identification of these factors and of the strategy that represents the match between strengths, weaknesses, opportunities and threats. It is based on the assumption that an effective strategy maximizes an industry's strength to capture opportunities, minimize its weaknesses and avoid threats. We use the SWOT analysis applied with the Porter analysis, the Determinant of National Competitive Advantage, called the "Diamond Model" for comparison of the export market between particular countries. The Diamond Model is involved as follows:

“1) Factor Condition. The Nation's position in factors of production such as skilled labor, infrastructure, necessary to compete in a given industry.

2) Demand Condition. The nature of home demand for the industry's product.

3) Related and Supporting Industries. The presence or absence in the nation of supplier industries and related industries that are internationally competitive.

4) Firm Strategy, Structures, and Rivalry. The conditions in the nation governing how companies are created, organized, and managed, and the nature of domestic rivalry.” (Porter, 1995, p.12) In addition, the role of government and chance are involved in this model. These can be defined in figure 2.1.

2.4 Data

This study uses primary data, and secondary data. Primary data comes from interviewing people who are involved in semiconductor industries, both government and private sectors. Secondary data comes from related institutions such as the Board of Investment, Trade Statistic Center: Department of Business Economic, Thailand, and the United Nations Library

Figure 2.1

Strengths Weaknesses Opportunities and Threats

Analysis for Exporting Market

ISSUES	COUNTRIES			COMMENTS	
	A	B	C		
Opportunities and Threats					
I Economic					
-gross national products trends					
-balance of payment trends					
-interest rete					
-inflation					
II Social					
-lifestyle change					
-education					
-language literacy					
III Political					
-stability					
-predictability					
Strengths Weaknesses					
I Factor Endowment					
*human resource					
*physical resource					
*knowlage resource					
II Demand Condition					
*home demand composition					
*demand size and pattern of growth					
*internationalization of domestic demand					
III Relation Soppoted Industry					
*competitive advantage in supplier industry					
IV Firm , Strategy , Struture and rivary					
* Role of Goverment					
* Role of Change					