

# CHAPTER 1

## INTRODUCTION

### 1.1 Background of Taiwan's Midstream Petrochemical Industry

The petrochemical industry has been regarded as the “leading industry” in developed as well as developing countries; its related sectors cover a wide range of products, including chemical fertilizer, pesticide, detergent, apparel, plastics, rubber and paint. In the past two decades, the product value of petrochemical related industries in Taiwan have been rising to 2,938 billion NT dollars by 2004, accounting for 28% of the product value of the manufacturing sector. It's worth noting that 44.8% of the product value of petrochemical related industries was contributed by chemical materials or midstream petrochemical industry ( see Table 1.1).<sup>1</sup>

Taiwan's petrochemical industry was developed in a reverse direction from bottom up into an integrated system with down, middle and upper streams intimately linked. The development of up- and mid-stream industries can drive the development of other industries. Such a system, having achieved considerable scale in a few decades, is unique in the world and has aided the flourishing development of the domestic economy. The characteristic of high capital intensity acts as a strong barrier to entry, and for that reason, midstream petrochemical market structure tends to become an oligopoly in which the big enterprises dominate the industry. In Taiwan, over 40% of midstream petrochemical industries operate in monopolistic markets during the period of 1989-1997.<sup>2</sup> However, with no way to expand upstream production of basic petrochemical materials, a supply shortage developed over the long term, affecting the manufacturing and sales of mid- and down-stream businesses and forcing them to rely heavily on imports.

In Taiwan, most of the inputs of the midstream petrochemical products are imported because Taiwan produces very little crude oil and natural gas. Since the

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<sup>1</sup> According to the Standard Industrial Classification, most of the midstream petrochemical products are classified as chemical materials.

<sup>2</sup> Among 21 petrochemical industries chosen in this paper, 10 industries operated in monopolistic markets in 1989, 1991 and 1992; 11 industries operated in monopolistic markets in 1990; 9 industries operated in monopolistic markets in 1993, 1996 and 1997; 6 industries operated in monopolistic markets in 1994; 8 industries operated in monopolistic markets in 1995.

liberalization policy was adopted by the government in 1986, the tariffs and import restrictions of petrochemical products have been continuously reduced. Accompanied by these changes, the performance and market structure of Taiwan's midstream petrochemical industry have changed significantly. Table 1.2 shows that domestic firms' price-cost margin (*PCM*) fluctuated casually and had no consistent trend during the period of 1986-2002. In addition, domestic concentration went up and down because import competition forced inefficient domestic firms out of business, and raised the domestic concentration as well as the domestic firms' *PCM* at the beginning; and, the latter induced new firms to enter the industry and lowered domestic concentration. Since 1986, import share had increased until 1992, implying that domestic firms had faced more and more competition pressure from foreign firms. But after 1992, import share decreased continuously probably because efficiency improvements by the domestic firms increased their competitiveness. As for the export share, it increased continuously during the period of 1991-2002 except the year of 1997. These findings show that there might not exist one-way relationships among domestic firms' *PCM*, domestic concentration, import share and export share. On the contrary, the relationships among them might be simultaneous. Meanwhile, we also observe that openness (trade share) had increased until 1988, implying that domestic firms had faced more and more competition pressure from foreign firms (Table 1.3). But after 1988, openness fluctuated casually and had no consistent trend. Table 1.3 also shows that there might not exist one-way relationships among domestic firms' *PCM*, domestic concentration and openness.

## **1.2 Purpose and Framework of the Dissertation**

In the past two decades, Taiwan's downstream petrochemical industries have moved to China to seek cheaper labor and larger market demand. The international linkage between China and Taiwan significantly affects those midstream petrochemical industries which have remained in Taiwan. Therefore, for a small, open economy such as Taiwan's, investigating the influence of international trade upon domestic industries' structure, openness, domestic firms' conduct and performance turns out to be an important work.

The dissertation is a collection of three separate but related papers which are

devoted to the empirical studies of Taiwan's midstream petrochemical industry. In addition to the introductory chapter, three papers are presented respectively in chapters 2 through 4. In chapter 2, based on an open-economy oligopoly model, causalities among domestic firms' *PCM*, domestic concentration, import and export shares are derived, and a simultaneous-equation system is established and estimated. In chapter 3, based on an open-economy oligopoly model, causalities among domestic firms' *PCM*, domestic concentration and openness are derived, and a simultaneous-equation system is established and estimated. Chapter 4 begins with a general model of oligopoly, and thereafter uses ordinary least regression analysis to investigate the effect of market power on exchange rate pass-through. The last chapter summarizes the empirical results in the previous chapters, their implications and provides suggestions for further research.