

## **Empirical Studies on the Asian Automotive Industry: Location Choice, Supplier Selection, and Comparative Advantage**

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### **1. Background and Significance of the Study**

The automotive industry can significantly contribute to a country's economic development. Because of its extensive linkages with many industries and its significant potential contribution to the economy overall, the automotive industry has attracted the interest of policy makers in many emerging countries and the development of the industry often is a key policy objective. However, the successful development of the automotive industry in emerging countries is a goal that is difficult to achieve without the financial and technological resources of multinational enterprises (MNEs). Insufficient technological know-how and capital are primary factors hampering the independent development of the automotive industry in emerging countries.

Against this background, global automakers and their strategies have played a crucial role in the development of the automotive industry in emerging countries. Note that over the two past decades, the role of global vehicle manufacturers and their strategies in the development of the automotive industries in emerging economies has grown immensely through the increase in investments by global vehicle manufacturers in emerging markets on the one hand and the decrease in government regulations on the industry on the other.

Given these changes and the significant potential contribution of the automotive industry to the economies of emerging countries, the purpose of this study is to provide empirical analyses on the strategies of vehicle manufacturers, focusing on their activities in the Asian region. In order to provide a better understanding of how Asian countries can build up a successful automotive industry and can raise the local benefits from the entry and local presence of foreign vehicle manufacturers, three issues related to vehicle manufacturers' strategies and to industrial competitiveness are examined: location choices, supplier selection, and comparative advantage.

Even though policy makers in many emerging countries have long been aware of the effects of MNEs' decisions on local economies, most preceding studies on related issues such as location choices and supplier selection focus on the automobile industry in developed economies such as in the United States, Japan, and the United Kingdom. For example, Klier and McMillen (2006) examine the location choices of auto suppliers in the United States, while Choi and Hartley (1996) investigate supplier selection in the U.S. automobile industry. Another limitation of previous studies on location choices and on the determinants of comparative advantage is that most of the studies do not directly focus on the automotive industry. Head and Mayer (2004), for instance, examine the location choices of Japanese manufacturing firms in the European Union, whereas Dudley and Moenius (2007) consider the effects of factor endowments and factor intensities on how the pattern of comparative advantage changes over time for 14 OECD countries and 13 industries. Furthermore, the examination of supplier selection in the automotive industry is mainly conducted by using descriptive analysis.

To fill this gap, this dissertation provides both descriptive and quantitative analyses on location choice, supplier selection, and comparative advantage focusing on the automotive industry in Asia. Another salient feature of this dissertation is that it analyzes comparative advantage and location choice in a regional context. Furthermore, detailed time-series data on six sectors of the automotive industry spanning a comparatively long period from 1988-2006 are employed in analyzing the determinants of the comparative advantage of the countries in the study.

## **2. The Organization of the Dissertation**

This dissertation is composed of six chapters. To begin with, Chapter 1 presents the introduction of the dissertation. Chapter 2 provides some background on the situation of the automotive industry in Asia. Next, Chapters 3 to 5 present empirical analyses on the determinants of the location choices of Japanese automotive firms investing in Asia, supplier selection criteria, taking the case of Thailand as an example, and the determinants of comparative advantage in the automotive industry. Finally, Chapter 6 concludes.

## **3. Major Results and Policy Implications**

Moving to the empirical part of this dissertation, Chapter 3 investigates the location decisions of Japanese firms in the Asian region during 1980-2004 in an attempt to know how a country in Asia can attract investment from Japanese automotive firms, who are key players in the Asian automotive industry. The analysis shows that low labor

costs, the abundant availability of skilled labor, large domestic demand and foreign market potential and agglomeration are crucial in raising the probability that Japanese automotive firms will invest in a particular country. In addition, the findings suggest that the pattern of location decisions of Japanese firms has changed after 1997 as a result of the relaxation of government regulation of the industry as well as regional economic integration, partly prompted by the outbreak of the 1997 financial crisis, while the positive effects of agglomeration and the availability of skilled labor on Japanese investment are even stronger after 1997. Finally, the analysis suggests that agglomeration of parts manufacturers and assemblers is associated with a statistically significant increase in the probability that Japanese parts manufacturers will invest in a country. The results confirm that linkages between assembly activities and parts manufacturing play an important role in location decisions.

To complement the analysis of location decisions in Chapter 3, Chapter 4, taking Thailand as an example, examines supplier selection criteria in order to investigate how a country can raise the probability that local suppliers will be chosen as subcontractors and the economy benefits from the presence of global vehicle assembly activities through supplier-customer relationships. Cross-section data on 162 auto-parts suppliers from the *Thailand Automotive Directory 2003-2004* is employed to examine the effects of the scale of production, the technology level, nationality, distance between suppliers and assembly plants, and the location of parts suppliers on the likelihood of a supplier being selected as a subcontractor. Furthermore, the role of these factors on subcontracting decisions for automobile and motorcycle assemblers are compared. The results suggest that automobile and motorcycle assemblers have in common that they place importance on the scale of production of suppliers, while they differ in the value they place on suppliers' technology level and on the distance between suppliers and their assembly plants. Moreover, automobile assemblers are more concerned with the technological capabilities of suppliers than motorcycle assemblers. Finally, the analysis shows that all the provinces that provide locational advantages to suppliers are provinces where Japanese assemblers are located. In other words, the empirical findings in this chapter provide evidence for positive externalities from agglomeration and suggest that agglomeration as well as linkages between auto-parts makers and assemblers play a role in supplier selection in the Thai automotive industry.

Next, Chapter 5 investigates the determinants of countries' comparative advantage in the automotive industry. This chapter subdivides the automotive industry into six sectors using the classification of the Japan Input-Output Tables. The results highlight the importance of strong supporting industries in raising a country's

comparative advantage in the automotive industry. Furthermore, the findings indicate that the role of factor endowments and factor intensities becomes more in line with the predictions of the Heckscher-Ohlin and Rybczynski theorems in the period after 1997, since the reduction in government regulations as well as economic integration brought conditions more into line with the assumptions of the theorems. Similarly, the positive effect of a large presence of Japanese firms on a country's comparative advantage in the industry also becomes more pronounced in the period after 1997. Lastly, it is found that the sources of a country's comparative advantage in the different automotive sectors can vary depending on the characteristics of the sector concerned and that costly-to-transport products are more likely to be produced in countries where there exists large local demand.

Taken together, this dissertation provides four major findings. First, it provides evidence of the significant impact of extensive vertical linkages between vehicle manufacturers and auto-parts firms on the decisions and behavior of vehicle manufacturers. Second, skilled labor and the technology level of local suppliers are important factors that help to increase the attractiveness of a country as an investment location and the likelihood that auto-parts firms will be chosen as subcontractors. The findings, moreover, suggest that the role of the availability of skilled labor in enhancing the probability that a country will be chosen as an investment location by Japanese automotive firms remained unchanged even following the Asian financial crisis and the moves toward economic integration.

Third, the relaxation of regulations on the automotive industry altered the pattern of location decisions of Japanese automotive firms, while the role of factor endowments and intensities, and the role of the presence of Japanese firms, also became more important in determining a country's comparative advantage in the automotive industry following the decline in government intervention in the automotive industry. Fourth, the findings suggest that the sources of a country's comparative advantage in the different automotive sectors can vary depending on the characteristics of the automotive sector and that the comparative advantage of a country in automotive sectors making costly-to-transport products was enhanced by large local demand and was less influenced by labor costs, but this was not the case for automotive sectors making products for which transportation costs are relatively small.

Based on the above four major findings, three policy implications can be derived. First, owing to the significance of the linkages between vehicle manufacturers and auto-parts firms suggested by the empirical results, governments should promote the formation and development of clusters in the automotive industry such as by

offering taxes incentives and/or building industrial estates. In addition, promoting linkages and fostering communication between assemblers and parts makers is vital to intensify relationships between them and increase opportunities for technology transfer in terms of both tacit and codified knowledge. Moreover, governments should enact policies for developing the automobile industry by taking the situation of the auto-parts industry into account because of the extensive connections between these two industries.

Second, governments should nurture a skilled labor force and promote technological capabilities to build a strong local auto-parts industry. Building up a skilled labor force and technological capabilities can be seen as laying the groundwork for the ability to absorb and assimilate MNEs' technologies.

And third, it is advisable for governments to take into account the effects of deregulation and as well as the interplay between country characteristics such as market size and products characteristics such as transportability when devising policies for the development of the industry.

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