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Global Integration of Thai Automotive Industry

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Abstract: This paper probes the development of Thai automotive industry over the past three decades with a view to form policy toward sustainable industry development. The key finding is, Thailand currently becomes a regional hub of vehicle production of leading carmakers in the world especially for one-ton pickups. It was the increased global competition and favourable economic and policy environment in Thailand during the early 1990s which encouraged the increased involvement of MNEs and made the country to be selected for the regional hub. A process of becoming a regional hub is reinforced by the abolition of foreign ownership restriction during the onset of the crisis. We find that local content requirements imposed during the period 1970-2000 did not have lasting long positive impact on local part suppliers and led to sustainable development. Policy domain should be limited to maintain conducive economic and policy environment in Thailand as well as to strengthen absorptive capability of indigenous manufacturers.

Key words: Thailand, Automotive Industry, Multinational Enterprises

JEL Classification: O14, D21, F23, L62, and N65

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1. Issue

Development of automotive industry, covering car and component manufacturing, is usually in the interest of policymakers in developing countries. Promotion of the automotive industry can lead to the expansion of numerous complementary investments by auto parts firms, thereby laying down the basis for broad-based industrial growth. As a result, several developing countries have intensively offered several incentives and selective policies in order to promote localization of automotive industry. But only a handful of developing countries reach developmental stage where completely built-up (CBU) vehicles become one of the industry's major export items and are mostly relied on locally manufactured parts. Thailand is one of them in reaching this developmental level.

To begin with, Thai automotive industry operated as the result of policy-induced incentives. Thai government granted high level of border protection against import of CBU vehicles as well as imposed local content requirements for creating linkages to various local supporting industries. As a result, a number of multinational enterprises (MNEs) entered and began their manufacturing activities in Thailand. The general perception suggests that the industry development path in Thailand would not be far different from that in other developing countries. The recent record of CBU vehicle export and presence of world class automotive clusters in Thailand draw attention to investigate factors that make Thailand reach this developmental level. Understanding the development path would provide useful policy lesson in economic development not only for Thailand but also other developing countries especially latecomers.

Despite its immense policy relevance, to the best of our knowledge so far, there is one study by Kohpaiboon (2006: Chapters 7 and 8) systematically investigating this development path and the involvement of multinational enterprises (MNEs).[1] Evidence from Kohpaiboon (2006: Chapters 7 and 8) is based on firm-level case studies using purposive rather than probability sampling technique. Nonetheless,

[1]There are other recent studies of Thai automotive industry (i.e. Doner *et al.*, 2004; Takayasu and Mori, 2004). The former illustrates the international comparison and prospect of automotive industries in selected East Asian countries whereas the latter focuses on technology transfer issue in Thai automotive industry..

the study has less emphasized presence of intra-MNE production networks which becomes prominent. Therefore, this study is an extended version of Kohpaiboon (2006) with emphasis on the intra-MNE production networks. To address presence of intra-MNE production networks, we follow methodology applied in Kohpaiboon (2006). Some of interviewed firms in Kohpaiboon (2006) are revisited to explore opinion related to the production network whereas additional firms are interviewed. The interview was conducted during 15 June- 11 August 2006. All interviews are conducted by the researcher.

The organization of this research is organized as follows. The industry's first look is presented in Section 2, followed by a section investigating MNE involvement in Thai automotive industry (Section 3). Section 4 illustrates consequences of the changed nature of MNE involvement in Thai automotive industry as well as playing field for indigenous parts suppliers. Summary and policy inferences are in the final section.

2. First Look of Thai Automotive Industry

The industry seemed to have fully recovered from the crisis by 2002. During the onset of the crisis, production volume dropped sharply from almost 600,000 units in 1996 to 144,243 units in 1998, causing a huge excess capacity for existing car manufacturers. By 2002 volumes of assembled vehicles had rebounded and reached almost 600,000 units which was more or less the peak during the boom period (1988-96) (Figure1). In 2008, production volume was nearly 1.4 million units.

Thai automotive industry has become more export oriented since 1996. Units of vehicle export increased from 14,000 units in 1996 to 152,800 in 2000. An increase in vehicle export continued and reached 838,600 units in 2008 (Figure 1). As a result, vehicle export accounted for around 41 per cent of total locally assembled vehicles during the period 2000-08. This is contrast to the general presumption that the increased importance of vehicle export would simply be a temporary response from the collapse of domestic demand for vehicles during the onset of the economic crisis. Rather the increased importance of vehicle export would be regarded as a structural change.

Completely built-up (CBU) vehicles become the industry's major export item. The predominant export role of parts which accounted the lion share of the industry's export prior 1996 has been replaced by that of CBU vehicle. Figure 2 illustrates (real) dollar value of parts exports as well as the industry's exports which cover both parts and CBU vehicles. Hence the gap between these two lines indicates dollar value of CBU vehicle exports. During the period 1990-2007, auto parts exports continued with moderate growth rate. Their average annual growth rate was around 9.9 per cent which was far lower than that of CBU vehicle export whose average growth rate was 30 per cent per annum during the period 2000–07. As a result, the export share of parts to the industry's export sharply declined from 80 per cent during the first half of 1990s to around 52 per cent during the period 2000–07.

Table 1 illustrates international trade of CBU vehicles. It clearly suggests that Thailand specializes in manufacturing and exporting one-ton diesel pickups. The pickups alone accounted for more than 50 per cent of total vehicle export throughout the period 1999-2004. In 2007 while (real) dollar value of one-ton diesel pickups continued to increase, a share of pick-up trucks declined to 43 per cent because the higher growth rate of passenger car export. Interestingly small (1,000-1,499 cc.) and medium (1,500-3,000 cc.) gasoline passenger vehicles have become increasingly important in total Thai vehicle export since 2001. Their shares increased to 7.9 and 23.3 per cent, respectively, by 2007. Interestingly, there also were sizable dollar values of import of (1,500-3,000 cc.) medium gasoline passenger cars. To some extent the presence of intra-industry trade in this product lines is due to different pattern of MNE production network in Southeast Asia that addressed below in Section 4.

Table 2 shows export destination of vehicle export during the period 1999-2005. The whole period is divided into three sub-periods, i.e. 1999-2001 (the onset of the crisis), 2002-05 (the relatively normal period) and the recent years (2006-07) in order to examine changes in export pattern. In the first sub-period, most of vehicle

exports were not for Southeast Asian countries where major importing countries like Indonesia and the Philippines were adversely affected by the crisis. Where the passenger cars are concerned, there was a considerable change in export destination. The relative importance of Southeast Asian market for Thai passenger car export significantly increased to for around 50 per cent during the period 2002-05, up from 12 per cent between 1999 and 2001. While the relative importance of Japan as an export destination of Thai passenger cars remained more or less unchanged between these three periods, Australia becomes increasingly the export destination in the recent years. By contrast, there has not any considerable change in export destination for pickups. This suggests that pickups have been targeted for export before the crisis. Exports of the passenger cars during the period 1999-2001 would be regarded as MNE response to mitigate the surged excess capacity as a result of the crisis though passenger cars are widely considered for regional rather than global market.

Pointedly, as Thai automotive industry has become more export-oriented, local content of locally assembled vehicles has increased naturally. In order to illustrate the increased local content of Thai manufactured vehicles, we calculate the ratio where the nominator is the (real) dollar value of parts imports whereas the denominator is production volume of locally assembled vehicles during the period 1988-2005. The former is a summation of import value of 91 HS 6-digit items that are used for vehicles manufacturing. Before constructing the ratio, the value of imported parts is converted into real terms using import deflator (the ratio of real and current goods imports according to National Income Account). Hence the ratio would to some extent reflect import content. Note that the import value of parts covers items for both original and replacement equipment manufactures (henceforth referred to OEM and REM respectively) so that the ratio tends to overestimate the import content of locally manufactured vehicles.

Figure 3 shows trend of the imported content of locally manufactured vehicles during the period 1988-2007. Real value of imported parts per 1,000 cars dropped from $8.1million during the late 1980s to around $ 2 million during the period 2004-05. In theory, the observed downward trend of this ratio would be either a result of the decreased import content of locally assembled vehicles or the shift from high- to

lower-import-content items. Due to the fact that during the period 1988-2007, the persisted downward trend of the ratio suggests that locally assembled vehicles have been less reliant on imported parts.

3. MNE Involvement in Thai Automotive Industry

3.1 Pattern of MNE Involvement

In general, there are two broad ways that MNEs can involve themselves in host countries: through FDI and non-FDI channels (e.g. technology licensing, subcontacting, MNE buyers).[2] Where automotive industry is concerned, MNEs tend to prefer FDI to non-FDI channels because production technology is a proprietary asset. FDI channel seems to be more effective mean in securing their proprietary asset. Therefore, pattern of FDI inflows is used for representing pattern of MNE involvement in Thai automotive industry.

There was a considerable change in the pattern of FDI inflows in the Thai automotive industry between 1970 and 2007 (Figure 4). Dollar value of FDI inflows in the automotive industry were more or less unchanged from 1970–85, with annual inflows amounting to less than $5 million. Its share of total manufacturing FDI inflows was around 6 per cent. Following this, the annual average value of inflows increased dramatically to $37 and $87 million during the periods 1986–90 and 1991–5, respectively. FDI inflows in the Thai automotive industry further increased after the 1997 financial crisis and reached the record high by 2007 with dollar value of $3,308 million. Its dollar value of FDI inflows slightly declined during the period 1999-2007, averaging out at $1,400 million per annum. As a result, a share of FDI inflows to the automotive industry accounted a quarter of total FDI inflows for the manufacturing sector between 1999 and 2007.

As indicated by the huge increase in FDI inflows, the increased degree of MNE involvement in Thai automotive industry took place in both car assembly and parts manufacturing industries. Regard to MNE car assemblers, the increased degree of MNE involvement was a result of the capacity expansion of incumbent car

[2] See a comprehensive discussion in Kohpaiboon (2005), Chapter 2.

assemblers dominated by Japanese MNE as well as the entry of the big 3 US car companies, namely Daimler Chrysler, General Motor (GM) and Ford whose prime objective is to produce in and export one-ton pickups from Thailand. Therefore, production capacity in the car assembly industry has rapidly increased since 1999. In 2006, production capacity reached 1.6 million units of vehicles, up from 0.9 million units in 1999. During the period 2006-08, there was not significant change in production capacity. Out of the total capacity, 57 per cent is for manufacturing one-ton pickups, followed by 31 per cent for passenger vehicles (Tables 3 and 4).

Where parts manufacturers are concerned, the increased degree of MNE involvement took place in two forms. Firstly, many MNE parts suppliers especially Japanese MNEs, which used to be involved with local parts suppliers through a technology licensing contract or minor shareholder, have expressed their intention to be co-owners and/or majority shareholders. Their prime objective was to take full control on parts manufacturing operation. The tendency of strengthening their involvement with local parts suppliers has been observed since the late 1980s. It has clearly noticed when the foreign ownership restriction was abolished during the onset of the crisis in 1997 (Kohpaiboon, 2006).

Interestingly as MNE parts suppliers increased their equity share and/or became major shareholder, their degree of participation in the firm's manufacturing process considerably changed. As argued in Kohpaiboon (2006), these MNEs started bringing updating and more cutting edge technology together with close supervision by foreign technicians. This did not occur when these MNEs were involved through technology licensing channel or minor and less active shareholders. Many of local partners of these MNEs stress that the real development in parts manufacturing began after the increased degree of MNE involvement.

Secondly, there was new entry of MNE parts manufacturers. It was Japanese parts suppliers who firstly moved in and established new affiliates for manufacturing new and more sophisticated parts since the late 1980s where Japan experienced dramatic currency appreciation. The evolution of Denso affiliates in Thailand provides a clear example of the new entry of Japanese parts manufacturers. Denso,

which established its first factory in Thailand in 1972 for producing cooling system in 1972, has established two new factories in 1995 and 2000 as well as set up another five affiliates (Figure 5). There are numerous new parts manufactured in new factories and new affiliates such as starter, alternator, magneto, windshield, wiper motor, oil cooler, radiator, fuel filter, rail, injector, supply pump, relay, flasher, oil pressure value, air cleaner filter. The similar pattern also occurs to other foreign parts manufacturers

Since the mid 1990s, there have been several world class non-Japanese multiple-parts manufacturers such as Dana (1994), TRW Steering & suspension (1998), Visteon Thailand (1998), Johnson Controls (1999), Delphi Automotive Systems (2000) and Tenneco Automotive (2002) establishing their factories in Thailand. As a result, from the late 1980s onward, a number of MNE parts manufacturers have increased significantly. During the period 1971–85, there were around 30 MNE parts manufacturers in Thailand, dominated by Japanese MNEs (Buranathanun, 1995; Higashi, 1995). From 1987–2005, there were almost additional 300 foreign parts suppliers entered into Thai auto parts manufacturing. Nowadays, a comprehensive range of parts is now locally manufactured. There are only a few items that have not yet locally manufactured. They are passenger car engines, fuel injection pumps, transmissions, differential gears, injection nozzles, electronic systems, electronic control units, turbo chargers, substrates for catalytic converters and anti-lock brake systems. All in all, Thailand becomes the site of world class automotive clusters in Southeast Asian region.

3.2 Causes of the Structural Change in the Nature of MNE Involvement

The increased MNE involvement and their changed nature are due to the increased global competition in automotive industry as well as policy shift in Thailand.

3.2.1 Increased Global Competition

There was intense competition among MNE car assemblers which considerably affected the pattern of MNE involvement in the automotive industry worldwide since the late 1980s. The principal automobile markets in the Triad

regions (North America, Western Europe and Japan), which account for over 90 per cent of global sales of vehicles, have been nearly saturated for the past ten years (Abrenica, 1998; Doner *et al.* 2004). In contrast, promising growth perspectives for vehicle sales have been exhibited in emerging market economies. In the meantime, governments in a number of these emerging market economies have moved away from highly protective policies based on quantitative restrictions and prohibitively high tariffs (Takayasu and Mori, 2004: p.209).[3] The liberalization approach of their automotive industry takes place faster through a regional rather than a global context (Humphrey and Oeter, 2000: p.42; Humphrey and Memedovic, 2003: p.2). Many countries have formed regional groupings such as the European Union (EU), the ASEAN Free Trade Area (AFTA), the North America Free Trade Area (NAFTA), and regional integration in the Latin American countries (namely Mercosur) to liberalize regional trade in cars and their parts. In several cases, extra efforts have been made in order to accelerate regional liberalization schemes for particular industries. For example, under the AFTA agreement, ASEAN countries strengthened their industrial cooperation program, namely ASEAN Industrial Cooperation (AICO) that would be regarded as a shortcut to benefit ASEAN regional liberalization. This has encouraged MNE car assemblers to become involved with local assembly in these emerging markets.

As a result of increased global competition, MNE car assemblers and parts manufacturers changed their strategy. Car assemblers must decide which models to produce at which locations, at what prices and quality standards, and for which markets (either region or global) (Takayasu and Mori, 2004). Prior to this, auto assemblers used to allocate assembly facilities in each country to access the highly-protected domestic markets. Their assembly facilities manufactured whatever vehicles they could under these limitations at prices that allowed them to earn a profit in local markets. When the market started to become more liberal, the excessive investment driven by protectionist barriers resulted in overcapacity problems. Production capacity in a country might be able to serve demand in other countries

[3] Two exceptional cases, China and India, should receive special attention. These two countries have gigantic domestic markets as a key to attracting auto maker MNEs to establish affiliates, even though the trade and policy regimes within these two countries are still highly restrictive. See details in Humphrey and Oeter (2000) and Doner *et al.* (2004).

within a region or worldwide. All car assemblers compete against each other in order to maximize their market share in the emerging market economies. Both car assemblers and parts manufacturers tend to utilize resources scattered throughout the world.

Car assemblers tend to consolidate their assembly facilities that used to be scattered within a region and decide which models to produce at which locations (country), at what prices and quality standards, and for which markets (either region or global). Each production base (country) tends to be more specialized in producing and exporting certain types of vehicle models whereas relies on import for the other models. Many car assemblers also developed the strategy of launching the same model on multiple markets at the same time, namely the 'original' model strategy. The scope of multiple markets can be either a region e.g. ASEAN or worldwide.

To select locations to produce certain types of vehicles, size of domestic market and its growth prospects are the most important factor (Doner *et al.*, 2004). Since there are certain scale economies in producing a vehicle model (i.e. 40,000–50,000 units/a model), the greater the market size the more likely MNE car assemblers are to attain them. Besides market size, MNE car assemblers should select a location where the policy environment is relatively more liberal and stable. In such an environment, they are likely to maximize resources scattered throughout the world to strengthen international competitiveness. This is especially true of small-open economies like individual ASEAN countries where assembly facilities are unlikely solely to serve highly-protected domestic markets.

3.2.2 Favourable Economic and Policy Environment in Thailand

It was favourable economic and policy environment in Thailand during the late 1980s and early 1990s that made the country to be selected for a regional hub of vehicle production for MNEs in the automotive industry. Where economic environment is concerned, Thailand has the largest domestic demand for vehicles in the region. From 1989–96, the annual vehicle sales of Thailand were 405,800 units, accounting for around 42 per cent of the total sales in ASEAN-4 countries. It was followed by Indonesia (27 per cent), Malaysia (21 per cent) and the Philippines (10

per cent). In addition, for passenger vehicles, the sales volume in Malaysia exceeded that of Thailand. For example, in 1995, the total sales of passenger vehicles were around 224,991 units and 163,371 units for Malaysia and Thailand, respectively. Nonetheless, the sales volumes in Malaysia were dominated by its National car, the Proton. For non-Proton vehicles, there was no single MNE car assembler in Malaysia whose sales volume was greater than 11,000 units per brand during the period 1995-2003.[4] It is unlikely any MNE car assembler in Malaysia would achieve the minimum efficient scale. This applies specially to commercial vehicles because Thailand has become the world's second largest production base for one-ton pickups (Doner *et al.*, 2004: p.187). Thus, there are many MNE car assemblers, especially one-ton pickups, for which assembly operations are likely to attain the scale economies level.

Policy environment in Thailand was relatively more liberal and stable than that of other ASEAN-4 neighbours. The first and foremost is Thailand never had an explicit goal to promote a national car, as occurred in Malaysia. As argued by President of Toyota Motor Thailand 'Thailand is the best candidate for hub status because it has no 'national-car' policy and offers a level of playing field'(Bangkok Post Economic Review, 1999). At the same time, Thailand did not have an explicit target in nationalizing local parts firms, as was the case in Indonesia and the Philippines (Doner, 1991: p.61). Furthermore, the degree of policy uncertainty, i.e. the frequency of reversing policy direction, was relatively higher in Indonesia and the Philippines. This was especially true in Indonesia where modification of its specific objectives occurred more frequently than for any of its three neighbours (Doner, 1991: p.54).

Besides the absence of a national car policy, Thailand was the first country in the ASEAN region to begin unilaterally liberalizing the automotive industry, i.e. the first move advantage. Despite remaining high compared with other Thai industries, protection on vehicles was reduced dramatically in the early 1990s so that import competition increased. In 1990, the limitation on the number of allowed series was repealed. Meanwhile, the Ministry of Commerce replaced passenger-car import

[4] Data are compiled from CEIC sectoral database and available from author's request.

restrictions with tariff measures.[5] Tariff rates for CBU passenger vehicles over 2,400 cc. were reduced to 68.5 per cent in 1992, from 300 per cent before 1992. Similarly, for CKD kits of passenger cars with 2,400 cc. engines and below, the tariff was reduced to 42 per cent (Table 5).

Moreover, the Thai government also kept its strong commitment to abolishing the LCRs by the year 2000. Despite the 1997 economic crisis, in 1998 the Thai government approved keeping the WTO commitment to abolish LCR policies on schedule in January 2000. To cushion the potential adverse impact of LCR abolition, the tariff rates on CKD vehicles were raised slightly from 20 per cent in 1999 to 33 and 30 per cent in 2000 and 2005 respectively. The import duty on CBU vehicles remained at 80 per cent (Table 5). Nevertheless, while tariffs for vehicles remain high, compared to other industries, absolute protection was considerably reduced for the auto assembly industry from the early 1990s to the present.

Secondly, commercial vehicles have always been subject to lower trade protection and consumption tax (excise tax) than passenger vehicles over the past three decades. Hence, the price of one-ton pickups was about half that of a medium-size passenger car (Doner *et al.*, 2004: p.188). Whether it is the government's intention or not would positively affect the always higher growth rate of domestic demand for commercial vehicles especially pickups and put Thailand as location where MNE car assemblers are likely to reach economies scale of production and enhance their competitiveness.

It seems likely that abolition of foreign ownership restriction during the onset of the 1997 crisis[6] significantly contributed to the current developmental stage of Thai automotive industry. Due to the fact that production technology of parts manufacturing seems to be proprietary, becoming majority/fully-owned affiliates would be more preferable to joint-venture or minority-owned ones in order to secure their proprietary asset. This is especially true when market competition is intense as it has happened in Thai automotive industry since the mid-1990s. When foreign ownership restriction was released, it could accelerate/affect decision to establish

[5] However, imports of used cars were prohibited.
[6] See WTO (1999, pp.30).

plants and/or bring more cutting edge technology to their affiliates in Thailand. It seems to have greater positive effect for non-Japanese MNEs in parts manufacturing which have less familiar with Thai business environment. Despite its significant role in a process of plant relocation, it is unlikely to conclude that abolition of foreign ownership restriction would be a prime cause inducing Thailand to be a regional hub for vehicle production.[7]

Due to the fact that automotive industry is relatively capital intensive, there is considerable sunk cost involving in their production plants so that the increased MNE involvement had to take place gradually. To begin with, Japanese MNE parts suppliers moved in as a result of the appreciation of the yen in the mid-1980s and their long presence in the country. In addition, when some Japanese car assemblers commenced their plan of using Thailand as an export base,[8] they first encouraged their suppliers in their keretisu network to enhance their involvement in Thailand. Several new parts, such as power steering tanks, air cleaners, wheels, gear boxes, etc. began to be locally produced. The rapid growth of domestic demand and the further appreciation of the Japanese currency reinforced the relocation of production bases, thereby widening the range of OEM parts available there and raising quality.

As postulated by a number of previous studies, locations decisions of MNEs operating in assembly activities are strongly influenced by the presence of other key market players in the given country (Barry and Bradley, 1997; Ruane and Gorg, 2001, Athukorala, 2003). This statement is supported by evidence of Thai automotive industry. Presence of numerous world class OEM parts suppliers motivated the re-entry of the US MNEs, General Motors (GM) and Ford with the prime target of CBU export, which in turn further enticed even more foreign parts suppliers into the Thai automotive industry during the mid-1990s. Finally, the process of relocation was further stimulated by the abolition of foreign ownership restrictions as well as the

[7] Over and above the abolition of foreign ownership restriction, the sharp currency depreciation did accelerate the process of relocation.

[8] The earlier movement of these car assemblers is a result of oligopolistic reaction among car assemblers in Thailand. Smaller firms want to use the export market to enhance production efficiency and assume the dominant position in the market.

sharp currency depreciation during the onset of the Asian financial crisis starting from mid-1997.

4. Global Integration of Thai Automotive Industry

4.1 National Specialization Strategy

Many car assemblers pursue national specialization strategy. That is, in a certain region, each production base (country) tends to be more specialized in producing and exporting certain types of vehicle models whereas relies on import for the other models. Cost competitiveness is a basic factor in determining which models/parts to produce at which locations (country) for which markets. Nonetheless it can also be influenced by how these MNEs consolidate their existing production network (intra and inter-firm) scatter around the world to maximize their long-term profit. Hence this could be varied from MNE to MNE.

Figure 6 shows some production and international trade networks of car MNE assemblers in Southeast Asia. Toyota, which long presented and accounted the largest market share in Thailand of both passenger cars and pickups in Thailand for the past three decades, uses the country as a production and export base of small-to-medium passenger cars as well as one-ton pickups. Regard to export market, the former is for Southeast Asian and Oceania regions whereas the latter is for global market.

This is different from Ford and Mazda where their production base in Thailand was rather small. These companies use existing production base in the Philippines for producing passenger cars (Ford Laser, Ford Escape, Mazda Protégé, and Mazda Tribute). Where one-ton pickups are concerned, it was the existing clusters of world class suppliers in Thailand and the adoption of platform production strategy[9] that

[9] In platform production strategy, automakers use a small number of underbody platforms as the basis for a greater number of vehicle model. This strategy is applied to cut the costs of platform development and to encourage component sharing among models. For example, platform sharing between Chrysler and Mitsubishi will allow Mitsubishi to reduce its number of light-vehicle platform from 12 to 6 or 7 (Treece and Sherefkin, 2001). Another example, Honda Odyssey and Accord share the same platform. The platform used for Ford Everest is also for Mazda Fighter.

make the companies assign their affiliates in Thailand (existing Mazda production facilities) producing and exporting one-ton pickups to more than 100 countries. Hence, in ASEAN network, Thailand exports one-ton pick-up truck (e.g. Ford Ranger, Ford Everest, and Mazda Fighter) to the Philippines and imports small-to-medium passenger cars from the Philippines. Regard to Honda network, most of passenger cars (i.e. Honda accord, civic and city) are manufactured in Thailand and exported to other Southeast Asian countries whereas Honda stream are produced in and exported from Indonesia.

The key implication is the observed different pattern among MNE suggests that they would be sluggish to relative cost changes once they have invested substantial resources in domestic production facilities and in establishing information links. This is especially true in the automotive industry which is relatively capital intensive and has considerable sunk costs involved in their investment. Cost competitiveness is not solely determined by a set of factor prices (labour cost and/or exchange rate) but the availability of world-class operator, technical and managerial skills, a good domestic basis of suppliers and services; relatively free access to world-priced inputs including capital; and excellent infrastructure. In other words, the locational decisions of MNEs depend on the availability of a wider array of complementary inputs that enable their facilities to be efficient by world standards. Given the heavy initial sunk costs, MNEs are hesitant to establish overseas plants without considerable first-hand commercial experience in the host country.

Note that the sluggishness does not mean that these MNEs will never leave. In a circumstance when the host country's government imposes prohibitive measures, the sluggishness means such policy-induced damage needs considerably long period of time to fix it. This is especially true for automotive industry whose production technology is still subject to ongoing development and is not generally available for arm's length purchase.

By contrast to electronic industry where (international) product fragmentation phenomenon[10] is prominent, assembling a vehicle is heavily reliant on parts that are locally manufactured. The geographical proximity is needed to minimize transaction costs involved with thousands of parts for a vehicle and to efficiently match order and delivery. Where auto parts are concerned, product fragmentation phenomenon occurs within the few firms. In particular, it is currently only Denso (the largest Japanese parts supplier) which has extensively used Southeast Asian region in sourcing their parts and components.

4.2 Relative Importance of Foreign Parts Suppliers

As global competition becomes more intense, MNE car assemblers tended to increase local parts procurement in order to strengthen international competitiveness of car assemblers. As a vehicle consists of numerous parts and components, many of which are quasi-nontradable, there is sizable transaction cost involved in procuring all the parts. The proximity between car manufacturers and parts suppliers, therefore, saves on the transaction costs. This also allows more efficient cooperation between car manufacturers and parts suppliers to match their production plan and delivery schedule. It also reduces exposure to exchange rate risk if they can source local parts. In addition, car manufacturers can exploit their existing comparative advantage as host countries in manufacturing a vehicle.

When MNE car assemblers utilize any production base for both domestic sales and export, therefore, we would observe clustering of automotive firms in which car assemblers are at the centre and surrounding with part suppliers. This would explain the low import content observed in Thailand for the past two decade (1988-2007). The low import content was also observed in other production hubs like Brazil and Mexico (Figure 7). Interestingly, what observed in Chinese automotive industries is just opposite to other hubs. While it is far beyond the paper's scope, this would cast

[10] Product fragmentation phenomenon is referred to the splitting of production process into discrete activities which are then allocated across countries according to cost competitiveness. Their production process especially a finished good is heavily reliant on imported intermediates sourcing globally.

doubt about the effectiveness and developmental outcome of market for technology kind of policy measures used in a case of Chinese automotive industry.[11]

In line with the increase local content in locally manufactured vehicles, car assemblers also expect more from parts suppliers. Firstly, they require higher technological capability from their parts suppliers. Under the 'original' model strategy, car assemblers did not have full information on producing a vehicle because it had not already been produced somewhere else. Car assemblers need capable parts suppliers which could jointly work out all necessary information for the manufacturing process, based on input prices available at selected production sites. Hence, parts suppliers are expected to attain product engineering and product design technological capability which is far more advance than the capability to duplicate prototype parts and run mass production with uniform quality, i.e. quality control capability.

Secondly, car assemblers introduce modularization for parts procurement. Under modularization, parts suppliers are classified into three levels, namely first-, second- and third-tier suppliers, according to their relationship with car assemblers. First-tier suppliers are required to take responsibility for the design as well as the manufacture of modules, not just individual components. If any suppliers fail to attain this requirement, they will be classified in the lower tiers, i.e. the second- or third- tiers. The lower tier suppliers are not directly involved with car manufacturers but are responsible for individual parts and/or raw materials and deliver their products to the first-tier suppliers.

Finally, car assemblers have placed far more emphasis on the quality and cost effectiveness. Nowadays car assemblers apply global sourcing system to reduce parts cost. Decision making regarding the selection of parts suppliers which used to take place at local levels has been increasingly consolidated to company headquarters in developed countries. Parts suppliers are required to be able to supply or to locally manufacture high quality components in other regions in order for automakers to

[11] Policies related to automotive industry in India and China are still traditional import substitution strategy (Humphrey and Oeter, 2000)

achieve global sourcing. New quality testing facilities had to be installed and suppliers had to learn how to pass these quality tests. Suppliers also must propose their cost-reduction plans to car assemblers, i.e. cutting production and operating costs by a certain per cent within given time periods. This is to enhance the competitiveness of assembled vehicles. For example, Toyota has set a 25 per cent cost reduction target within 3 years. Isuzu and GM have adopted a target of cost reduction of about 5 per cent a year.

The increased parts localization of car assemblers will translate into denationalization and into intensified competition for becoming a regional hub in the new production networks. As a result, a few indigenous suppliers were able to pass this new requirement standard. Nowadays there are around 354 Thai-owned OEM suppliers (Figure 8). The other 1,100 Thai suppliers were indirectly linked with car assemblers through first-tier suppliers. These official figures of Thai-owned OEM suppliers tend to grossly overstate the number of surviving firms (Kohpaiboon, 2006). In fact OEM suppliers have been dominated by affiliates of MNE parts suppliers. The number of purely Thai firms must be around 10 suppliers, comparing to 287 foreign firms.[12] The official figure above would include some OEM suppliers that manufactured minor parts as well for old car models, i.e. the models that were being assembled before the strategy changes. This would be done in order to reduce any possibly political pressure from denationalization process.

Therefore car assemblers enticed MNE parts manufacturers to establish affiliates in Thailand, thereby rapidly increasing FDI inflows in the automotive industry. OEM suppliers have been supplanted by MNE affiliates. Some of these parts manufacturers were technology owners and provided such knowledge to local parts suppliers under technology licensing agreements during prior 1990. When the foreign ownership restriction was abolished during the onset of the crisis in 1997, these technology owners took full control of the OEM market. Local partners are responsible for production for the after market (i.e. repaired parts for vehicle services

[12]Four indigenous suppliers, i.e. Summit Auto Body, Thai Summit, Sammit Motor Manufacturing and Somboon Group are usually mentioned as to the first tier suppliers who considerably supply for car assemblers. All of them supply pressing and stamping parts related to auto body.

and maintenance). Some of Thai firms become lower tier suppliers whereas many of them went out of business.

It is noteworthy that the denationalization phenomenon is also observed in other regional hubs. For example as of late 1997 Brazil, a regional hub in Latin America, had only one locally owned firm among 13 largest component producers (Humphrey, 1998). Another example, Korean parts suppliers experienced significant acquisitions by Western first-tier suppliers during the onset of the financial crisis. This is especially true for industries where production process is likely to be proprietary to any specific firms. Under the intense competition, MNE parts suppliers need to bring it with them cutting edge technology so that fully-owned affiliate would be the way to secure their proprietary asset.

The intense competition also occurs among MNE parts suppliers in Thailand especially after the entry of the US car assemblers. The parts procurement policy of these US car assemblers heavily relies on price bid competition among parts suppliers around the world. This prompted other car assemblers to follow suit. In the traditional practice of Japanese car assemblers, it was usual for a parts supplier to be attached to only one car assembler. This practice changed from around 1995 onward. A parts supplier is now allowed to supply more than one auto maker. Order volume is heavily reliant on the competitiveness of suppliers. This also enhances the likelihood of parts suppliers benefiting from scale economies. This changed procurement policy of Japanese car assemblers as argued by Kasuga *et al.* (2005) is referred to as the collapse of vertical 'keiretsu' system.[13]

4.3 Playing Field for Indigenous Suppliers

The fact that only a few indigenous suppliers maintained their OEM suppliers status points out to the effectiveness of local content requirement measures. It is irrefutable to reject that local suppliers did gain technological capability benefit from the presence of LCR and the other protection measures granted so far. The relevant question is whether such protection measures generate sufficient benefits to induce

[13] The collapse of vertical keiretsu system is also observed from the fact that Denso (Thailand) is no longer to strictly supply its manufactured parts to Toyota.

sustainable development of the automotive sector, especially the auto parts industry, where local firms participate. LCR measures had not any lasting positive impact on local part suppliers. Such measures, in other words, were not a sufficient condition in building up the technological capability of local suppliers and allowing them to benefit from the gains of dynamic economies. They did help local firms to acquire well-established quality-controlled production technology but failed to motivate them to use this technology efficiently and advance to even higher levels of technology.

It can be argued that OEM suppliers that survive in the new environment are likely to be large firms that are able to access longer-term financial support in order to comply with the new requirements. Nevertheless, as argued in Kohpaiboon (2006), the general impression gained from firm interviews is that the main obstacle is the difficulty of acquiring higher technological capability within a short transition period.

Parts suppliers need time to accumulate technological capability from the quality control level to the product engineering and product design levels. This seems to be consistent with the 'infant industry' argument of temporary protection to gain dynamic economies in following periods. However, there is no evidence to suggest that the LCR measures enabled local suppliers to achieve dynamic economies. The LCR measures commenced 20 years before the strategy change but only a handful of local suppliers survived. In addition, the reason that local suppliers passed the new requirement standard was not directly related to the protection provided by LCR measures, but because they received significant assistance from the car assembler whose production strategy in the late 1980s shifted towards exporting vehicles from Thailand (see above). Hence, these firms undertook their technological upgrading from the late 1980s onwards.[14] This longer transition period enabled these firms to build up their technological capability gradually and maintain their positions successfully in the OEM market.

[14] Evidence from Interview with the first engineers of 100 per cent Thai owned Tier-1 suppliers (i.e. Somboon Group and Summit Auto Body) by the author in 2006. In particular, the company's owner imported used machines from Japan and Germany, respectively, to strengthen their engineering capability with assistance from Mitsubishi.

In the new environment, playing field for indigenous suppliers in the MNE production network would be very limited especially for being OEM supplier. Where OEM is concerned, bulky auto-body-related stamping parts would be the available playing field for indigenous suppliers. With the long experience in assembly, Thailand would have strengths in press parts and related die, molds and jigs. It is worth note that a Thai company, Aapico, has emerged as one of the world's best suppliers of low-volume tooling (Crispin, 2002; Deyo and Doner, 2001). In addition, manufacturing these parts requires relatively less technological capability especially product design. Since their product design is related to vehicle appearance in which car assemblers are fully responsible, a very high level of product design capability is not actually required. To maintain their position as OEM suppliers, indigenous suppliers must acquire certain level of product design knowledge in understanding 2-dimensional drawing and manufacture them at the internationally competitive prices. Nonetheless, indigenous parts suppliers must be very competitive and alert to any innovation to enhance their efficiency. From the recent interview, agreed price of these parts is determined, based on ex-factory price prevailing in industrial economies.

Where other sophisticated OEM parts are concerned, it is very unlikely for indigenous parts suppliers to be and/or maintain their OEM supplier status in foreseeable future. Its manufacturing process is involved with tacit knowledge through learning-by-doing process. This is proprietary assets of each MNE. MNE parts suppliers which have long experience in product development, product design and manufacturing process would be far superior to indigenous suppliers.

The alternative is to become lower tier suppliers of intermediates and raw materials such as plastics, textile products, leather goods, etc., which would be relatively larger than being OEM supplier. Growth prospect of demand for these products seems to be promising because of the high growth of vehicle production and the increased local content of locally assembled vehicles. It is not necessarily that being lower tier suppliers implies less opportunity to gain technological benefit from car assemblers. It rather depends on the nature of linkages developed. This is well supported by the failure of LCR measures in creating sustainable industry development. Presence of increased competition among car assemblers considerably

passes through to parts suppliers in every tier. This would be a healthy force for the latter to make long-term commitment and devote real resources to productivity enhancing productivity. As suggested by several previous studies (e.g. Bell et al. 1984; Eveson and Westphal, 1995; Moran, 2001), long-term commitment and devoted real resources are needed for the considerable improvement in technological capability.

In addition, according to the fact that intermediates and raw materials must be made to the precise specification of particular OEM suppliers, inter-firm cooperation is needed (Hobday, 1995, 2000). In this way, MNE parts suppliers can considerably influence the business operations and technological capabilities of indigenous suppliers. In general, MNEs could provide technical know-how and service to ensure that subcontracting firms can produce quality components to meet specifications. This sort of linkage has been highlighted in previous studies as one of the key factors contributing to technological development in North East Asian newly industrialized economies (NIEs), i.e. Korea, Taiwan, and Hong Kong in the electronics industry (Hobday, 1995; Nabeshima, 2004). Recent evidence that OEM suppliers provide regular training to their subcontractors (covering both indigenous and foreign firms) supports the inter-firm cooperation.

5. Summary and Policy Inferences

This paper probes the development of Thai automotive industry over the past three decades with a view to form policy toward sustainable industry development. The key finding is, automotive industry in Thailand has experienced rapid expansion since 2001. From 2005 onward, production volume exceeded 1 million units. Interestingly, about 41 per cent of locally assembled vehicles are currently for export. Nowadays, Thailand becomes a regional hub of vehicle production of leading carmakers in the world especially for one-ton pickups. A well global integration of Thai automotive industry is a result of the increased involvement of MNEs. FDI inflows into the automotive sector increased dramatically after the 1997 financial crisis. The surged FDI inflows in automotive sector explained the remained high level of FDI inflows throughout the period 1997 to the present.

It was the increased global competition and favourable economic and policy environment in Thailand during the early 1990s which made the country to be selected for the regional hub. As the increased global competition forced car assembler MNEs seek emerging market economies to set up their production base in each region, Thailand had the largest domestic market for vehicles and offered favourable (liberal and stable) policy environment as opposed to other Southeast Asian neighbours. In particular, Thailand never pursues a national car policy. A process of becoming a regional hub is reinforced by the abolition of foreign ownership restriction during the onset of the crisis. As a result, existing MNE affiliates in the industry have expanded their production capacity as well as there have been new entry of several world part manufacturers.

As being a regional hub, vehicle assembly in Thailand virtually procure locally manufactured parts to save transaction cost and enhance their competitiveness. In other words, the production network between car assemblers and parts manufacturers take place within Thailand. Nevertheless, only a few indigenous suppliers are involved in this production network because of lack of technological capability. This points out to the failure of local content requirement measures imposed during the period 1970-2000. It is irrefutable to reject that local suppliers did gain technological capability benefit from the presence of LCR measures but they had not any lasting positive impact on local part suppliers and led to sustainable development.

Due to a presence of considerable sunk costs in the automotive industry, MNE affiliates tend to be less sensitive to temporary shocks and/or minor changes in labour costs. In a circumstance that the host country's government imposes prohibitive measures, the less sensitivity instead implies such policy-induced damage needs considerably long period of time to fix it. This is especially true for automotive industry whose production technology is still subject to ongoing development and is not generally available for arm's length purchase.

The remained playing field for indigenous parts suppliers would be bulky auto-body-related stamping parts and lower-tier suppliers. Product engineering and

design capability is required relatively less in the former. In the meantime, the latter seems to exhibit promising growth prospect because OEM suppliers still procure intermediates and raw materials locally. Since most of intermediates and raw materials for parts manufacturing are made to the precise specification, OEM parts suppliers and indigenous manufacturers need to cooperate to ensure quality components to meet specifications. It is the above cooperation through which the latter can technologically benefit from the former.

The key policy inference is, it is very unlikely for Thai government to influence the MNE production network for national objectives. Policy domain should be limited to maintain conducive economic and policy environment in Thailand as well as to strengthen absorptive capability of indigenous manufacturers. The former is to keep Thailand in the regional hub position. In the latter, vocational training is still weak as well as the rate of enrollments in technical areas especially engineering and science is still low in Thailand. This would be the prioritized area with action plans for promoting further investment relocation for more advance activities (e.g. product design) and maximizing benefits from the increased involvement of MNEs.

Table 1
Values of Thai Vehicle Export and Import, 1999-2007

	1999-2001	2002-04	2005	2006	2007
Export ($million)	1609	2825	5198	6648	8227
Percentage share					
Passenger car 1000-1499 cc.	1	11	9	9	8
passenger car 1500-3000 cc.	13	13	19	23	23
one-ton pickups	67	57	44	47	43
Import ($million)	488	548	795	772	1013
Percentage share					
passenger car 1500-3000 cc.	45	37	33	24	19
passenger car larger than 3000 cc.	8	11	6	6	4
Bus	13	16	29	29	33
Truck	11	10	5	5	7

Notes: passenger car 1000-1499 cc., 1500-3000cc. and greater than 3,000 cc are referred to HS870322, 870323 and 870324, respectively. One ton pick up truck is HS870421 whereas bus and truck are HS8702 and 8704, respectively.
Source: Compiled from UN Comtrade Database

Table 2
Percentage Share of Export Destination of Thai Vehicles, 1999-2005

	ASEAN-10	Indonesia	Philippines	Australia	Japan	Others	Total Value ($million)
1999-2001							
Passenger cars	11.9	1.5	0.1	14.8	9.7	62.3	353.1
Trucks	4.5	0.2	0.7	23.8	0.1	71.6	1,266.7
Others	73.6	3.1	1.1	1.5	0.3	24.1	14.2
Total	6.7	0.5	0.6	21.7	2.2	69.2	1,634.1
2002-05							
Passenger cars	50.1	21.3	10.6	14.9	7.8	26.3	1,134.4
Trucks	6.8	2.7	0.9	23.0	0.2	70.1	2,223.2
Others	77.4	1.0	0.4	1.4	0.5	20.4	26.0
Total	21.8	8.9	4.1	20.1	2.7	55.0	3,383.5
2006-07							
Passenger cars	34.3	10.7	9.6	29.9	1.6	34.2	3,387.7
Trucks	5.8	2.5	1.0	18.6	0.2	75.4	3,990.3
Others	77.6	2.2	0.1	16.2	0.5	5.6	59.7
Total	19.4	6.2	4.9	23.7	0.9	56.0	7,437.6

Source: Compiled from UN Comtrade Database

Table 3
Production Capacity (Units) of Thai Car Assemblers, 1989-2006

	1989	1994	1999	2003	2005	2006
Toyota	24,000	100,000	200,000	240,000	350,800	450,000
Mitsubishi	40,000	126,600	160,000	190,200	170,200	208,000
Isuzu	27,400	83,200	140,600	189,600	200,000	200,000
General Motor	n.a.	n.a.	40,000	40,000	100,000	160,000
Auto Alliance &Mazda	7,200	8,400	135,000	135,000	135,000	155,000
Nissan	23,520	96,500	113,100	124,000	102,000	134,400
Honda	8,220	39,000	70,000	80,000	120,000	120,000
Hino	9,600	9,600	9,600	28,800	28,800	28,800
DaimlerChrysler	2,340	4,600	14,900	18,100	16,300	16,300
YMC Assembly	12,000	12,000	12,000	12,000	12,000	12,000
Volvo	6,000	6,000	6,000	6,000	10,000	10,000
BMW.	n.a.	n.a.	n.a.	n.a.	10,000	10,000
Total	**160,280**	**485,900**	**901,200**	**1,063,700**	**1,255,100**	**1,576,500**
Average Annual Growth *	**-**	**24.8**	**13.2**	**5.7**	**5.7**	**19.9**

Source :Data before 2005 are from Kohpaiboon (2005) and during the period 2005-06 from Thai Automotive Industry Association

Table 4
Production Capacity in 2006 classified by MNE Car Assemblers

	Passenger Cars (1)	Commercial Vehicle (2)=(3)+(4)	One-ton Pickups (3)	Other Commercial Cars (4)	Total (5)= (1)+(2)
Toyota	200,000	250,000	200,000	50,000	450,000
Mitsubishi	50,000	230,000	150,000	80,000	208,000
Isuzu	-	200,000	180,000	20,000	200,000
General Motor	40,000	120,000	120,000	-	160,000
Auto Alliance	-	155,000	150,000	5,000	155,000
Nissan	36,000	98,400	96,000	2,400	134,400
Honda	120,000	-	-	-	120,000
Hino	-	28,800	-	28,800	28,800
Daimler Chrysler	16,300	-	-	-	16,300
YMC Assembly	12,000	-	-	-	12,000
BMW.	10,000	-	-	-	10,000
Volvo	10,000	-	-	-	10,000
Total Capacity (% share)	**494,300 (31)**	**1,082,200 (69)**	**896,000 (57)**	**186,200 (12)**	**1,576,500 (100)**

Note: number in parenthesis is percentage share of total production capacity
Sources: Thai Automotive Industry Association

Table 5
Tariff and Taxes (per cent) related to Completely Built-up (CBU) and Completely Knocked-down (CKD) Vehicles, before 1992–present

	Before 1992	1992	1999	2000-present
Completely built-up (CBU) vehicle				
Passenger cars over 2,400 cc.[1]				
Tariff rate	300	68.5	80	80
Excise tax	44–55	41.8	43–50	41–48
Passenger cars under 2,400 cc. [1]				
Tariff rate	180	42	80	80
Excise tax	44–55	35.75	41.25	38.5
Pick-up truck				
Tariff rate	120	60	60	80
Excise tax	9.9	n.a.	5.5	3.3
Completely knocked-down (CKD) vehicle				
Passenger cars over 2,400 cc. [1]				
Tariff rate	112	42	20	33 (30) [4]
Excise tax	44–55	41.8	43–50	41–48
Passenger cars under 2,400 cc.[1]				
Tariff rate	112	42	20	33
Excise tax	44–55	41.8	41.25	38.5
Pick-up truck				
Tariff rate	72	20	20	33
Excise tax[2]	9.9	3	5.5	3.3–19.8[3]

Notes: [1] Before 1992, the classification of a passenger vehicle is 2,300 cc.

[2] Excise tax includes the municipal tax.

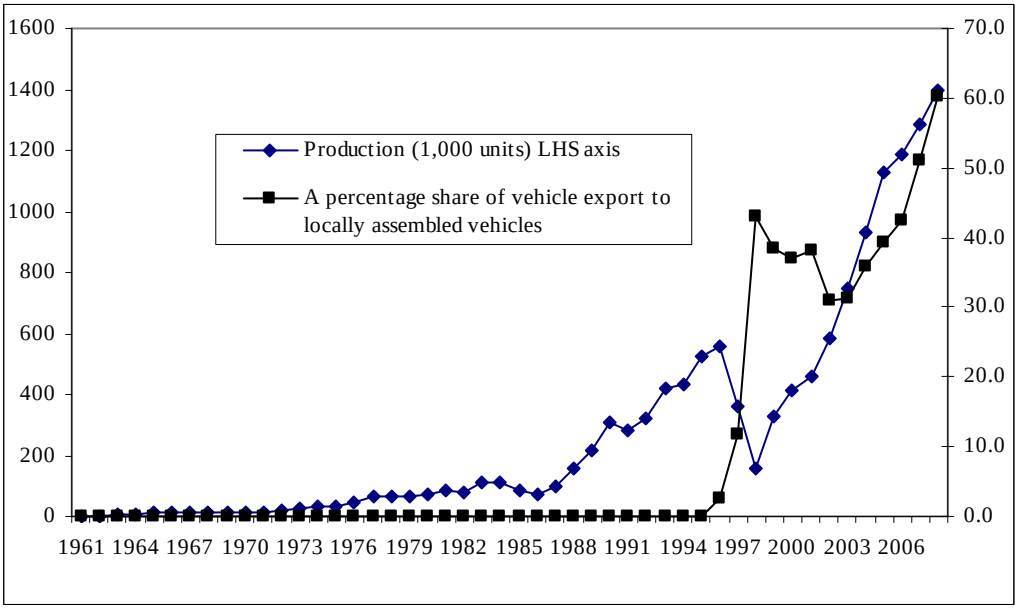
[3] Excise tax for one-ton pick-up trucks is 3.3 per cent whereas for the so called 'pick-up passenger vehicle (PPV) it is 19.8 per cent.

[4] A number in parenthesis is tariff in 2005.

Source: Ministry of Finance.

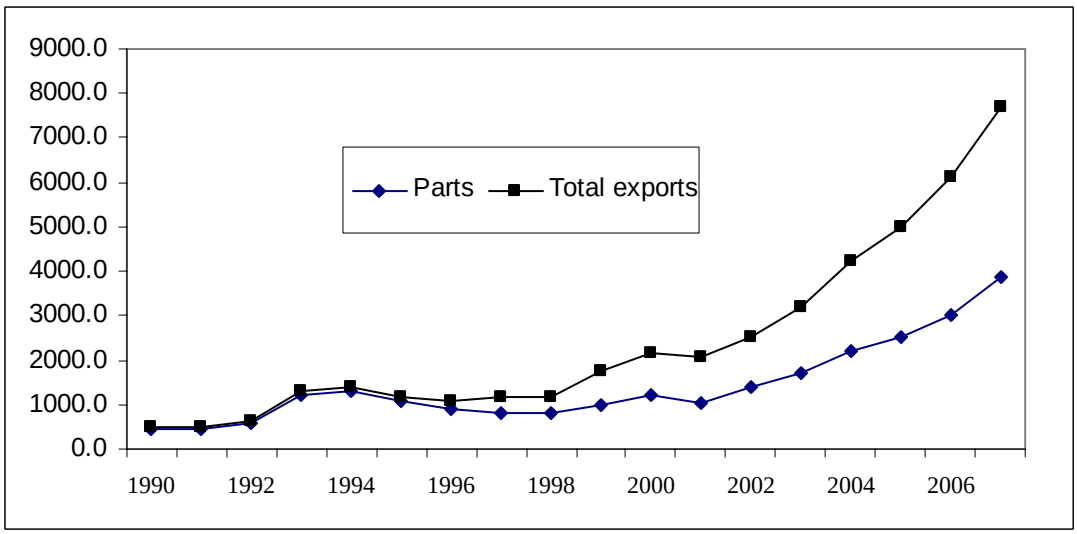
Figure 1

Volume of Vehicle Production and Share of Vehicle Exports, 1961-2008



Source: Thai Automotive Association

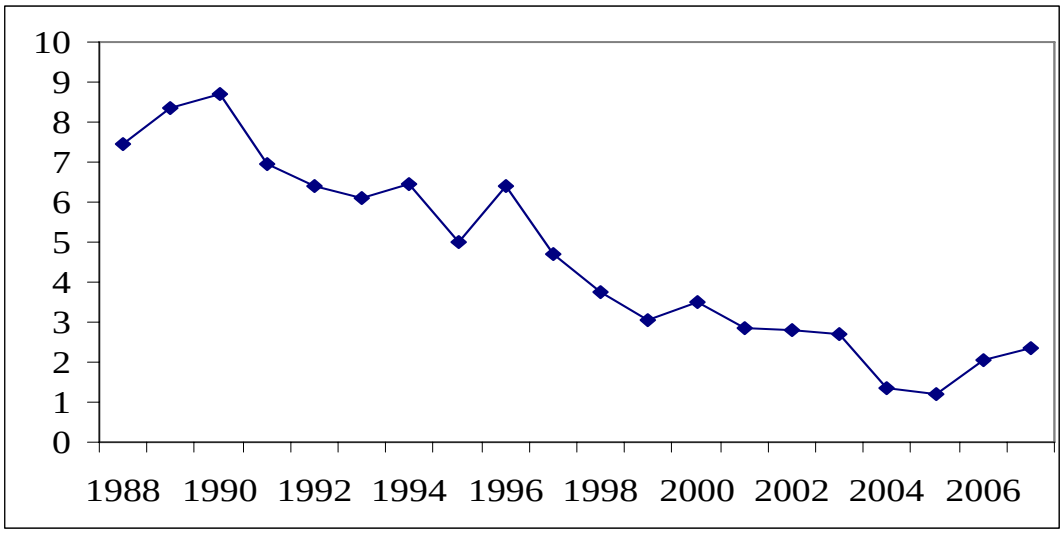
Figure 2
Export Value ($million) of Thai Automotive Industry, 1990-2007



Note: Lists of auto parts are complied from carefully choosing from 6 digit HS items. The final lists cover 91 items from HS39, HS40, HS85 and HS87. See the full list of auto parts in Appendix 1.

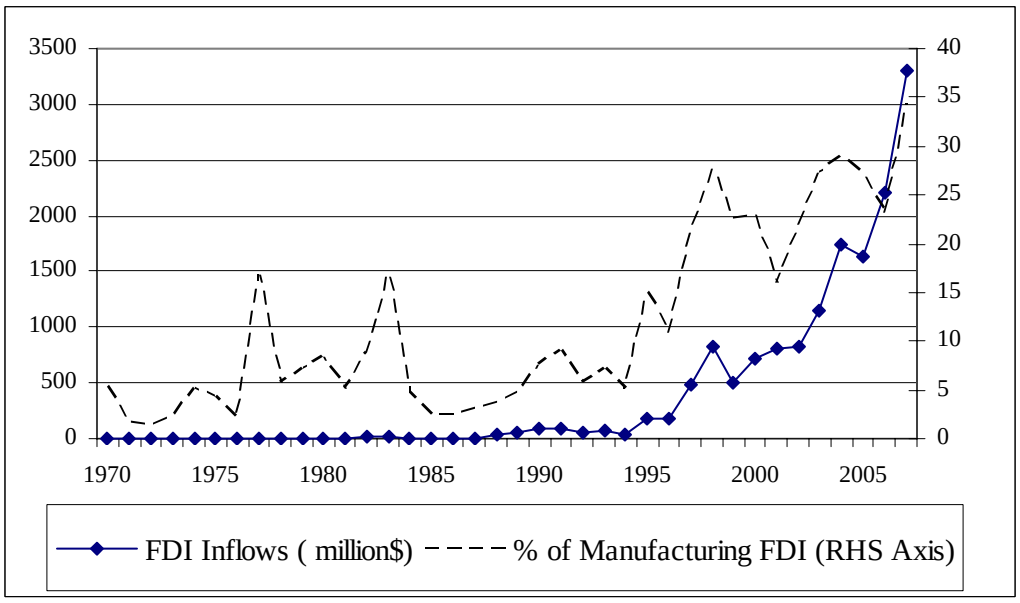
Source: Compiled from UN Comtrade Database

Figure 3
Ratio of (real) Import Value of Parts to Locally Assembled Cars ($million/1000 units), 1988-2007.



Source: Import value of parts is compiled from UN Comtrade Database according to the list in Appendix 1 whereas vehicle units and their share are from Thai Automotive Industry Association.

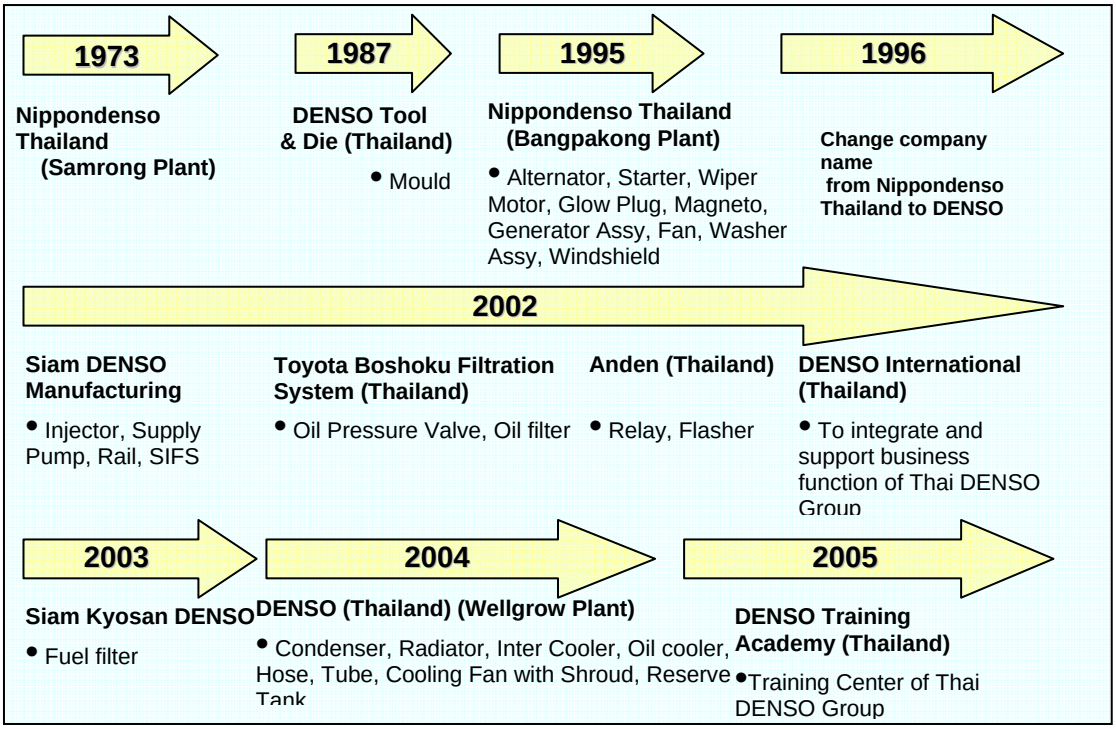
Figure 4
FDI Inflows in Thai Automotive Industry, 1970-2007



Source: Bank of Thailand

Figure 5

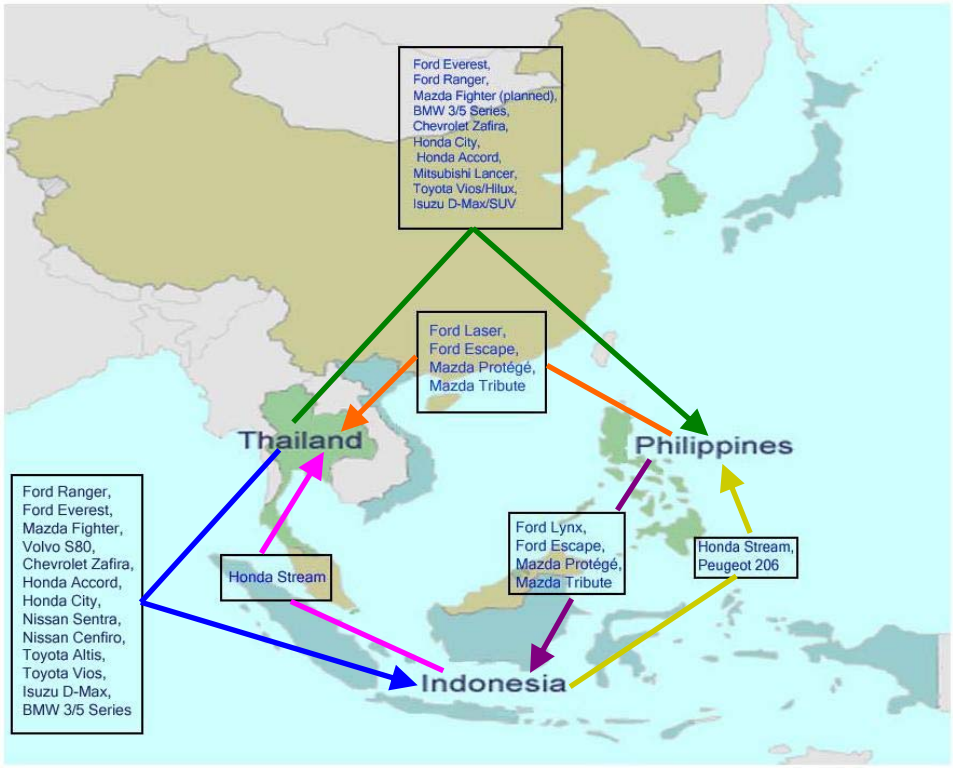
Evolution of Denso Affiliate in Thailand, 1972-present



Source: Compiled from Company Profile

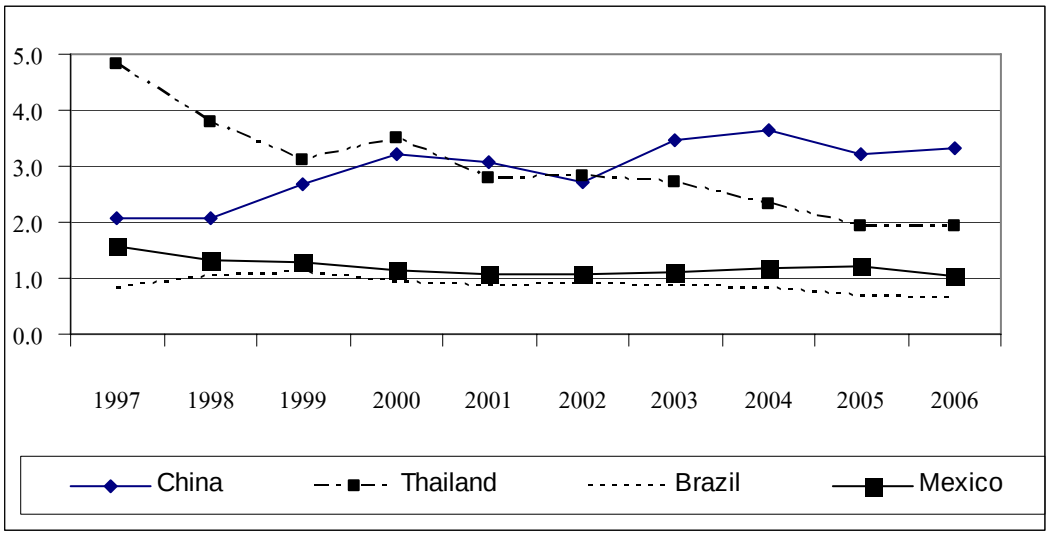
Figure 6

Production and International Trade Networks in Southeast Asia of Selected MNE Car Assemblers



Source: Kohpaiboon (2005)

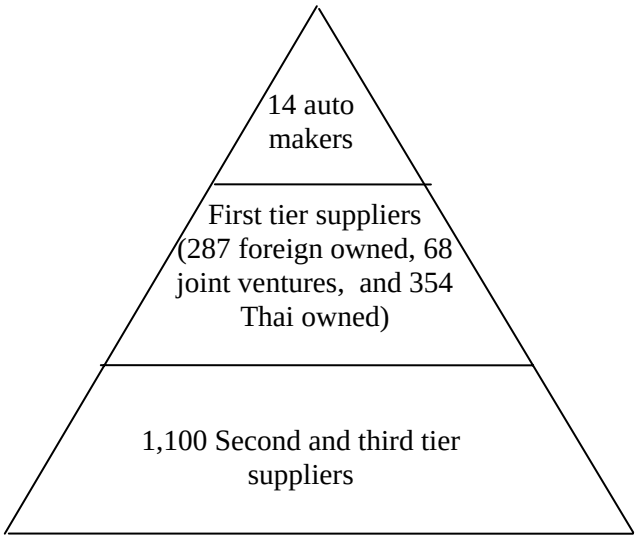
Figure 7
Ratio of (real) Import Value of Parts to Locally Assembled Cars ($million/1000 units) of Selected Emerging Market



Note: Lists of auto parts are complied from carefully choosing from 6 digit HS items. The final lists cover 91 items from HS39, HS40, HS85 and HS87. See the full list of auto parts in Appendix 1 of Kohpaiboon (2009).

Sources: Production data are compiled from CEIC Database whereas import value of parts are from UN Comtrade Database.

Figure 8
A Relationship Structure in the Thai Automotive Industry



Source: Thai Automotive Industry Association (2005).

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Appendix 1

Lists of Autoparts

HS codes	Description
392630	Fittings for furniture, coachwork etc, of plastics
400920	Pipe, reinforced/combine w/metal only, w/o fittin
400921	Pipe, reinforced/combine w/metal only, w/o fittin
400922	Pipes, vulc rub, reinf/combo with metal,w/ fittin
400930	Pipe, reinforced/combine w/ textiles, w/o fitting
400931	Pipe, reinforced/combine w/ textiles, w/o fitting
400932	Pipe of vul rub,reinf w/ text only mat,w/fittings
400940	Pipe, reinforced/combine w/ material, w/o fitting
400941	Pipe, reinforced/combine w/ material, w/o fitting
400942	Pipe, reinfrcd/comb w/other textile mat,w/fitting
400950	Tubes, pipe etc, vulcan soft rubber, with fitting
401010	Conveyor belt vulcanize rub, trapezoidal cross sec
401011	Conveyor belts or belting reinforced with metal
401012	Conveyor belts reinforced with textile materials
401013	Conveyor belts reinforced only with plastics
401019	Conveyor belts/belting of vulcanize rubber, nesoi
401091	Conveyor belt vulcanize rub, width < 20 cm
401099	Conveyor/transmission belt, of vulcan rubber nesoi
401310	Inner tubes of rubber for mot cars, buses & trucks
401693	Gasket, washers & other seals, of vulcanized rub
681310	Brake linings a pads, asbestos, oth minrls, celuls
700711	Toughnd safety gls of size a shape for vehcls etc
700721	Laminated safety glass for vehicles, aircraft etc.
700910	Rear-view mirrors for vehicles
732010	Leaf springs and leaves therefor, of iron or steel
732020	Helical springs of iron or steel
830230	Oth bs metl mountngs fttngs etc for motor vehicles
840729	Inboard engines for marine propulsion
840733	Spark-igntn recrctng pistn eng etc >250 nov1000cc
840734	Spark-igntn recprcting piston engine etc > 1000 cc
840790	Spark-igntn rcprctng/rotary int combstn eng, nesoi
840820	Compression-igntn int combustion piston engine etc
840991	Spark-ignition int combustion piston eng pts nesoi
841330	Fuel, lub/cooling med pumps for int comb pistn eng
842123	Oil or fuel filters for internal combustion engine
842131	Intake air filters for internal combustion engines
842542	Jacks and hoists,hydraulic,exc blt-in jack systems
848210	Ball bearings

(cont.)

Appendix 1 (Cont.)

HS codes	Description
848220	Tapered roll brg, incl cone & roller assemblies
848230	Spherical roller bearings
848240	Needle roller bearings
848250	Cylindrical roller bearing nesoi
848280	Oth ball or roll brg, inc combined ball/roll brgs
848291	Balls, needles and rollers for bearings
848299	Parts of bearings, nesoi
848310	Transmission shafts (inc cam-&crank-shaft), etc.
848320	Housed bearings, incorp ball or roller bearings
848330	Bearing housings; plain shaft bearings
848340	Gears; ball or roller screws; gear boxes, etc
848350	Flywheels and pulleys, including pulley blocks
848360	Clutches & shaft couplings (inc universal joints)
848390	Toothed wheels,chain sprockets&oth trans elem; pts
848410	Gaskets, metal layers, or other matl, mech seals
848490	Sets or assortments of gaskets and similar joints
850131	Dc motors & generators w output n ov 750 w
850220	Generating set w spark-ignition int combustion eng
850300	Parts of electric motors, generators & sets
850710	Lead-acid batteries of a kind used for stg engines
851110	Internal combustion engine spark plugs
851120	Internal combustion engine magnetos, magneto-dynam
851130	Distributors; ignition coils
851220	Elect lighting/visual signlng eq ex for bicycles
851230	Electrical sound signaling equipment for mtr vhl
851240	Wndshield wipr dfrstr & dmstr for cycle/mtr vehcle
853190	Parts of electric sound or visual signaling aprts
853340	Variable resistors inc rheostat & potntiomtr nesoi
853610	Fuses for voltage not exceeding 1000 v
853630	Other apparatus for protecting elc crts =< 1000 v
853641	Relays for a voltage not exceeding 60 v
853661	Lampholders For Voltage Not Over 1000v
853669	Elect plugs & sockets f voltage not over 1000 v
853910	Sealed beam electric lamp units
853921	Tungsten halogen electric filament lamps
853922	Filament lamp power nov 200 w & voltage over 100 v
853929	Filament lamps ex ultraviolet/infrared lamps nesoi
854420	Insulated coaxial cable & oth coaxial elect condct

(cont.)

Appendix 1 (Cont.)

HS codes	Description
854430	Insulated wiring sets for vehicles ships aircraft
8706	Chassis fitted with engines for all types of vehicles
870710	Bodies f mtr car/vehicles for transporting persons
870810	Bumpers and parts, for motor vehicles
870821	Safety seat belts for motor vehicles
870839	Brakes and servo-brakes & pts for motor vehicles
870840	Gear boxes for motor vehicles
870850	Drive axles with differential for motor vehicles
870860	Non-driving axles & pts thereof for motor vehicles
870870	Road wheels & pts & accessories for motor vehicles
870880	Suspension shock absorbers for motor vehicles
870891	Radiators for motor vehicles
870892	Mufflers and exhaust pipes for motor vehicles
870893	Clutches and parts thereof for motor vehicles
870894	Steering wheels, columns & boxes f motor vehicles
870899	Parts and accessories of motor vehicles, nesoi
902920	Speedometers and tachometers; stroboscopes
903210	Thermostats
903220	Manostats
940120	Seats of a kind used for motor vehicles