Exports, Imports, and Plant Efficiency In Indonesia's Automotive Industry

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Abstract

The Indonesian automotive industry has been characterized as a classic case of an infant industry that has failed to grow despite the government's attempts to stimulate the industry's growth through various protective measures. Under the recently liberalized trade regime, the industry is facing increasing pressure from international competition. The purpose of this paper is to examine the recent trends in exports, imports and plant efficiency in the automotive industry. One of the main findings of the analysis is that the recently liberalized trade regime has positively affected the exports of Indonesia's automotive industry. The study also finds that imports from the ASEAN region are increasing and this has positively affected productivity in some groups of plants including locally and foreign-owned plants.

Keywords: Automotive industry, Indonesia, Trade, Efficiency

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1 Introduction

In Indonesia, the government has made various attempts to stimulate growth of its automobile industry through various protective measures. However, development of the industry is characterized as being a classic case of an infant industry that has failed to grow because Indonesia is inefficient in the production of vehicles, with the exception of some commercial vehicles (Aswicahyono et al., 2000). The industry is currently receiving a great deal of attention in terms of the recent trend of trade liberalization and its effect on development of the industry as well as on how the industry can be integrated into the regional production system of East Asia. As a member of the ASEAN Free Trade Area (AFTA), Indonesia is bound by the AFTA commitment to reduce tariffs on imports that have at least a 40-percent ASEAN content to 0–5 percent by 2002 under the Common Effective Preferential Tariff (CEPT) scheme. The preferential tariff would partially fill in the cost gaps between domestic production and imports. In addition, it would affect the trend of foreign direct investment (FDI) which has played an important role in the development of the automotive industry within the ASEAN region. For example, a reduction in tariffs within the region gives potential foreign investors that would not have invested due to the small scale of the market in one country an opportunity to exploit scale economies by exporting from one country to other countries in the region. Therefore, FDI may concentrate in one country that has relatively favorable economic conditions for foreign investors, in order to benefit from not only scale economies but also from an agglomeration economy. In this respect, Indonesia has lagged in the development of supporting industry and infrastructure from other countries in the region, such as Thailand.

This paper examines trends in Indonesia's automotive industry and focuses on changes in exports, imports and plant efficiency as a result of the changing environment surrounding the industry. Section 2 summarizes the characteristics of the Indonesian automotive industry and the government's industrial policies, and describes recent trends in Japanese-affiliated companies. Section 3 investigates the trends in exports and imports, and Section 4 examines the effects of foreign trade on productivity and efficiency over the period 1990–2000 by estimating a latent class stochastic frontier model using a plant-level panel dataset. Finally, Section 5 offers some concluding remarks.

2 The development of Indonesia's automotive industry

2.1 Characteristics of Indonesia's automotive industry

The increase in the number of studies on the Indonesian automotive industry is evidence of the rising interest in this industry. In these papers, several important factors that have hampered growth of the industry were identified (Aswicahyono et al., 2000; Imai, 1999; Ito, 2002; Okamoto and Sjöholm, 2000; Radhi, 2002).

An important factor is the small scale of the market. Although Indonesia is the fourth most populous country in the world, the proportion of households that are in the high-income bracket (i.e., those households that can purchase a car) remains very limited. Furthermore, neighboring countries have protected their own automotive industries, and as a result, the Indonesian automotive industry has had no choice but to rely heavily upon its own domestic market. This meant that the Indonesian auto manufacturers could not exploit scale economies, and under such circumstances, it is difficult to decrease the cost of production, resulting in inefficient operation.

In addition, pronounced product differentiation is an important characteristic of the automotive industry. It has been argued that the Indonesian automotive markets are segmented by a relatively large number of brands compared to total demand for vehicles. This feature also forced auto makers, including parts makers, to operate inefficiently due to the lack of scale economies. Evidence of this can be found in the study by Ito (2002) where production functions were estimated using a plant-level dataset for the 1990s. The results of the study suggest that the scale effect is an important determinant of productivity levels in the automotive industry.

A second important characteristic of Indonesia's automotive industry is its heavy reliance on production for the domestic market, and in particular, its production bias towards commercial vehicles. Commercial vehicles that are better-suited to Indonesian market conditions (that is, given the poor roads and the flexible carrying capacity of the vehicles) accounted for more than 80 percent of total annual car production (Aswicahyono et al., 2000).[1] However, as pointed out in Imai (1999), this heavy reliance on commercial vehicles is

[1] According to the chairman of GAIKINDO, this figure exaggerates the dependence of the Indonesian automotive industry on commercial vehicles because some types of vehicles that should be classified as passenger vehicles are classified as commercial vehicles.

Table 1
Local procurement ratios for the Indonesian automotive industry by category

Year	1994	1995	1998
Commercial car			
Category I (up to 5 tons)	12.20–51.00	5.39–48.14	40–50
Category II (5–10 tons)	21.60–37.50	23.40–33.67	30–40
Category III (10–24 tons)	24.87–36.30	29.27–35.06	
Category IV (Cat. I-4x4)	1.00–31.90	2.20–30.79	
Passenger car	5.00–42.90	5.02–42.24	

Sources) Japan International Cooperation Agency (1997) for 1994, 1995 and Surjadipradja (2003) for 1998.

not a problem in and of itself; rather, the problem is that it is difficult to export these cars and the parts for these vehicles since they are designed for specific market conditions.

A third factor is the dominance of foreign manufacturers and the slow progress of localization. As in many developing countries, the automotive industry is dominated by foreign multinational corporations (MNCs). In particular, Japanese MNCs are a significant factor in the automotive industry, including the parts and components industry, accounting for more than 90 percent of annual car production in 1996–2000. However, the slow progress of localization by Japanese firms has often been blamed as a factor behind the slow development of the automotive industry in Indonesia. According to a survey by the Japan Auto Parts Industries Association (JAPIA), the local procurement ratio in Japanese automotive parts and components manufacturers in the ASEAN region was 56.4 percent in 1997 (Imai, 1999), while the average localization point for the production of commercial vehicles in Indonesia was about 40–50 percent in 1998 (Table 1). This indicates that localization of car production in Indonesia is far behind that of other ASEAN countries, and this in turn implies a high dependence on imported materials, parts and components; hence the production cost of vehicles is relatively high in Indonesia.

A fourth characteristic is the lack of competition due to government intervention. As mentioned above, the government supported the automotive industry through various protective measures. However, these highly protective measures resulted in a lack of competition and made it possible for firms to survive even if they could not improve their efficiency. Okamoto and Sjöholm

(2000) examined the performance of the automotive industry in 1990–95, and the results suggest that the industry failed to achieve positive productivity growth (in fact, it even registered negative growth), and that the industry's performance was poor despite the government's support. Ito (2002) also estimated various measures of competition and productivity. She concludes that there was little competition in the Indonesian automotive industry and that the important determinants of productivity growth are the scale of production and capital utilization, not technological change.

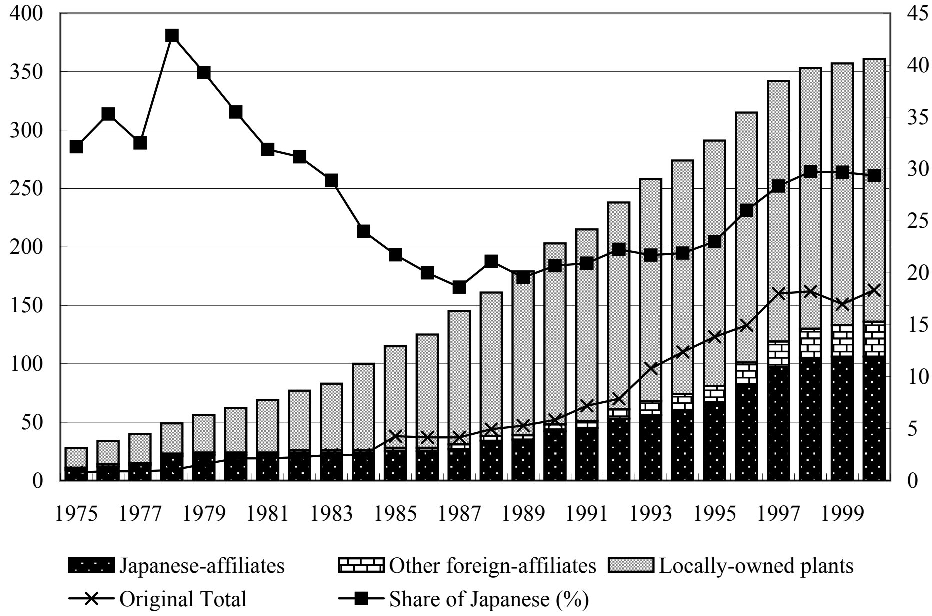
2.2 Industrial policy and localization of production

The government played an important role in the development of the Indonesian automotive industry. In the period after independence, economic policy was characterized by a strong sense of nationalism (Pangestu, 1996, p. 152). In the 1950s, the government implemented the *Banteng* program to support participation of *pribumi* (indigenous people) in business. In 1957, as a part of the program, the government tried to restrict the importation of completely built-up (CBU) vehicles by charging higher tariffs as compared to the tariffs for semi-knockdown and completely knockdown kits. This policy was aimed at encouraging pribumi businesses to establish assembly plants locally, and in fact, several local firms did set up assembly plants in cooperation with foreign firms from Europe, the former Soviet Union, and Australia (Radhi, 2002). However, the number of vehicles that were assembled locally did not increase, while imports of CBU vehicles increased during the period. After 1969, the government issued several decrees that reflected a plan to establish full capacity for assembly of cars locally by 1984.

Aswicahyono et al. (2000) attributes the current fragmented and uneconomic structure of the automotive industry to these plans and policies. Subsequent policy measures included an issuance of a decree that prohibited the importation of CBU vehicles (in 1974). Furthermore, the "deletion program" was introduced in 1976 to develop the parts and components sectors. This program specified that certain components had to be produced locally, and commercial vehicles were required to be assembled with local components. Under this program, if local assemblers could not change their procurement process by the target date so that the targeted components were locally procured, they were penalized by a 100-percent import duty on imported components. The group of components that were initially targeted in this program included replacement parts such as paint, tires and batteries that had to be locally procured by 1977; the list of parts was further extended to functional components that used more sophisticated technology for production such as transmissions, brake systems and engines. Although several functional components companies were established in the 1980s (Sato, 1996), these targets were generally not met, partly because they were too ambitious (Aswicahyono et al., 2000) and partly because the cost to locally procure functional components was not low enough compared to the import cost even if an import duty penalty was imposed (Japan International Cooperation Agency, 1997). In June 1993, the government replaced the mandatory deletion program with the "incentive program." Under this new program, a local content point system was adopted and assemblers were allowed to choose which components would be locally procured or manufactured in-house. According to the level of local contents point, the import duty on remaining components varied between 0 and 65 percent. This program was abolished in 1999.

The government tried to encourage supporting industries by restricting imports, and by promoting foreign direct investment and technology transfer from foreign firms. However, as indicated in Table 1, the local procurement ratio was still low at 40–50 percent for commercial vehicles in 1998, suggesting that there was no significant progress in the localization of production in Indonesia. Japan International Cooperation Agency (1997) investigated local content points for each component and part in 1995. According to the results, most subcomponents that were produced with higher local content points were subcomponents such as cylinder blocks and heads that are thought to be mainly manufactured in-house by assemblers and subcomponents such as radiators and sparkplugs that were already produced by Japanese-affiliates in the 1980s. Nomura (1997) investigated the procurement of parts and raw materials for some Japanese-affiliated assemblers in 1995. He characterized the procurement process as (i) manufacturing in-house or imports of main components, (ii) outsourcing of other main components to foreign-owned suppliers, and (iii) outsourcing of other universal components to local suppliers. According to the survey results, most foreign-owned suppliers of investigated assemblers were Japanese-affiliated makers that began production locally in the 1970s, and most of the local suppliers were provided technical assistance by Japanese companies. These facts imply that Japanese companies contributed to development of the industry through direct investment and technical assistance, but technology transfer was limited to production technology for certain parts and components.

Figure 1 The number of plants in Indonesia's automotive industry



Sources) Author's estimation from the raw datasets underlying Statistics Indonesia (various years a), and Toyo Keizai (various years) and Fourin (2000).
Note) "Original Total" is the number of plants classified into automotive industry in the raw datasets underlying Statistics Indonesia (various years a).

2.3 Foreign affiliates in the automotive industry

As mentioned above, Indonesia's automotive industry has been dominated by foreign-affiliated companies, especially Japanese. Commercial production of vehicles by Japanese-affiliates in Indonesia started in the early 1970s after the importation of CBU vehicles was banned. Several Japanese auto-parts and components makers, that were mainly producing replacement parts such as batteries and sparkplugs, also began production in Indonesia in the 1970s. Figure 1 shows the estimated number of plants that were involved in the manufacture of vehicles and parts. [2] As can be seen in the figure, the

[2] The number of plants was estimated using information from datasets underlying Statistics Indonesia (various years a), and Toyo Keizai (various years) and Fourin (2000). Plants include (i) plants reported in the raw datasets for 1975–2000 underlying industrial surveys (Statistics Indonesia, various years a) and classified into vehicles (38431 or 34100 at Indonesian Standard Industrial Classification, ISIC, revision 2 or 3, respectively) or parts sector (38433 or 34300); and (ii) other plants, as reported in Toyo Keizai(various years) and Fourin (2000) that were involved in the production of vehicles or parts. This group of plants includes manufacture of tires, wire harnesses, car batteries and other parts which are not classified into vehicles and parts sectors at the ISIC level.

number of foreign-owned plants remained at 20–30 plants through the mid-1980s, while the number of total plants (mainly local plants) was gradually increasing. In the late 1980s, when Japanese foreign direct investment to Asian countries was increasing, the number of Japanese affiliates also increased in Indonesia and the pace accelerated after 1995. Reflecting this trend, the share of foreign-owned plants increased after 1995 and has reached 30 percent in recent years. In 2000, there were more than 350 plants in Indonesia's automotive industry, and one-third of these plants were foreign-owned, primarily by Japanese affiliates.

Although the number of Japanese affiliates continued to increase up to 2000, the pace has slowed since 1998. This partly reflects the sluggish Indonesian economy and the slowdown in demand for vehicles due to the Asian economic crisis. The Indonesian economy, which was hit hard by the 1997 crisis, registered economic growth of -13 percent in 1998 with the automotive industry being one of the most damaged industries. New vehicle sales dropped from 386,691 units in 1997 to 58,303 units in 1998. Furthermore, during the crisis, the value of the rupiah declined against the U.S. dollar from Rp. 2,342 per U.S. dollar in 1996 to Rp. 10,014 in 1998. This depreciation of the rupiah also hurt the profitability of the automotive industry because most intermediate goods were imported.

However, sale of vehicles recovered to 300,000 units in 2000 and continued to increase to 354,333 units in 2003. While the current level remains lower than the peak of 386,691 in 1997, growth in sales has been faster than projected by GAIKINDO in mid-2003 (at 340,000 units). According to the chairman of GAIKINDO, Ir. Bambang Trisulo, total fixed investment in the automotive industry amounts to the level at which about 750,000 vehicles can be produced, and at the moment, the industry can produce about 400,000 units when plants operate at full capacity. This implies that the utilization rate for the automotive industry was about 90 percent in 2003. Furthermore, the sale of vehicles in Indonesia is projected to reach 500,000 in 2008, or in

One of the problems in the usage of raw datasets from industrial surveys involves coverage; this is especially true for datasets from earlier years. Therefore, the starting year of operation for each Japanese affiliate was confirmed using information from Toyo Keizai (various years) and Fourin (2000). Unfortunately, there is no comprehensive source for the starting year of each locally owned plant; thus the number of locally owned plants may be underestimated, particularly in earlier years. See Section 4.2 for more detail about the raw datasets for Indonesia's industrial surveys.

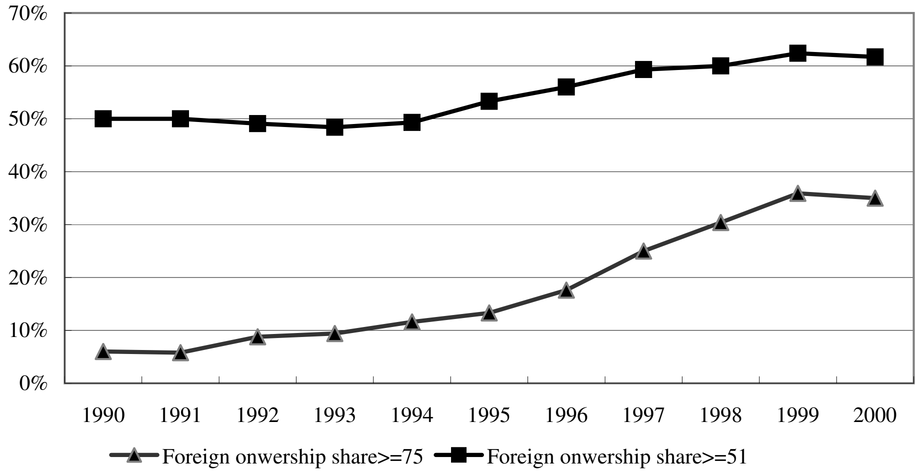
2007 in the case of optimistic projections. These trends suggest that the performance of the automotive industry has been better than most other industries in Indonesia in recent years.

Another indicator of the relatively good performance of the automotive industry is seen in exports. As noted in the next section, exports of vehicles and parts increased during and after the economic crisis. In conjunction with the depreciation of the rupiah, this increase partly reflects the fact that several Japanese parent companies cooperated in handling the serious drop in demand due to the economic crisis. For example, a Japanese assembler increased exports of engines to its parent company in Japan (Yamashita, 2000). In addition, JAPIA promised the Indonesian government that Japanese-affiliated members of GIAMM would increase exports (Fourin, 2000). As a result, total exports by GIAMM members increased from US$334 million in 1999 to US$613 million in 2000. These data not only indicate that foreign-affiliated companies supported the automotive industry after the economic crisis, but it also suggests the importance of the international production network.

In more recent years, several Japanese companies have been considering Indonesia as one of the important bases for its international production network. In the process of global restructuring of the automotive industry and the progress of the AICO and CEPT schemes, Japanese assemblers have been planning regional strategies in the ASEAN region. Under the liberalizing trade regime, assemblers and parts makers could concentrate their production bases in one country (for example, Thailand) and export to other countries. However, some major Japanese assemblers and parts makers have chosen to utilize existing facilities in each country, perhaps in order to minimize new investment. For example, Toyota Motor Corporation announced a plan to establish a global vehicle-and-parts supply network, referred to as the "IMV (innovative international multipurpose vehicle) project." In the plan, affiliates in Indonesia are to produce 70,000 units of multipurpose vehicles annually (mainly minivans, while 200,000 units are to be produced in Thailand, mainly pickup trucks), and production of gasoline engines is expected to rise to 180,000 units, 130,000 of which is designed for export within and beyond the region (Toyota Motors Corporation, 2003).[3] Furthermore, Toyota and Daihatsu Motor Corporation announced that it will produce and sell a new small car in Indonesia, that was developed jointly and is called "U-IMV (Under IMV; Daihatsu ZENIA

[3] The plan also proposes 240,000 diesel engines to be produced in Thailand, 130,000 of which will be designed for export.

Figure 2 Shares of foreign-onwed plants with high foreign ownership share

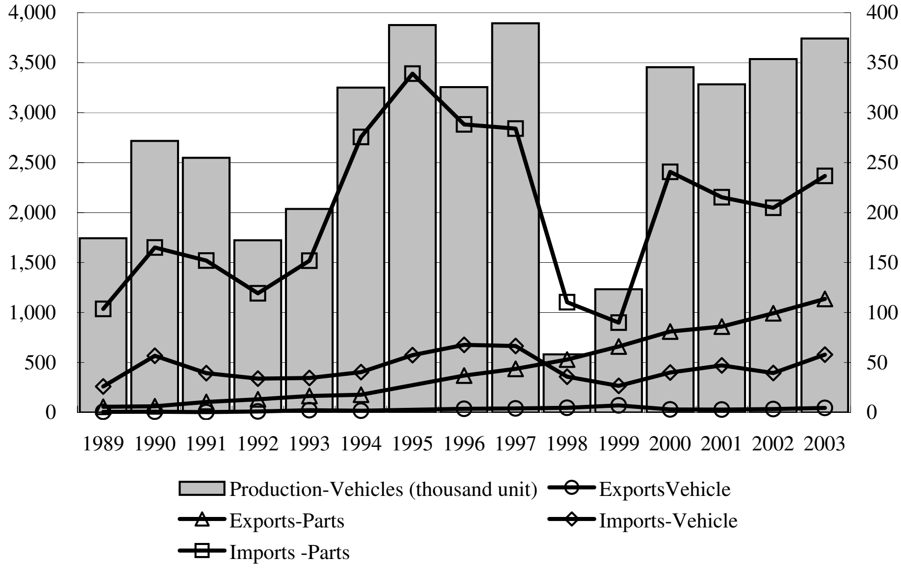


Sources) Author's estimation from raw data underlying Statistics Indonesia (various years a), and Toyo Keizai (various years) and Fourin (2000).

and Toyota Avanza)." These cars will be priced under Rp. 100 million (about US$12,000). The Japanese companies and their local partner, P.T. Astra International, expect to sell 2,400 units of Avanza and 1,200 units of Xenia each month starting in January 2004 (Laksamana.net, 2003). In addition to these two assemblers, other Japanese assemblers, including Honda Motor Corporation and Hino Motors, have established new plants in Indonesia in recent years.

An important change related to the trend in foreign-affiliated companies is the increase in the share of foreign ownership. This is important for foreign companies because it sometimes takes a long time to negotiate with local partners on crucial matters. If a foreign company has a relatively high ownership share, it becomes easier to formulate and execute medium- and long-run regional strategies to utilize international production networks. Deregulation of foreign direct investment since the mid-1990s is also a factor behind the increase in the share of foreign ownership. Indonesia's investment law was introduced in 1967, and thereafter various decrees regulated foreign direct investment. However, since 1986 there has been gradual liberalization on all aspects in the area of foreign investment policy (Pangestu, 1996). In particular, regulations on investment issued in 1994 brought about drastic liberalization of foreign direct investment. For example, after the issue of the regulations, foreign companies were allowed to establish a company in Indonesia with a 100-percent foreign ownership share. In addition, the rule that foreign companies had to transfer foreign shareholdings of their affiliates so that Indonesian eq-

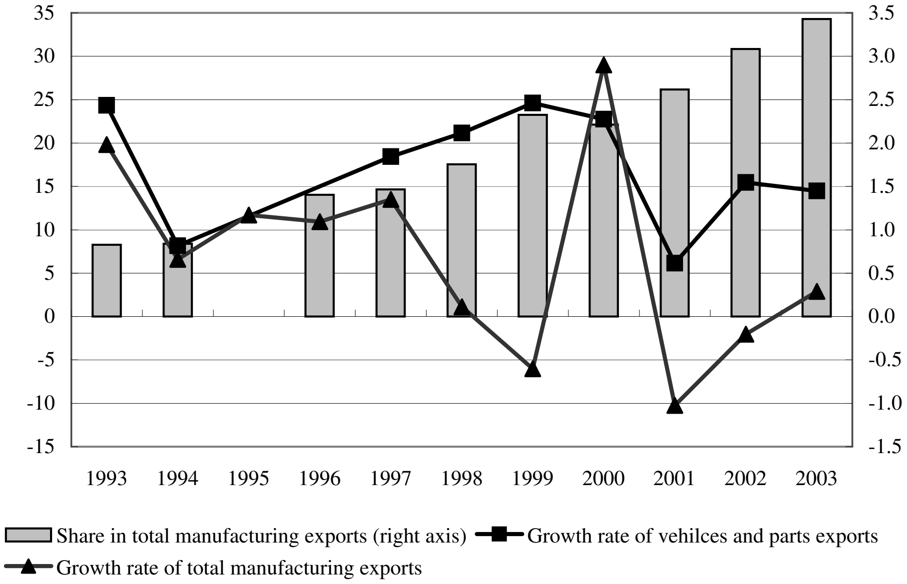
Figure 3 Exports and imports of vehicles and parts



Sources) Author's calculation from United Nations Statistics Division (2004) and Fourin (2000, 2004).

uity would be increased to a majority shareholding of 51 percent was dropped after 1994. The deterioration of the financial condition of local partners after the economic crisis contributed to this trend of rising foreign ownership, and several Japanese companies acquired a majority share of equity in their affiliates. The Japanese assemblers that increased ownership share in affiliates or plan to increase their shares include: Honda (49–51 percent in 2002), Nissan (35–75 percent in September 2001), Daihatsu (40–61.75 percent, announced in August 2002), Suzuki (49–90 percent, announced in November 2002), Hino (60.15–90 percent of its manufacturing firm, announced in January 2003) and Toyota (49–95 percent of its manufacturing firm, announced in February 2003.[4] Similarly with assemblers, the number of majority-foreign parts makers has increased. Figure 2 shows the share of foreign-owned plants that had foreign ownership shares of 51 percent or more and 75 percent or more during 1990–2000. Both shares increased in the mid-1990s, and in particular, the ratio of plants with more than a 75-percent foreign ownership share increased in 1997–99.

Figure 4 Growth and share of vehicles and parts exports



Sources) Author's calculation from United Nations Statistics Division (2004).

3 Exports and Imports

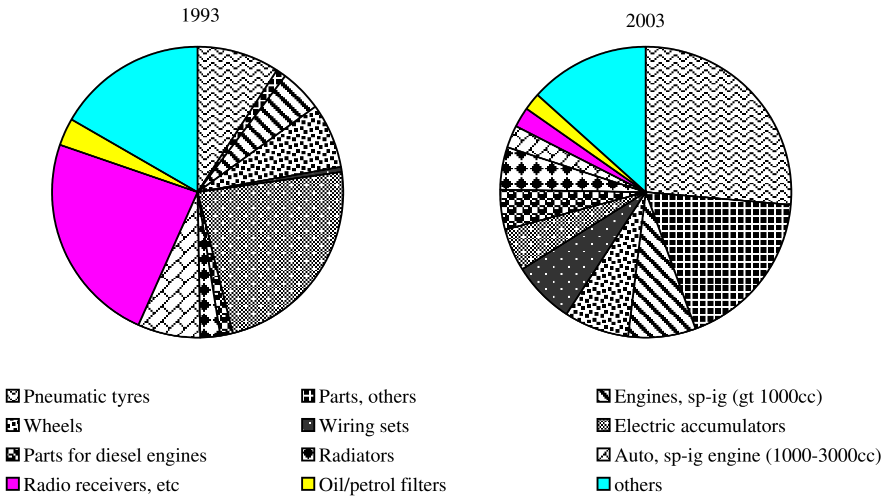
In the last decade, trade regimes have been liberalized in the ASEAN region. For example, the AICO scheme, which started in 1996, allowed participating companies to enjoy preferential tariffs in the range of 0–5 percent for trade of goods within the ASEAN countries. The ASEAN countries have also made progress in lowering intraregional tariffs through the AFTA-CEPT scheme. These developments have affected the decision making of automotive manufactures. As mentioned in the previous section, several Japanese-affiliated companies in the region have been restructuring their production systems and networks in the automotive industry. Most of the companies participating in the AICO scheme were Japanese affiliates in the automotive industry, and some are also enjoying preferential tariffs under the AFTA-CEPT scheme. Under the liberalized trade regime, the structure of trade of vehicles and parts within the ASEAN region has been changing. This section examines the trends in trade with a focus on Indonesia's automotive industry.

Figure 3 shows the trend in Indonesia's total exports and imports of vehicles and parts.[5] Imports of parts fluctuated widely along with the trend in vehicle production. When vehicle production increased to more than 300,000

[4] These data were taken from press releases from the home pages of these companies.

[5] See the appendix table for the definition of vehicles and parts used in this paper.

Figure 5 Export structure of vehicles and parts

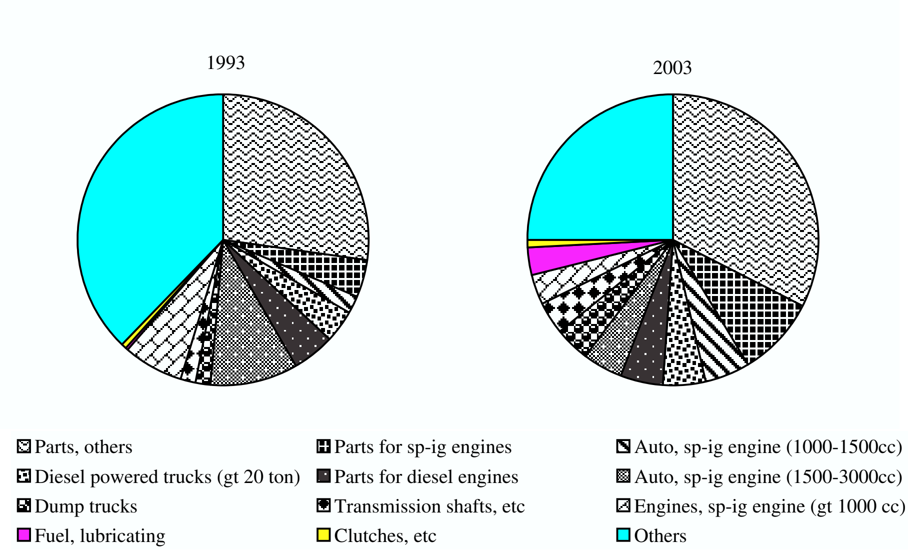


Sources) Author's calculation from United Nations Statistics Division (2004).

units in the mid-1990s, imports of parts also increased significantly. However, as a result of the economic crisis, vehicle production decreased drastically in 1998. At the same time, imports of parts decreased by 61 percent. Although the decline can be partly explained by the depreciation of the rupiah, these facts indicate that vehicle production was heavily dependent on imported parts and components. On the other hand, exports of parts continued to increase during the period, reaching US$1.1 billion in 2003. Total exports of vehicles and parts grew at a very high rate in the late 1990s (Figure 4) registering growth of 25 percent in 1999 and 23 percent in 2000. The growth rate was more remarkable when we compare it to the growth rate of total manufactured exports. While total manufactured exports registered very low or negative growth after the economic crisis (except in 2000), total exports of vehicles and parts continued to grow at a relatively high rate. Although the share of vehicles and parts in total manufacturing exports is low, the share increased from less than 1 percent in the first half of the 1990s to 3.4 percent in 2003, reflecting the relatively high growth of this sector.

The structure of Indonesia's exports of vehicles and parts has also changed drastically in the last decade (Figure 5). In 1993, major export commodities included radio receivers (HS852729), electric accumulators (HS850710) and pneumatic tires (HS401110). While the share of radio receivers and electric accumulators decreased drastically, the share of pneumatic tires has increased in the last decade, accounting for one-fourth of total exports of vehicles and parts in 2003. The second-largest category was Other parts (HS870899) which

Figure 6 Import structure of vehicles and parts



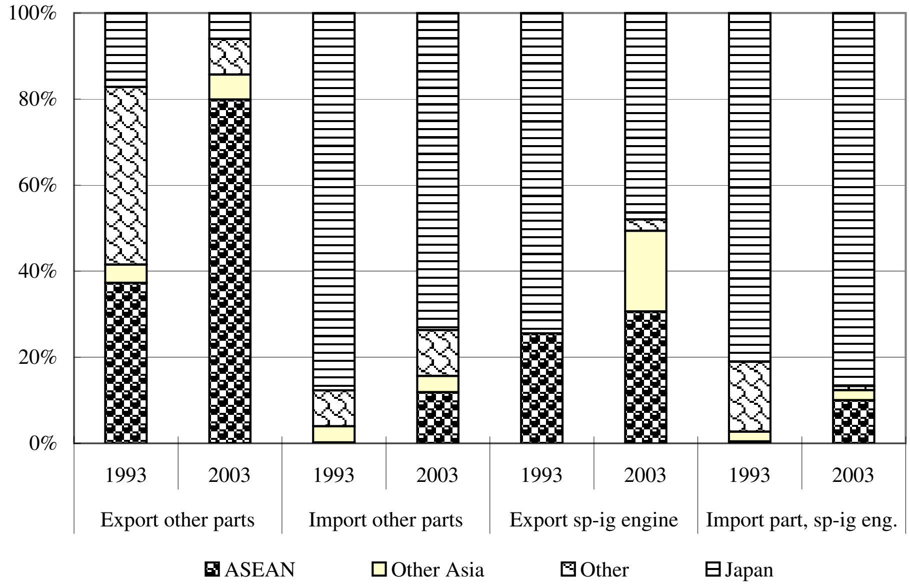
Sources) Author's calculation from United Nations Statistics Division (2004).

saw its share increase from about 1 percent in 1993 to 18 percent in 2003. The third-largest category is spark ignition engines (HS840734). As of 1993, Indonesia's automotive industry had already exported this engine, and as a share of total exports of vehicles and parts, exports of spark ignition engines increased from 4.6 percent in 1993 to 7.6 percent in 2003. It is very likely that this increase in exports of these types of engines, as well as radiators (HS870891), reflects the strategies of Japanese-affiliated companies (as explained in the previous section).

The change in import structure was not as large as that of exports (Figure 5). However, there are two important changes that are worthy of mention: (i) the increasing share of Other parts and (ii) the increasing share of parts for spark ignition engines (HS840991). Most of these parts had been imported from outside of the ASEAN region (more than 99.5 percent), an in particular were largely from Japan (more than 80 percent) in 1993 (Figure 7). However, imports from the ASEAN countries have increased in recent years and in 2003, they accounted for more than 10 percent in both categories. Figure 7 also suggests that Indonesia increased not only imports but also exports of Other parts in its trade with other ASEAN countries, and that Indonesia increased its imports of engine parts from the region and relatively increased the exports of engines to Asian countries other than ASEAN and Japan.

Figure 8 and figure 9 compare the level of trade (in terms of value) and the partners in the automotive industry among the ASEAN4 countries, namely,

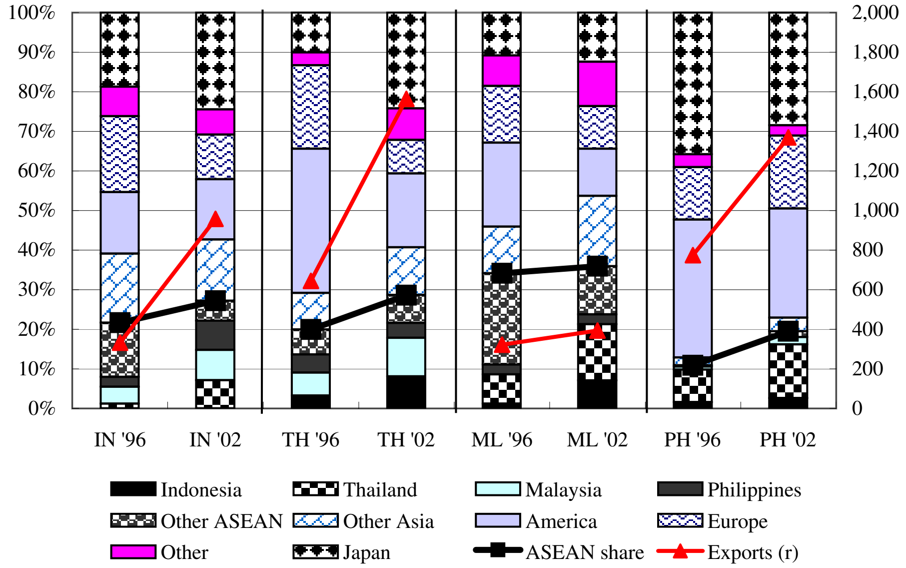
Figure 7 Trading partners of engine, its parts, and others



Sources) United Nations Statistics Division (2004)

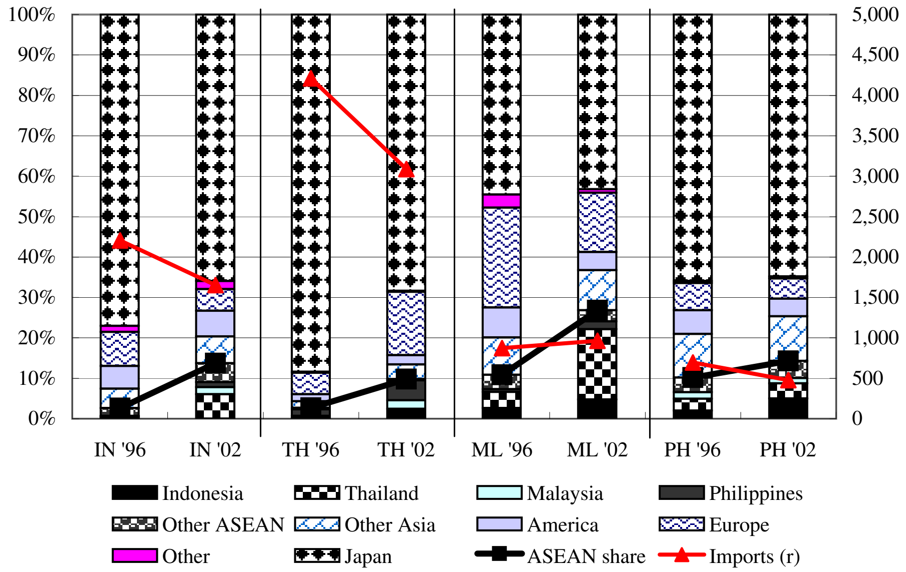
Indonesia, Thailand, Malaysia and the Philippines in 1996 and 2002. The Philippines was the largest exporter of parts among the ASEAN4 countries in 1996, followed by Thailand. A striking characteristic of these countries is the relatively high share of exports to the Americas and Europe. However, as a result of the sharp increase in the value of exports over the 1996–2000 period, except for Malaysia, the direction of trade has gradually changed. A common trend for all four countries is the increase in the share of exports to other ASEAN countries, especially to the other ASEAN3 countries. In particular, the share of Indonesia's total exports of parts to Thailand, Malaysia and the Philippines increased from 8 percent in 1996 to 22 percent in 2002. Another important trend is the increasing share of exports to Japan for Indonesia and Thailand, while the corresponding share for Malaysia and the Philippines did not increase. On the import side, the value of imports was higher for Thailand and Indonesia in 1996 than for other countries. However, imports for the two countries decreased significantly over the 1996–2002 period. In particular, for these countries, the share of imports from Japan declined. On the other hand, the share of imports from other ASEAN3 countries was very low for all four countries in 1996 but increased, especially for Malaysia. The share for Indonesia increased from 3 percent in 1996 to 14 percent in 2002. These facts suggest that since the end of the 1990s, the ASEAN4 countries have increased both exports and imports within the region and that some of these countries have also increased exports to Japan while decreasing their

Figure 8 Comparison of export direction for ASEAN4 countries



Sources) Author's calculation from United Nations Statistics Division (2004) and Thai Customs Department (2004).

Figure 9 Comparison of import direction for ASEAN4 countries



Sources) Author's calculation from United Nations Statistics Division (2004) and Thai Customs Department (2004).

imports from Japan.

The trends discussed above indicate the progress of complementary production systems and networks in the region. The remainder of this section measures and examines the revealed comparative advantage index (RCA) for Indonesia as compared to other countries. In order to focus on the automotive industry in the ASEAN region, the regional RCA (RRCA) is defined as follows:

$$RRCA_i = \frac{\left(\frac{\text{Exports of category } i \text{ to ASEAN}}{\text{Total exports of vehicles and parts to ASEAN}}\right)}{\left(\frac{\text{World exports of category } i \text{ to ASEAN}}{\text{Total world exports of vehicles and parts to ASEAN}}\right)}. \quad (1)$$

It should be noted that the RRCA is different from the usual RCA in two respects. First, the market is limited to the ASEAN region instead of the world market. Second, commodities are limited to vehicles and parts. Therefore, when the RRCA is greater than 1, the results should be interpreted to mean that Indonesia is a relatively heavy exporter of commodity i compared to other exporters in the region and compared to other vehicles or parts exported from Indonesia. Table 2 shows the RRCA for some commodities. Commodities 1–15 are the top 15 commodities exported from the ASEAN4 countries in 2002, and commodities 21–30 are the other commodities for which the RRCA for Indonesia is relatively high. The largest category of exports from the ASEAN4 countries was Other parts in 2002, amounting to US$372 million. The RRCA of this category for Indonesia was less than 1 in 1996, but it exceeded 1 in 2002 and 2003. In addition, Indonesia's exports accounted for 30 and 44 percent of the sum of exports of this category from the ASEAN4 countries in 2002 and 2003, respectively. These data suggest that in these categories, Indonesia became a relatively heavy exporter to the ASEAN region. Another important change is the increase in the RRCA for parts for diesel engines (HS840999) and spark ignition engines (HS840734). Indonesia accounted for a relatively large share in the total sum of ASEAN4's exports in these categories. These changes suggest that Indonesia is one of the important players in the regional production system under the liberalized trade regime. Moreover, Indonesia is a relatively heavy exporter of pneumatic tires (HS401110), wiring sets (HS854439) and electric accumulators (HS850710). In addition, the RRCA for air condensers (HS841520) was relatively high in 2003.

Table 3 shows the RRCA in world markets other than the ASEAN region. The largest category of exports from the ASEAN4 countries is diesel-powered trucks (HS870421) that are mainly exported from Thailand, followed by wiring sets (HS854430) and other parts (HS870899). While Indonesia has revealed comparative disadvantages in export of diesel-powered trucks and other parts, the RRCA of wiring sets for Indonesia is greater than 1 indicating that Indonesia is a relatively heavy exporter in this category. Indonesia also has revealed comparative advantages in export of pneumatic tires, wheels (HS870332), electric accumulators, radiators and inner tubes (HS401310). Most of the products

Table 2
Regional RCA index for the ASEAN automotive markets

			RRCA-Indonesia (World=1)			RRCA-ASEAN3 (World=1)			Total exports-ASEAN4 (US$ million)		
No	HS	Commodity	1996	2002	2003	1996	2002	2003	1996	2002	2003
1	870899	Motor vehicle parts nes	0.56	2.78	3.26	0.97	1.68	1.15	49(14)	372(30)	366(44)
2	870840	Transmissions for motor vehicles	0.00	0.02	0.02	11.31	2.26	0.02	74(0)	109(0)	1(23)
3	840991	Parts for spark-ignition engines	0.02	0.10	0.10	1.20	1.33	1.13	19(0)	102(2)	97(3)
4	870421	Diesel powered trucks (lt 5 ton)	0.00	0.00	0.00	1.02	2.85	2.36	16(0)	88(0)	96(0)
5	870323	Auto, sp-ig engine (1500-3000 cc)	0.00	0.19	0.48	0.17	0.40	0.69	11(0)	68(11)	162(17)
6	401110	Pneumatic tyres, new	7.90	7.49	7.00	4.04	2.32	1.82	25(35)	63(46)	72(52)
7	840820	Engines, diesel	0.01	0.07	0.00	2.12	2.01	1.38	25(0)	50(1)	52(0)
8	854430	Ignition/other wiring sets	5.17	3.34	0.44	2.49	1.80	0.33	10(36)	41(33)	5(27)
9	870829	Parts and accessories of bodies	0.00	0.69	0.14	0.48	0.56	0.48	8(0)	36(24)	31(8)
10	840999	Parts for diesel engines	1.02	1.50	1.96	0.43	0.18	0.19	12(39)	35(68)	47(75)
11	850710	Lead-acid electric accumulators	18.22	9.92	6.17	15.69	9.52	5.46	15(24)	31(21)	28(24)
12	870894	Steering wheels, columns & boxes	0.08	0.54	0.25	2.35	3.77	4.14	6(1)	27(4)	36(2)
13	851220	Lighting/visual signalling equip. nes	0.92	0.14	0.39	5.62	3.99	2.47	12(4)	25(1)	25(4)
14	840734	Engines, spark-ignition, over 1000 cc	1.34	6.57	4.81	0.04	0.08	0.68	2(91)	23(96)	39(67)
15	870810	Bumpers and parts	0.28	2.07	0.99	9.72	5.13	3.82	8(1)	21(10)	26(7)
21	870710	Bodies for passenger vehicles	1.88	30.78	4.82	0.01	2.67	3.67	2(98)	6(75)	3(27)
22	852729	Radio receivers	112.78	25.63	5.05	14.94	2.07	7.46	46(67)	8(76)	13(16)
23	940120	Seats	2.31	7.89	0.13	2.04	2.18	2.23	0(23)	3(49)	3(2)
24	870891	Radiators	2.32	6.49	4.71	6.27	1.45	1.11	4(9)	5(54)	7(55)
25	842123	Oil/petrol filters	5.51	4.12	3.06	3.56	0.46	0.69	7(29)	10(70)	13(56)
26	851230	Sound signalling equipment	0.02	3.13	4.86	8.19	2.60	1.56	3(0)	3(24)	3(47)
27	841520	Air cond used in vehicle	-	2.71	5.34	-	1.75	2.11	0(	2(29)	3(42)
28	842131	Intake air filters	5.82	2.63	3.00	2.78	1.23	1.08	3(36)	5(36)	5(44)
29	870331	Automobiles, diesel engine (lt 1500cc)	0.00	2.39	7.29	0.00	1.88	0.05	0(	0(25)	0(98)
30	870321	Automobiles, sp-ig engine (lt 1000cc)	0.00	2.31	0.27	1.28	0.53	0.50	1(0)	6(53)	1(13)

Sources) Author's calculation from United Nations Statistics Division (2004), Thai Customs Department (2004)
Notes) ASEAN3=(Thailand, Malaysia, Philippines), ASEAN4=ASEAN3+Indonesia, Figures in parenthis are Indonesia's share (%) in total exports of ASEAN4 countries. Figures for ASEAN3 or ASEAN4 in 2003 doesn't include Philippines because of data constraint.

for which Indonesia has a revealed comparative advantage in world markets are resource-intensive or labor-intensive products. With regard to parts for diesel engines and spark ignition engines, which are relatively capital-intensive, Indonesia has shown revealed comparative advantages in the ASEAN markets in recent years. However, the RRCAs are not shown in the table because the sum of exports from the ASEAN4 countries is relatively small. Nevertheless, Indonesia's RRCA for spark ignition engines increased from 1.82 in 1996 to 2.28 and 2.67 in 2002 and 2003, respectively. The RRCA of parts for diesel engines also increased from 0.30 to 0.62 and 1.27 over the same period.

4 An econometric analysis on plants' efficiency

4.1 Econometric method

This section examines the productivity and efficiency of plants in the automotive industry. As mentioned in the previous section, Indonesia's total exports of parts have increased in recent years. This increase in exports would affect plant productivity or efficiency not only because of the increase in demand, but also because firms would be forced to upgrade technology in order to improve the quality of products and to produce at cheaper cost. In addition, an increase in the share of imports from the ASEAN region would also affect plant productivity and efficiency through import of cheaper intermediate goods or increased competitive pressure. However, these effects on each plant are different depending on the transactional relationship. For example, the increase in a firm's exports would also affect the productivity or efficiency of its suppliers, as well as itself. However, other suppliers without transactional relationships with exporters could not benefit through this channel. Accounting for these effects, this section estimates production functions and measures the technical efficiency of plants using an econometric method.

Technical inefficiency is in general defined as the distance from a production frontier,[6] and there are several methodologies to measure the technical (in)efficiency of plants (or firms). Of these methodologies, this study applies a latent class stochastic frontier model to a plant-level panel dataset for the Indonesian auto parts industry during 1990–2000.[7] One of the main advantages of using this model is that the latent class model does not assume the same

[6] See, for example, Coelli et al. (1998).
[7] See, for example, William H. Greene (2002); Econometric Software, Inc. (2002); Hagenaars and McCutcheon (2002).

Table 3

Regional RCA index for the World automtovie markets (less the ASEAN region)

			RRCA-Indonesia (World=1)			RRCA-ASEAN3 (World=1)			Total exports-ASEAN4 (US$ million)		
No	HS	Commodity	1996	2002	2003	1996	2002	2003	1996	2002	2003
1	870421	Diesel powered trucks (lt 5 ton)	0.00	0.00	0.10	3.10	8.40	13.10	151(0)	1,157(0)	1,375(0)
2	854430	Ignition/other wiring sets	8.50	6.50	8.40	28.70	8.40	6.10	802(4)	855(10)	372(21)
3	870899	Motor vehicle parts nes	0.20	0.50	0.70	0.40	1.30	1.10	63(6)	509(6)	383(11)
4	401110	Pneumatic tyres, new	6.20	16.50	20.00	1.80	1.40	1.70	97(34)	331(63)	380(69)
5	870323	Auto, sp-ig engine (1500-3000 cc)	0.00	0.00	0.00	0.20	0.30	0.30	59(0)	282(0)	243(0)
6	870431	Sp-ig engine trucks (lt 5 ton)	0.00	0.00	0.00	0.30	1.50	4.10	17(2)	209(0)	353(0)
7	870839	Brake system parts except linings	0.00	0.10	0.10	5.80	2.80	0.50	141(0)	202(1)	33(4)
8	870332	Auto, diesel engine (1500-2500 cc)	0.00	0.10	0.00	0.10	0.40	0.00	14(3)	184(3)	16(2)
9	870870	Wheels including parts/accessories	14.20	8.40	10.30	1.60	2.70	3.10	53(58)	180(31)	209(38)
10	850710	Lead-acid electric accumulators	38.10	24.30	25.40	7.00	3.80	4.80	82(45)	111(47)	94(50)
11	870322	Auto, sp-ig engine (1000-1500 cc)	0.10	0.00	0.00	0.70	0.50	1.10	96(1)	105(0)	166(0)
12	852729	Radio receivers	341.30	148.50	43.60	52.50	2.80	39.40	147(49)	86(88)	139(17)
13	840820	Engines, diesel	0.00	0.00	0.00	0.50	1.00	1.00	12(0)	82(0)	92(0)
14	870891	Radiators	9.80	18.40	18.60	5.80	2.20	2.40	45(20)	82(53)	80(59)
15	870829	Parts and accessories of bodies	0.30	0.10	0.10	0.20	0.30	0.50	18(18)	74(4)	86(3)
21	851230	Sound signalling equipment	0.00	18.20	19.80	3.90	2.10	2.60	3(0)	11(55)	10(59)
22	841520	Air cond used in vehicle	0.00	17.40	16.40	0.00	1.30	1.70	0	10(65)	10(65)
23	401310	Inner tubes of rubber	18.90	15.00	28.30	5.80	4.20	10.10	10(33)	10(33)	9(34)
24	842123	Oil/petrol filters	6.60	6.10	6.90	3.60	1.50	1.80	24(21)	33(36)	39(41)
25	842131	Intake air filters	5.10	3.30	3.50	3.30	1.30	1.00	10(19)	12(26)	9(41)
26	870110	Pedestrian controlled tractors	0.00	3.30	6.30	0.20	0.10	0.10	0(0)	0(79)	1(96)
27	870893	Clutches and parts	0.20	3.20	1.90	0.40	0.40	0.60	4(7)	18(50)	19(37)
28	700721	Safety glass (laminated)	0.10	3.10	4.00	0.40	0.80	1.70	2(2)	18(35)	28(31)
29	401290	Solid or cushioned tyres	4.30	2.70	2.80	5.80	2.00	2.90	5(10)	6(16)	6(16)
30	851290	Parts of light, signal, etc	0.30	2.60	2.10	0.70	2.50	2.70	5(6)	50(13)	38(13)

Sources) Author's calculation from United Nations Statistics Division (2004), Thai Customs Department (2004)

Notes) ASEAN3=(Thailand, Malaysia, Philippines), ASEAN4=ASEAN3+Indonesia, Figures in parenthis are Indonesia's share (%) in total exports of ASEAN4 countries. Figures for ASEAN3 or ASEAN4 in 2003 doesn't include Philippines because of data constraint.

production function for all sample individuals.[8] This advantage is important because there exists various types of plant heterogeneity in the automotive industry, and thus the assumption of a common production function is too restrictive. The latent class model latently sorts sample individuals into J classes. Then, parameters in a production function are estimated for each class. A latent class stochastic frontier model can be written as follows:

$$
\begin{aligned}
& y_{it|j} = f(\boldsymbol{x}_{it}|\boldsymbol{\beta}_j) + \nu_{it} - u_{it}, \\
& \mathrm{Pr}_i[\text{class} = j] = F_{ij} = MLOGIT(\boldsymbol{\theta}_j \boldsymbol{z}_i), \\
& \qquad i = 1, 2, ..., n; \quad t = 1, 2, ..., T; \quad j = 1, 2, ..., J,
\end{aligned} \tag{2}
$$

where y_{it} and $\boldsymbol{x}_{it}$ refer to output and a set of inputs for plant i in year t, respectively. The form of the production function $f(\cdot)$ is common for all classes, but the parameters $\boldsymbol{\beta}_j$ are different among classes. Thus, production frontiers $f(\boldsymbol{x}|\boldsymbol{\beta})$ for class j are different among classes. Other two terms, ν and u are a pure disturbance term and an inefficiency term, respectively. These are assumed to be independently and identically distributed according to the normal distribution ($\nu \sim N[0, \sigma_\nu^2]$) and according to the half-normal distribution ($u \sim |N(0, \sigma_u^2)|$)), respectively. The structure for choice of class is based on a multinomial logit model ($MLOGIT$), and class probabilities for each individual (F_{ij}) are allowed to vary with the nature of the individual ($\boldsymbol{z}_i$). The model is estimated by maximizing the likelihood function derived from the model (maximum likelihood estimation). Once the model is estimated, we can estimate the inefficiency term u and calculate the efficiency index, $\exp(-\hat{u}_{it})$, in the case where the dependent variable is in the form of a natural logarithm.

In this study, the estimated model is specified as follows:

$$
\begin{aligned}
\ln^*(V_{it}) = & \beta_{j.0} + \beta_{j.l} \ln^*(L_{it}) + \beta_{j.k} \ln^*(K_{it}) \\
& + \beta_{j.ll}[\ln^*(L_{it})]^2 + 2\beta_{j.lk} \ln^*(L_{it}) \ln^*(K_{it}) + \beta_{j.kk}[\ln^*(K_{it})]^2 \\
& + \delta_{j.ds} \ln^*(Vehpro_t) + \delta_{j.ex} \ln^*(Export_t) + \delta_{j.im} \ln^*(Rimase_t) \\
& + \zeta_{j.ex} D_{ex} + \zeta_{j.im} D_{im} + \nu_{it} - u_{it}, \\
\theta_j \mathbf{z}_i = & \theta_{j.0} + \theta_{j.old} DF_{old} + \theta_{j.new} DF_{new}
\end{aligned} \tag{3}
$$

where V, L, and K are value added, the number of workers and capital stock (proxied by the volume of electric power used), respectively. The function $ln^*(\cdot)$ is a logarithmic function subtracted by the sample average ($\ln *(\cdot) = \ln(\cdot) - \overline{\ln(\cdot)}$). Thus, the first part of the equation, which is composed of the

[8] Random parameter modeling also does not require this assumption; however, it needs distributional assumptions on parameters in the model.

first six terms on the right-hand side of equation (2) is a translog production function. In order to examine the effect of a change in domestic demand for cars and foreign trade of auto parts on plant productivity, five variables are added to the model: $Vehpro$ is the number of cars produced in Indonesia during year t, $Export$ is the total exports of parts during year t, $Rimase$ is the imports from the ASEAN region as a share of total imports of parts, D_{ex} and D_{im} are dummy variables that take a value of one if plant i was respectively exporting or importing during year t. The class probability is assumed to depend on the type of ownership. The dummy variable DF_{old} has a value of one if a plant began operation with a positive foreign ownership share before 1990, while another dummy variable DF_{new} has a value of one if a plant began operation with positive foreign ownership share in the 1990s or 2000.

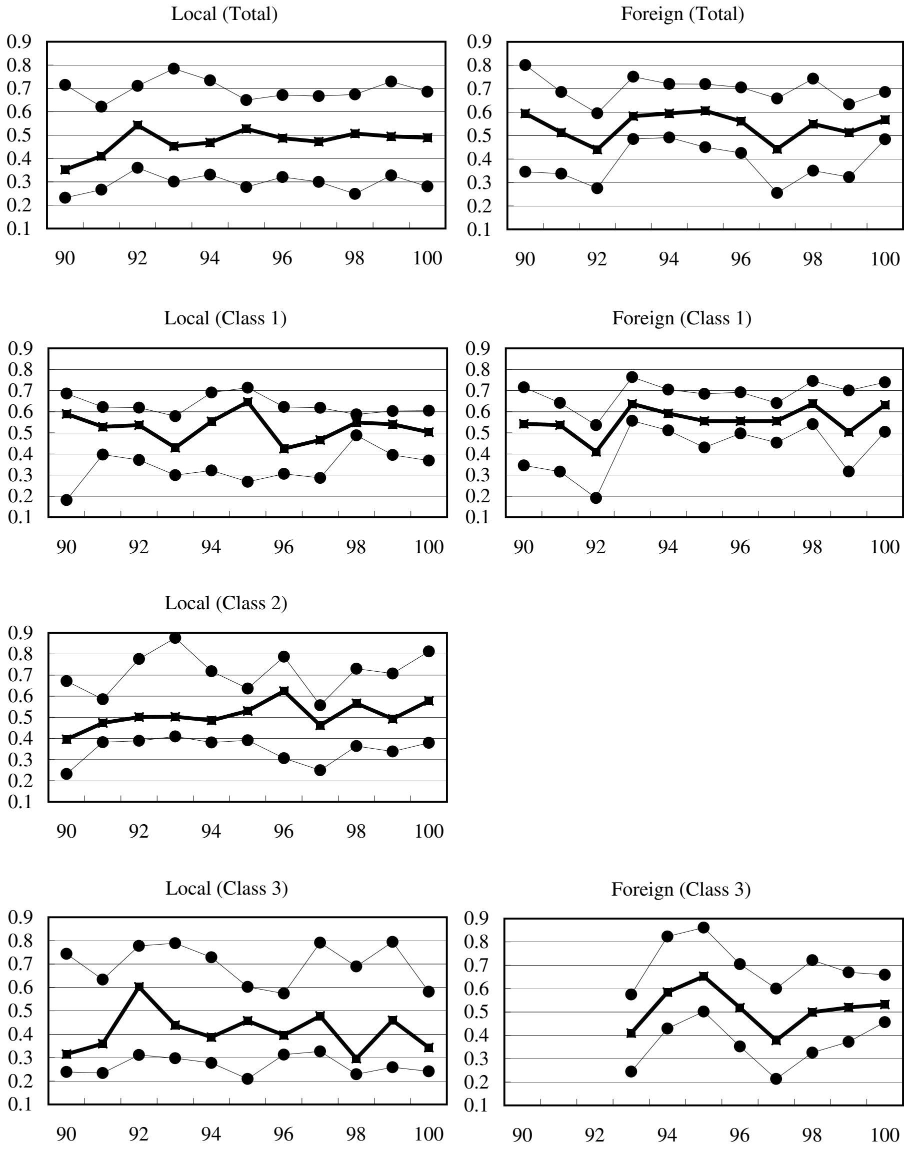
4.2 Sample and data for the automotive industry

For estimation of the model explained above, raw data underlying Indonesia's industrial surveys were used. The surveys have been conducted on an annual basis by Statistics Indonesia (formerly the Central Bureau of Statistics) since 1975 and the raw datasets include information on each plant employing 20 workers or more. The datasets are basically cross-sectional for each year, but it is possible to create a panel dataset for 1975–2000 using plant identification codes. Although the datasets are relatively rich compared to similar datasets for other developing countries, the datasets include inconsistent data entries for some variables. One of these is a variable on the starting year of commercial production, and another variable is ownership variables (e.g., foreign ownership variable). In order to check for, and if necessary modify, inconsistent entries, information from Statistics Indonesia (various years b), Toyo Keizai (various years), Fourin (2000) and various internet sources were used. In addition, the datasets contain information on capital stock for 1988–95 and 1997–2000, but data for 1996 are not available. Furthermore, there are a relatively large number of plants that did not report the value of capital stock. Therefore, the analysis uses the volume of electric power (Kw) as a proxy for the capital stock variable. The sample of plants for this analysis includes plants that were classified in the parts sector (38433) during 1990–2000, but plants that did not report on some variables that are needed for this analysis were dropped. As a result, an unbalanced panel dataset was constructed, which includes 702 observations for 105 plants during the period 1990–2000.

Table 4
The estimation results of a latent-class stochastic frontier model

Class	Class One		Class Two		Class Three	
Variable	Coef.	t-value	Coef.	t-value	Coef.	t-value
Production function						
Intercept	-5.091	2.348 **	-1.838	1.66*	-1.644	1.791*
$\ln(L)$	0.383	2.754 ***	1.182	10.598***	0.749	11.481***
$\ln(K)$	0.190	2.415 **	0.158	2.592***	0.501	12.165***
$[\ln(L)]^2$	0.874	6.821 ***	0.361	6.672***	0.260	5.166***
$[\ln(L)][\ln(K)]$	-0.117	2.203 **	-0.121	5.561***	-0.081	3.517***
$[\ln(K)]^2$	0.046	1.498	0.070	3.861***	0.085	5.178***
$\ln(Vehpro)$	0.390	2.437 **	0.137	1.584	0.105	1.615
$\ln(Export)$	0.304	1.942 *	-0.100	1.254	0.186	2.376**
$\ln(Rimase)$	0.096	3.339 ***	0.046	3.249***	0.014	1.020
D_{ex}	-0.129	0.531	-0.024	0.126	-0.143	1.200
D_{im}	-0.083	0.440	-0.191	1.951*	0.187	1.819*
Class factors						
Intercept	-0.995	2.453 **	-0.151	0.502		
DF_{old}	1.461	1.663 *	-0.457	0.452		
DF_{new}	0.361	0.633	-2.640	2.096**		
Variance components						
σ	1.744	10.672 ***	1.191	14.912***	1.487	18.207***
λ	2.284	3.246 ***	6.837	2.611***	5.862	3.578***
The number of plants		25		27		53
Foreign-owned plants		15		3		26
Started before 1990		5		2		4
Average scale elasticity		0.93		1.24		1.26

Figure 10 The efficiency index



Sources) Author's estimation.

4.3 Estimation results

The model explained above was estimated three times assuming that the number of latent classes is two to four, respectively. Based on the Bayesian Information Criterion for the estimated results, a model with three classes was chosen. Table 4 shows the regression results of the latent class stochastic frontier model. Based on the estimated class probability for 105 sample plants, there were 25 plants whose probability of being classified in class 1 was highest among the three classes, and 27 plants and 53 plants have highest probability of being classified in class 2 and class 3, respectively. The estimate of class factor parameter on DF_{old} for class 1 was significantly positive at the 10 percent significance level. This indicates that relatively old foreign-owned plants tend to be classified in class 1. The significantly negative parameter estimate on DF_{new} for class 2 indicates that relatively new foreign-owned plants tend to be classified in class 1 or class 3. In addition, these results also indicate that the group in class 2 is characterized as a group of locally owned plants.

There are some differences in parameters of production function among classes. First, the parameter on vehicle production was significantly positive for class 1 but insignificant for other classes. This suggests that productivity for class 1 is positively affected by the increase in domestic vehicle production, and indicates that plants in this class have transactional relationships with assemblers. Second, the parameter on total exports was significantly positive for class 1 and class 3, but was insignificant for class 2. This suggests that the increase in total exports of parts positively affects the productivity of plants in classes 1 and 3. As explained above, there are a relatively large number of foreign-owned plants in these classes. Third, the parameter on the share of imports from ASEAN was significantly positive for class 1 and class 2, but insignificant for class 3. This indicates that plants related to vehicle production could also benefit from the increase in imports from ASEAN. One possible interpretation of the significantly positive parameter for class 2 is that productivity is affected by the increase in imports from ASEAN through increasing competitive pressures. The insignificant parameter on the export dummy for all classes indicates that productivity does not depend on whether the plants themselves are exporting. On the other hand, the effect of imports is different among classes. It is negative for class 2 and positive for class 3.

Figure 10 shows the efficiency index by class and ownership (upper line = upper quartile, middle line = median, lower line = lower quartile). The efficiency indices were calculated from the estimation results. Higher values indicate more efficient plants and lower values indicate less efficient plants. Several characteristics of plant efficiency for the automotive industry can be seen in the figure. First, the level of efficiency, as measured by the median value, is relatively low for both locally and foreign-owned plants. Efficiency does not appear to have increased during the period, fluctuating around 0.5. Second, the level of efficiency is almost identical between foreign and local plants, but is slightly greater in foreign-owned plants than locally owned plants. Third, the range from the lower quartile to the upper quartile appears wider for locally owned plants than foreign-owned plants, particularly for class 1 during the mid-1990s and class 3. This indicates that some locally owned plants were relatively efficient, but there were a relatively large number of inefficient locally owned plants compared to foreign-owned plants. The lower quartile for class 3 of the foreign group is rising after 1998 but the corresponding line for locally owned plants remains at a low level.

5 Concluding remarks

Indonesia's automotive industry has been characterized as an infant industry that failed to grow; yet, the performance of this sector was relatively good compared to other industries in Indonesia following the economic crisis. There are some factors behind this relatively good performance of the industry. The progress that has been made in lowering the intraregional tariff rate is one of the factors. A related factor is the restructuring of multinational corporations' production networks in the ASEAN region.

This paper has examined recent trends in Indonesia's exports, imports and plant efficiency. One of the findings that emerges from the analysis is that Indonesia's exports have steadily increased under a liberalized trade regime. This is also an important factor that contributed to the relatively good performance of the automotive industry. Second, vehicle production depended heavily on imports, mainly from Japan. However, in recent years, the share of imports from the ASEAN countries is increasing while the corresponding share from Japan is gradually decreasing. This trend probably reflects the restructuring of Japanese major assemblers and parts makers' production networks in the region. Third, the results of the econometric analysis suggest that there are three groups of plants in the automotive industry and that some groups, in which there are a relatively large number of foreign-owned plants, can benefit from the increase in exports and the increase in the share of imports from ASEAN countries. In addition, the results suggest that the increase in the share of imports from ASEAN also affected productivity for a group in which a relatively large number of locally owned plants were classified. Fourth, the level of plant efficiency fluctuated at a relatively low level and did not appear to increase during 1990–2000. In addition, some locally owned plants have relatively high efficiency, but there are a relatively large number of locally owned plants that have low efficiency.

These findings suggest that the environment surrounding Indonesia's automotive industry is changing and that the industry is gradually growing.

However, some challenges remain. One issue is the low efficiency level of some locally owned plants, as noted above. Another issue involves the inefficiency of the infrastructure. For instance, Tanjung Priok is one of Indonesia's largest and better-performing ports located in Jakarta. Yet, it is less productive than most other major ports in Southeast Asia and its unit cost is higher than others (Ray, 2003). The inefficiency of Indonesia's infrastructure including its port facilities is capable of hampering exports and imports, and thus development of the industry.

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Appendix A.

Table 1

Classification of vehicles and parts

HS code	Description	HS code	Description
401110	Pneumatic tyres new of rubber for motor cars	870310	Snowmobiles, golf cars, similar vehicles
401210	Retreaded tyres	870321	Automobiles, spark ignition engine of <1000 cc
401220	Pneumatic tyres used	870322	Automobiles, spark ignition engine of 1000–1500 cc
401290	Solid or cushioned tyres, interchangeable treads	870323	Automobiles, spark ignition engine of 1500–3000 cc
401310	Inner tubes of rubber for motor vehicles	870324	Automobiles, spark ignition engine of >3000 cc
700711	Safety glass (tempered) for vehicles, aircraft, etc	870331	Automobiles, diesel engine of <1500 cc
700721	Safety glass (laminated) for vehicles, aircraft, etc	870332	Automobiles, diesel engine of 1500–2500 cc
700910	Rear-view mirrors for vehicles	870333	Automobiles, diesel engine of >2500 cc
830120	Locks of a kind used for motor vehicles of base metal	870390	Automobiles nes including gas turbine powered
830230	Motor vehicle mountings, fittings, of base metal, nes	870410	Dump trucks designed for off-highway use
840734	Engines, spark-ignition reciprocating, over 1000 cc	870421	Diesel powered trucks weighing < 5 tonnes
840820	Engines, diesel, for motor vehicles	870422	Diesel powered trucks weighing 5–20 tonnes
840991	Parts for spark-ignition engines except aircraft	870423	Diesel powered trucks weighing > 20 tonnes
840999	Parts for diesel and semi-diesel engines	870431	Spark ignition engine trucks weighing < 5 tonnes
841330	Fuel, lubricating and cooling pumps for motor engines	870432	Spark ignition engine trucks weighing > 5 tonnes
841520	Air cond used in vehicle	870490	Trucks nes
842123	Oil/petrol filters for internal combustion engines	870510	Mobile cranes
842131	Intake air filters for internal combustion engines	870520	Mobile drilling derricks
848310	Transmission shafts and cranks, cam and crank shafts	870530	Fire fighting vehicles
848320	Bearing housings etc incorporating ball/roller bearing	870540	Mobile concrete mixers
848330	Bearing housings, shafts, without ball/roller bearings	870590	Special purpose motor vehicles nes
848340	Gearing, ball screws, speed changers, torque converter	870600	Motor vehicle chassis fitted with engine
848350	Flywheels and pulleys including pulley blocks	870710	Bodies for passenger carrying vehicles
848360	Clutches, shaft couplings, universal joints	870790	Bodies for tractors, buses, trucks etc
848390	Parts of power transmission etc equipment	870810	Bumpers and parts thereof for motor vehicles
850710	Lead-acid electric accumulators (vehicle)	870821	Safety seat belts for motor vehicles
851220	Lighting/visual signalling equipment nes	870829	Parts and accessories of bodies nes for motor vehicles
851230	Sound signalling equipment	870831	Mounted brake linings for motor vehicles
851240	Windscreen wipers/defrosters/demisters	870839	Brake system parts except linings for motor vehicles
851290	Parts of cycle & vehicle light, signal, etc equipment	870840	Transmissions for motor vehicles
852729	Radio receivers, external power, not sound reproducer	870850	Drive axles with differential for motor vehicles
854430	Ignition/other wiring sets for vehicles/aircraft/ship	870860	Non-driving axles/parts for motor vehicles
910400	Instrument panel clocks etc for vehicles/aircraft etc	870870	Wheels including parts/accessories for motor vehicles
940120	Seats, motor vehicles	870880	Shock absorbers for motor vehicles
870110	Pedestrian controlled tractors	870891	Radiators for motor vehicles
870120	Road tractors for semi-trailers (truck tractors)	870892	Mufflers and exhaust pipes for motor vehicles
870130	Track-laying tractors (crawlers)	870893	Clutches and parts thereof for motor vehicles
870190	Wheeled tractors nes	870894	Steering wheels, columns & boxes for motor vehicles
870210	Diesel powered buses	870899	Motor vehicle parts nes
870290	Buses except diesel powered		