

## **The Automotive Industry in Emerging Economies: A Comparison of Korea, Brazil, China and India**

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### **Executive Summary**

The automotive industry in Korea, Brazil, China and India is currently going through impressive growth. Governments have played a key role in the evolution of the industry in all these countries. The Korean industry has made the most significant progress, and is now exporting cars to developed markets. It is the only country that invested in R&D for product development, retained management control in joint ventures with multinational companies (MNCs), and had ambitious export targets. The industry in Brazil is controlled entirely by MNCs. Although this has led to growth and adoption of lean production, indigenous product development is lacking. Tariff barriers have come down, forcing domestic production to become more market responsive. Fluctuating tariffs and taxes, and cyclical demand have characterized the industry. Indian industry is experiencing a revolution with rapid growth and the entry of 9 MNCs and plans for 3 more to enter in the next two years. The Chinese industry is also growing very rapidly although it is still highly fragmented. Passenger cars are only 15% of total vehicle production in China. Demand in Brazil, India and China is highly price sensitive and growth is led by the demand for a small car. Higher taxes on mid and large size cars give the small car a big price advantage. Import duties for components imply that the supplier base in these countries needs to develop fast. The supplier industry could become a bottleneck for growth.

A major implication is that the future in China and India, the two biggest potential markets with the highest growth rates, is uncertain though bright. Governments seem to appreciate the necessity for stable policies and progressive deregulation, and regard the automotive industry as one of the pillars for economic growth. However, uncertainty exists about the extent of growth, the degree to which suppliers can meet demand, and the number of players that will be able to survive in the long run. MNCs have followed the practice of introducing successful models to these markets. It remains to be seen whether this strategy will succeed. The Brazilian industry is much older than that of China or India, and will probably continue to experience significant growth. Capacity is expected to reach 2.5 to 3 million by the year 2000. The Korean car makers are also entering India, and could enter other emerging markets as well. Korea is a market for overseas MNCs, but is emerging as a trade partner rather than a major net importer of cars. However, opportunities exist for overseas supplier companies in Korea. With stagnation in developed markets and huge additions of capacity in emerging markets, monopoly of MNCs over car production could erode although they will continue to dominate product development.

## **Introduction**

Korea, Brazil, China and India on the one hand, and Thailand, Mexico, Malaysia, and Indonesia on the other hand are all late-industrializing nations. But, as Amsden and Kang (1995) argue, there is a basic difference between the two groups with regard to the current and future status of their automobile industries. The second group of late industrializing countries, comprising Thailand, Mexico, Malaysia and Indonesia have built an indigenous automobile industry to restrict outflow of precious foreign exchange and to meet local demand. These countries do not intend to become major players in the global automobile industry in the near future. On the other hand, the first group of late-industrializing countries, namely Korea, Brazil, China and India are building significant manufacturing capabilities and have the potential to become significant players in the world automobile industry. Korea has already become a significant exporter. The sheer size and market potential of China and India, and impressive rates of economic growth suggest that they could emerge as significant players in world markets. Amsden and Kang (1995) call this group of countries 'emerging economies or manufacturers' and not just 'emerging markets.'

The evolution and current state of the automobile industry in these emerging economies are not identical. The objective of this paper is to do a comparative analysis of the automobile industries in these four countries and identify some factors that seem to lead to better performance.

There are some major differences between these countries and the developed nations. First, industry evolution has been influenced considerably by Government policies and regulations in all these countries. However, this may not necessarily impede growth and development since these governments sometimes play a supportive role that helps build long term capabilities. Second, infrastructure in roads tends to be poor. This has implications for the long term growth of the industry. The level of technology and manufacturing capability tends to be highly varying with very few world class plants and many others at a fairly mediocre level. The supplier industry is also not well developed, and product development capabilities tend to be poor except perhaps in the case of Korea. These markets are also much more price sensitive than developed markets. This is perhaps because the ratio of car prices to incomes is much higher in emerging markets. On the positive side, assembly costs in these countries are lower by at least 30% (O'Brien and Karmokalias 1994), although this does not give any significant advantage since assembly costs are a small proportion of total costs.

## **Economic Performance**

The economic performance in 1994 of the automobile industries of Korea, Brazil, China and India, based on a few important dimensions, is given in the following table. The data includes sales of all vehicles other than passenger cars also.

DIMENSIONS	KOREA	BRAZIL	CHINA	INDIA
1. Share of world vehicle sales volume (%) (1994)	2.5	2.2	2.0	1.0
2. Growth in share of world vehicle sales volume (1991-1995)	8.7	12.4	42.86	42.86
3. Production (million units)	1.5	0.96	0.51	0.34
4. New registrations (million units)	1.05	0.77	0.62	0.34
5. Share of output exported (%)	25	20	0	5.0
6. Share of inputs imported (%)	<1	0	6.0	<1.0
7. Share (%) of passenger car in total vehicle sales	68	75	15	60
8. Persons per car	12.4	11.4	245	200

These four countries together accounted for about 7.7% of world sales in 1994. As is clear from the table, India and China offer huge untapped markets and their growth rates are also impressive. However, the volume of trade with the rest of the world is very low. Korea and Brazil on the other hand have significant exports, but few imports. There are likely to be opportunities for foreign companies since these emerging markets cannot develop without help from outside. In China, the share of passenger cars in total vehicle sales is very low at 15%.

### Industry Evolution

The evolution of the automobile industry in these countries has some interesting differences. Amsden and Kang (1995) trace significant developments in the Korean industry. The Korean automobile industry started production in the early 1960s and initially gained experience through CKD manufacture, and started mass production with a single model (the Pony). Three large diversified Korean companies emerged in the automobile market - Daewoo, Hyundai and Kia. These companies gained knowledge and experience through joint ventures with MNCs, although they never surrendered management control. Later they developed their own models for the world market. Government policies clearly encouraged exports, and by 1993 they were exporting 38% of their production. Industry evolution has been driven by the need to grow and export by passing through the stages of CKD manufacture, foreign collaboration with Korean managerial control, mass production and export of a limited number of models, gradual adoption of lean production and finally, acquiring product design capabilities to try and become truly international.

The Indian automobile industry was governed by regulations since the country became independent in 1947. Imports, collaborations and equity ventures were severely restricted by the government. Capacity expansion was restricted and required licenses issued by the government, and technology transfer from foreign companies was subject to government approval. In 1981, the government decided to set up Maruti Udyog Limited in collaboration with Suzuki Motor Company of Japan, the first MNC to enter the country. Maruti started mass production by introducing a "people's" car in the economy segment. This led to a boom in demand for automobiles in India. With a current capacity of about 250,000 vehicles, Maruti is the clear market leader with about 70% market share in 1995.

Market liberalization in 1991 and a change in policy allowed free entry to foreign companies. MNCs have not chosen to enter on their own and have entered into joint ventures with Indian

partners. Unlike the Korean industry which grew from CKD manufacture to a significant exporter of cars, the Indian automobile industry's growth seems to be currently led by immediately available opportunities in the domestic market. Several large assemblers have entered the Indian market through joint ventures. Unlike Korea, managerial control is with international companies. As of date, no Indian company has plans to become a significant global player except perhaps Telco which is about to launch indigenously designed vehicles in international markets. The component industry however, has a long way to go to meet the challenge. Therefore, the assemblers are initially importing knocked-down kits, and are slowly indigenizing. Several assemblers are encouraging their own overseas component suppliers to enter India through joint ventures with local supplier firms. One can characterize the industry evolution as a movement from strict government regulations to an industry driven by growth prospects, foreign managerial control, minimal government interference except for duties and taxes, and no major thrust towards becoming truly global or acquiring capabilities in product development. However it may emerge as a significant exporter since domestic markets may not be able to sustain 18 companies in the country.

The development of the Brazilian automotive industry has been described by Ferro (1995). The industry initially started off with the objective of import substitution in the 1950s. However, unlike Indian government policy at that time, foreign companies were allowed to enter with full management control, and Volkswagen, General Motors and Ford were major companies in Brazil for a long time. However, isolation from world trade hampered industry development. Much later, in 1990, the government opened up the market to imports. Current growth has been led by the "popular" car in the economy segment. The Brazilian industry has also not invested significantly in product development. Efforts are on to adopt lean manufacturing practices, although the supplier industry continues to a major bottleneck. Government policy on duties and taxes has been vacillating leading to cyclical demand over the years. The evolution of the Brazilian industry has been a transition from import substitution to integration with world markets, fluctuating duties and taxes, government led price reductions, thrust towards adoption of lean production and growth led by the "popular" or small car segment. No indigenous Brazilian automotive company has emerged so far and there is no thrust towards acquiring product development capabilities.

The evolution of the industry in China has been described in detail by Yang (1994). The Chinese automobile industry had a different evolution. The industry has always been highly fragmented and in 1979 there were 130 assemblers who made 186,000 vehicles, with most of them making only hundreds of vehicles. By 1993 there was some consolidation into 'combined management companies' and there were 40 assemblers producing about 500,000 vehicles. Further, unlike Korea, Brazil and India, passenger car production has been a very small percentage of total production, and was 15% in 1994. Autonomy provided to provincial governments led to dispersed development led by foreign collaborations. The strategy was to obtain foreign capital and technology, and they were forced to give managerial control to international partners. Of late the government has been trying to push a "people's car" in the economy segment. This is similar to what happened in Brazil and India where the small car led industry growth. The industry is in the process of developing its supplier base, and probably has some way to go before it acquires product development skills. It is also probable that unlike Brazil and Korea, there will be no major thrust toward adopting lean production in the near future.

Industry evolution has therefore been led by government policy, notably the degree of autonomy given to provincial governments, attempts to consolidate a highly fragmented industry, acquisition of foreign capital and technology, relatively weak Chinese managerial control in joint ventures, and a thrust towards growth and development. Impressive economic growth and a large population with a very low number of cars per thousand people suggest that demand is likely to grow significantly.

## Government Policies

The Indian government has made significant shifts in its automobile policy. Ever since independence, the government considered the passenger car as a luxury item, and imposed very high tariffs. After the economic liberalization launched in 1991, the Government of India announced a new automobile policy in June 1993. Excise duties varied over the years as follows.

1984-85	1990-91	1992-93	1992-93	1993-94
15%	42%	66%	56%	40%

The import duty on car components was increased from 40% to 75% during 1984-91 and brought down to 50% recently. Thus duties and taxes continue to be high by international standards. These might be brought down as the industry becomes more competitive.

The Brazilian government's role has also made changes in the recent past. Previously, the focus of government policy was on import substitution, as is typical of most developing countries. The government is now trying to improve the global competitiveness of the Brazilian automobile industry by opening it up to imports. On the other hand, the government is also introducing supportive measures to rejuvenate the domestic industry. Some of these measures are : new institutional arrangements involving the entire supply chain including the importers, unions and government agencies, tax reductions, and pushing the 'popular' or small car by differential taxes. Import duties have varied a lot in the last five years as shown below.

1990	1991	1992	1993	1994	Feb 1995	April 1995
85%	60%	50%	40%	35%	20%	70%

Some stability in policy is probably needed for faster development of the industry.

The influence of the Chinese government in shaping the country's automobile industry has been significant. China's progress from the command to the market economy, and the autonomy given to provincial governments has helped growth. The government also succeeded to some extent in consolidating a highly fragmented industry. The Chinese government now identifies the auto industry as one of China's 'developmental pillars' and has been trying to attract foreign investment to improve technology. It has even accepted its role as a minority partner in some ventures. The government is also encouraging the "people's" car. Although managerial control is with foreign companies, they are obliged to raise the domestic content of car subassemblies. The government has also played an active role in restructuring manufacturer-supplier relations.

The role of the Korean government has perhaps been the most positive among all the four countries. This is because the Korean government has always supported as well as disciplined the Korean industry through export targets and incentives and through price controls. Overseas investments were encouraged by subsidised credit, and technology infrastructure improved through imports. The industry also enjoys trade protection. It is interesting to note that price controls seem to have had a positive impact in Korea, forcing companies to improve productivity and efficiency by cutting costs. However, in Brazil, these controls were perhaps counterproductive. This may be due to high rates of inflation, leading to severe pressures on profit margins and adversely affecting assembler-supplier relations. It is also likely to have had an adverse impact on growth. Another factor might have been that unlike Korea, there was no drive to acquire, absorb and develop technology and products, which in turn was driven by the need to export. Price controls thus worked well in an industry with higher levels of capability, whereas they were counterproductive in an industry at an earlier stage of evolution.

State participation in assembly units is high in China. The joint ventures with Peugeot, VW, Chrysler, and GM have state participation in equity. India's largest assembler Maruti, is a 50-50 venture between the Government and Suzuki. However government participation is absent in all other companies. State participation in equity is completely absent in Korea and Brazil. The following table summarizes some of the key elements of government policy.

	KOREA	BRAZIL	CHINA	INDIA
Local content requirements	Not an issue	High	High	None*
Import duty				
Full vehicles:	25%	70%	30%	110%
CKD/SKD:		30%		50%
Parts/components:	15%	20%	25%	50%
Excise duty	10-25%	20-35%	High	40%
State Ownership	Absent	Absent	High	Low

\* Capacity expansions require government licences and may depend on the level of indigenization.

### Industry Structure

The car assembly industry of the four countries have been compared in the following table, based on the number of firms, level of concentration, and the major MNCs present in the country.

COUNTRY	NUMBER OF ASSEMBLERS	GROWTH IN NO. OF ASSEMBLERS (%) (1985-95)	OUTPUT SHARE OF TOP 3 FIRMS (%)	GROWTH IN OUTPUT SHARE OF TOP 3 FIRMS (%) (1985-95)	MNCs PRESENT
KOREA	6	100	95	-5	Mazda, Mitsubishi, GM, Ford, Honda, Mercedes
BRAZIL	5	28	95	15.8	GM, Ford, VW, Fiat,
CHINA	18	38.5	48	4.3	GM, VW, Chrysler, Peugeot
INDIA	5	100	88	17.33	Suzuki, Peugeot, GM, Ford, Fiat, Daewoo, Mercedes, Rover, VW*

\* Hyundai, Mitsubishi, BMW have announced plans to enter in the years 1996-98. Audi plans to sell cars without local manufacture.

## Supplier Industry

The auto component industry of these countries differ in the number and size distribution of component firms, and other characteristics, like turnover, OEM/RM split, equity, and export performance.

	KOREA	BRAZIL	CHINA	INDIA
No. of firms	1100	550	250-300	350
Turnover (\$bn)	12	15	5	2.6
OEM:RM Split	80:20	50:50	50:50	20:80
Overseas collaborations	Many licensing agreements	20% of firms are foreign affiliates Many licensing agreements	60% of firms have Japanese links	38% of firms have foreign tie ups
Exports	10% of sales	15-20% of sales	20% of sales	10% of sales

One of the reasons for the success of the Korean automobile industry is the closely knit assembler-supplier structure. The automobile assembler companies belong to large chaebols (conglomerates). Thus, they have affiliate firms within the conglomerate supplying them with parts, machinery, software or information, and even financing. Suppliers have invested heavily in learning both from assemblers and from foreign supplier companies, and have become more capital-intensive and specialized. The result is improved performance, and ability to design some proprietary parts. This has helped assemblers enter world markets. Such close assembler-supplier relations within the same business group or conglomerate is not there in India, Brazil or China. The industry size in India and China is much smaller than in Korea and Brazil, although growth rates are much higher.

## Extent of Adoption of Lean Production

The extent to which these emerging economies have adopted lean production varies. Korean companies argue that lean production can be successful only when there are large volumes. Since the Korean companies have relatively low volumes, they have not adopted lean production. JIT is not practised because of the very low volumes that would be transported, the poor quality of parts suppliers and the instability of the process due to rapid introduction of new models, and rapid growth. Other elements of lean manufacturing like developing multi skilled workers and allowing workers to stop the assembly line are not practised perhaps because of the current emphasis on growth and exports. However, they are aware of the benefits of lean production, and consider lean production as a goal to be achieved in the near future.

The experiment with adoption of lean production in Brazil seems to have borne fruit (Ferro 1993). In spite of cultural factors like high power distance and an authoritarian structure which inhibit the diffusion of lean production, the Brazilian industry has been able to make use of the motivated and trained workforce to push acceptance of lean manufacturing approaches, like teamwork, training, participation, involvement and commitment of workforce, increased communication and decentralization, emphasis on problem solving activities, reduction of quality inspectors, and flatter structures by cutting managerial and supervisory layers. The results are reduced inventory and lead time, reduced defects and increased productivity.

Since the Indian industry achieved significant production volumes in the mid 1980s with the arrival of Maruti, the transition to lean production is likely to take time. However, with many automobile makers entering the growing Indian market, lean production is likely to be adopted. The success of lean production at the industry level depends not only on the efforts of the assemblers, but also on the suppliers and on institutional and cultural factors. A very

important obstacle in adopting lean production is that a large proportion of components are imported in the form of CKD/SKD kits by the new entrants. Distances of suppliers from assemblers are frequently high. The bargaining power of suppliers for some components is high, because of their small number. They accept only large orders. It is likely that after the shake out which many analysts expect, adoption of lean production will take off more rapidly.

There is not much information available about the diffusion of lean manufacturing practices in China. However, given the diffused nature of the industry and the low volumes generated, it is expected that the Chinese industry has a long way to go, before it can adopt lean manufacturing as an industry paradigm.

## **Implications and Conclusions**

The table in the Appendix summarizes the comparison between these countries. The Korean industry, a later entrant than Brazil, has progressed much further. Government support, a clear vision of becoming an export oriented world class industry, retaining management control, investing in R&D, and acquiring product development capabilities has helped it to grow and develop fast. The other three countries have not invested in capability development to the same extent. Brazilian plants are simply overseas plants of MNCs. Indian plants are joint ventures with MNC control. It is unlikely that significant R&D will be done there. In Brazil, China and India, industry growth is led by the small car segment. Lean production has not been adopted in a significant way, except perhaps in Brazil. The relatively poor development of the supplier industry is still acting as a deterrent to rapid growth.

Uncertainty exists about the extent of growth, the degree to which suppliers can meet demand, and the prospects for an individual company. MNCs have followed the practice of introducing successful models to these markets. It remains to be seen whether this strategy will succeed. Korea is a market for overseas MNCs, but is emerging as a trade partner rather than a major net importer of cars. However, opportunities exist for overseas supplier companies in Korea. With stagnation in developed markets and huge additions of capacity in emerging markets, the monopoly of developed nations over car production could erode, although they will continue to dominate product development.

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## Appendix

	<b>Korea</b>	<b>Brazil</b>	<b>China</b>	<b>India</b>
Evolution	CKD - mass production of one model - exports -building skills in product development	Import substitution -growth and entry of 4 MNC's - foreign managerial control	Highly fragmented industry -consolidation - joint ventures with MNC control - growth	Government regulations - growth - entry of 13 MNC's - foreign managerial control -deregulation
Major products	Mid Size	Small Car	Small Car	Small Car
New Product development	Capability exists although suppliers are lagging behind	Indigenous capability lacking	Indigenous capability low	Except Telco, capability lacking
Managerial control	With Korean companies	With MNC's	With MNC's	Usually with MNC's
Lean Production	Gradually adopting it	Thrust towards lean production	Marginal	Marginal
Goal of Technology Strategy	To become world class and global. Investing heavily in R&D	To facilitate growth and efficiency. Low investment in R&D	To meet domestic needs. A catch up strategy	To facilitate growth. Low investment in R&D
Suppliers	Moving towards world class status. Some are able to design proprietary parts	Getting restructured for lean production. Acquiring design capabilities	Growing rapidly through joint ventures	Growing rapidly through joint ventures
Government role	To help investments abroad, and to upgrade technology infrastructure Disciplining and supporting industry	Fluctuating tariffs, price controls, heavy taxes except for low priced `popular' cars	Acquiring technology and managerial expertise through joint ventures	Largely restricted to duties and excise. No clear policy as yet.