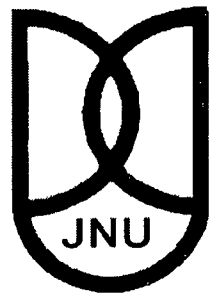
PRODUCTIVITY SPILLOVERS FROM FDI IN INDIAN AUTOMOTIVE INDUSTRY: A FIRM LEVEL ANALYSIS

A dissertation submitted to the Jawaharlal Nehru University in partial fulfillment of the requirements for the award of the degree of

MASTER OF PHILOSOPHY

ANNU



CENTRE FOR THE STUDY OF REGIONAL DEVELOPMENT
SCHOOL OF SOCIAL SCIENCES
JAWAHARLAL NEHRU UNIVERSITY
NEW DELHI – 110067
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JAWAHARLAL NEHRU UNIVERSITY
Centre for the Study of Regional Development
School of Social Sciences
New Delhi-110067

Date.....

DECLARATION

I Annu, declare that the dissertation entitled "**Productivity Spillovers from FDI in Indian Automotive Industry: A Firm Level Analysis**" submitted by me for the award of the degree of Master of Philosophy is my bonafide work and may be placed before the examiners for evaluation.

Annu

CERTIFICATE

We recommended that this dissertation be placed before the examiners for the evaluation.

PROF. P.M. KULKARNI
(Chairperson)

PROF. AMARESH DUBEY
(Supervisor)

Tel.: 26704463, Gram : JAYENU Fax : 91-11-26742586, 26741504

DEDICATED

TO

MY PARENTS

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Chapter 1

Introduction

One of the important developments internationally in the last two decades or so has been the increasing importance of foreign direct investment (FDI) in developing countries (Pant and Mondal 2010). In these countries FDI is now considered as an important component of development strategy and efforts are being made towards stimulating FDI inflows. Illustratively, in developing countries FDI inflows as a percent of GDP rose from only 10 percent in 1980 to approximately one third in 2005. Furthermore, developing and transitional economies together, for the first time, absorbed close to half of the global FDI inflows in 2010 (World Investment Report 2011). This is also reflected in the global ranking of top 20 FDI recipients in 2010 of which half were developing or transitional economies compared to 7 in 2009. This is mainly because the FDI is now seen as an important source of international capital, technology and better managerial practices in the developing countries which are characterized by a shortage of these.

Among the developing countries, India also encouraged FDI inflows into the country after the economic reforms of 1991 (Sasidharan and Ramanathan 2007). However, the country's foreign investment policy was highly restrictive prior to 1991. It used to rely more on bilateral and multilateral loans of long term maturities than foreign investment. While the foreign investment was permitted in designated industries it was subject to varying conditions on setting up joint ventures with domestic partners, local content clauses, export obligations, promotion of local R&D and so on (Bhattacharya et.al 2008). FDI was primarily seen as a source of acquiring industrial technology which was not available through other means of licensing and capital goods import. FDI proposals with an element of technology transfer were given clear preference, whereas the proposals with only equity component tended to be rejected (Pant 1995).

However, following the severe balance of payment crisis in 1991, the Government of India initiated a process of wide ranging economic reforms which aimed at substantial integration of the Indian economy with the global economy. The reform package

included industrial de-licensing, privatization, and international trade and foreign investment promotion measures among others. Thus FDI promotion was taken up as one of the key objectives of trade and industrial reforms and to attract FDI, the policy regime was liberalized considerably. As a first step, the government granted automatic approval for foreign equity investment of up to 51 percent in a specified list of 34 technology intensive/ capital intensive / high priority industries, and a case by case approval for foreign equity investment of up to 74 percent in 9 sectors, mostly relating to infrastructure. Gradually, FDI policy has been liberalized further and FDI upto 100 percent under the automatic route is allowed in almost all sectors except a few strategic sectors (arms and ammunition, atomic energy, railway transport, etc.) and small scale reserved sectors. Furthermore, the government has given various incentives such tax incentives, tax holidays etc. to encourage FDI. It has also signed a number of bilateral investment treaties (BITs) to protect the interests of foreign partners in ensuring the appropriate treatment and facilitating their business operations in India (Bhattacharya et.al 2008).

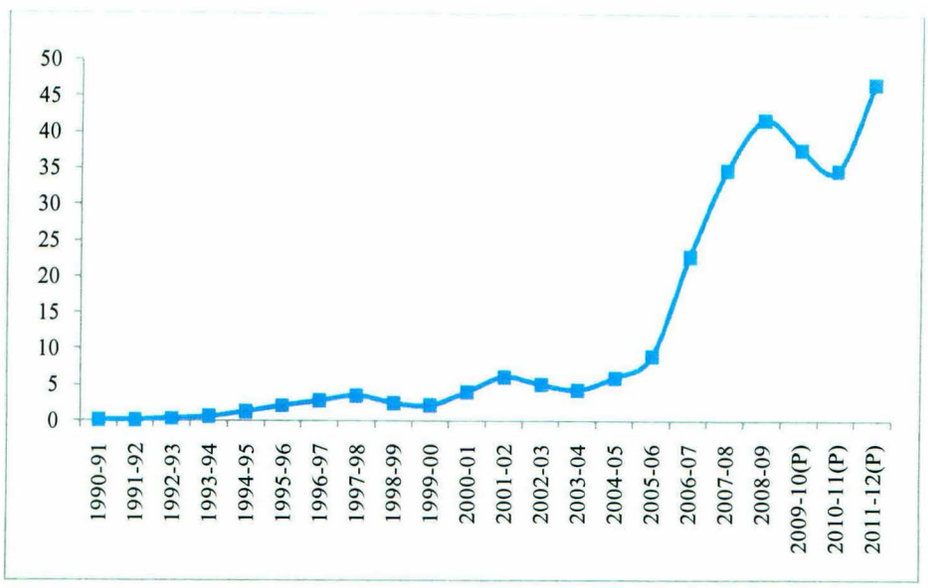
As a result of these liberalization measures adopted by the Indian government, FDI inflow in India has increased tremendously and the year 1991 marks the beginning of a new growth phase of FDI in India (Chart 1.1). For example, FDI inflows in India increased from meager USD 0.1 billion in 1990-91 to USD 47 billion in 2011-12[1]. Cumulatively FDI inflows amount to USD 256 billion from April 2000 to April 2012 (DIPP, April 2012).

India has become one of the favorite destinations for global FDI flows and a large number of foreign companies from different parts of the world have entered into India. These also include companies like General Motors and Ford Motors that had divested holdings in India during the 1950s and 1970s. A large number of Asian companies such as Daewoo Motors, Hyundai Motors and LG Electronics from South Korea, Matshushita Television and Honda Motors from Japan invested in India during this period (Bhattacharya et.al 2008). The growing FDI in India can be attributed to the availability

[1] Data on FDI has been revised since 2000-01 with expanded coverage to approach international best practices. These data, therefore, are not comparable to FDI data for previous years.

of vast untapped market, availability of low-cost skilled workers and more liberal policies of the Indian government.

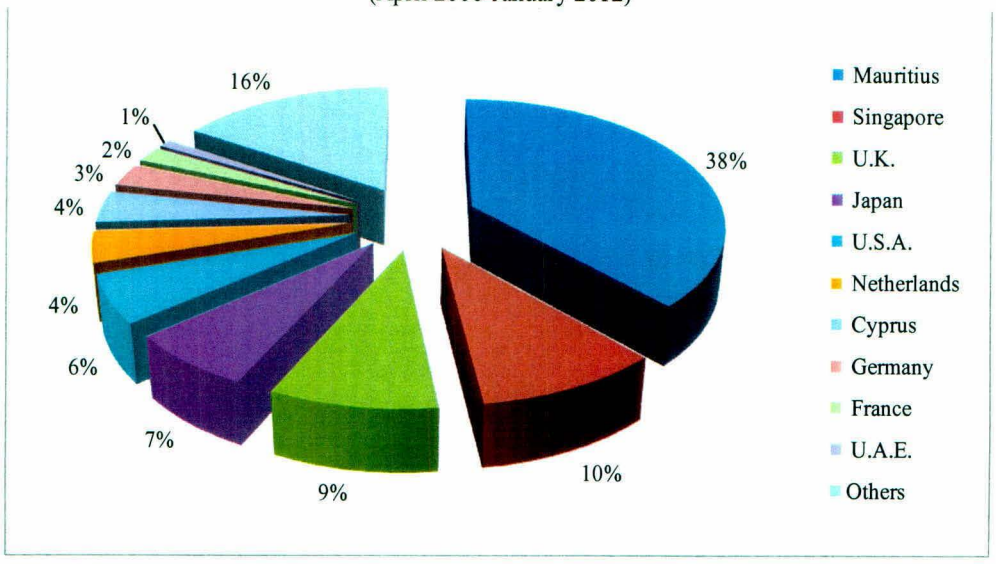
Chart 1.1
FDI Inflows in India: USD Billion



Source: Reserve Bank of India, Monthly Bulletin, June 2012.

With respect to the sources of FDI, measures by the government have lured investors from every corner of the world. The number of countries investing in India has increased. While only 15 countries invested in India in 1991, the number increased to over 132 countries in April 2012. Mauritius is the biggest investor which alone accounts for 38 percent of cumulative equity FDI inflow in India from April 2000 to April 2012 (Chart 1.2). This is primarily due to the Double Tax Avoidance Treaty between India and Mauritius. The sector attracting highest FDI inflows in India has been services which alone accounts for 19 percent of cumulative equity FDI inflows received during April 2000 to April 2012.

Chart 1.2
Share of Top 10 Investing Countries in FDI Equity Inflows in India (%)
(April 2000-January 2012)



Source: DIPP, FDI Statistics, April 2012.

The growing FDI has widely acknowledged direct benefits at the country level (boost in domestic investment and its multiplier effect on income, employment, prices, exports growth, technology growth etc.), industry level and firm level (access to better technology, management skills, and capital), however, the emphasis has now shifted to indirect benefits of FDI or to the FDI spillovers in developing countries. While the presence of foreign firms creates competition for the domestic firms through advanced technology and better organization skills, some of these advantages may not be totally internalized and a part of it may spillover to domestic firms. The spillovers can be in the form of improvement in productivity, boost in exports or better managerial practices of the domestic firms. However, domestic firms need technological base to absorb and benefit from such externalities. Thus, given the presence of foreign firms can affect domestic firms either way, it is important to examine empirically that whether the entry of foreign firms in India after the economic reforms of 1991 has been beneficial or detrimental for the performance of domestic firms (Sasidharan and Ramanathan 2007).

1.1 FDI Spillovers: Types, Channels and Determinants

By definition the spillovers or externalities are defined as the benefits accruing to the producers because of market activity of other producers (Kathuria 2001). Thus FDI spillovers are the benefits accruing to domestic producers from the presence of foreign producers. These spillovers can be broadly classified into inter-industry (vertical) or intra-industry (horizontal) spillovers. They can occur via five channels: competition, labor mobility, demonstration, exports and backward and forward linkages with domestic firms (Crespo and Fontoura 2007). The first four channels lead to horizontal spillovers and the last one leads to vertical spillovers.

Vertical Spillovers

These arise mainly by customer-supplier relationship between foreign firms and domestic firms i.e. via backward linkages of foreign firms with the suppliers of inputs or forward linkages with the domestic producers of the same product as supplier of inputs. It is generally argued that inter-industry spillovers are more likely than the intra-industry spillovers because MNCs can prevent the leakage of technology to its competitors, while it has no incentive to prevent the diffusion of technology to its suppliers or clients (Kathuria 2000).

The backward linkages arise because MNCs due to high transportation costs between their home and host country and other regulations imposed by the host country government like local content requirement etc., source inputs from domestic suppliers and in their attempt to ensure quality, they benefit domestic suppliers in a number of ways. The MNCs assists the local suppliers to achieve technical and organizational competence by providing technological assistance as well as training programmes for employees of local supplier firms (Lall 1978). This can improve the productivity of domestic firms. Furthermore, the competition amongst the domestic firms to become suppliers of MNCs can also increase their efficiency. Thus the backward linkage route can improve the productivity of domestic firms. However, negative spillovers can also

arise for domestic firms where MNCs focus on export market and in order to meet the international quality standards they source inputs from international suppliers. It may also be due to the inability of the domestic suppliers to meet their quality requirement. The domestic suppliers unable to standby the import competition will be forced to exit from the market. However, this could also encourage them to upgrade to meet the global standards and improve their productivity (Sasidharan and Ramanathan 2007). Thus the backward linkage could go either way in its impact on productivity of local suppliers.

Similarly, the forward linkage can impact productivity of domestic firms either way. MNCs by supplying high quality low cost inputs can benefit domestic producers of end consumer products. However, it can also lead to increase in prices and possibility exists that if domestic firms don't have capability to benefit from the upgrade of quality, they may face negative impact in terms of increased cost (Crespo and Fontoura 2007).

Horizontal Spillovers

They arise when the entry of foreign firms affect productivity, exports, or managerial practices of domestic firms in the same industry. They can occur via channels such as competition channel, demonstration channel, human capital movement channel and export channel.

Competition Channel: This is the most important channel by which foreign firms can generate spillovers in an industry. The entry of foreign firms induces competition and forces rival domestic firms to improve their productivity either by using their existing resources more efficiently or by investing to upgrade or adopt new production techniques in order to remain competitive. Thus FDI may result in increase in productivity of domestic firms. However, competition from foreign firms can also lead to crowding out of domestic firms. The weak domestic firms, unable to compete with technologically advanced, organizationally and managerially superior foreign firms, would be forced to exit. This is called "market stealing effect" (Aitken and Harrison 1999). So, the positive spillovers from competition effects arise only if domestic firms are not far below the

technologically frontier (Sasidharan and Ramanathan 2007). Thus competition channel could impact local firms either way.

Demonstration Channel: The successful implementation of new production technologies and better organizational/ managerial practices by the foreign firms encourages domestic firms to fast learn, imitate and adopt them rather than when they have to bear the entire cost as well as the uncertainty of results of introducing a new technology. Thus this channel can improve the productivity of domestic firms. However, as Barrios and Strobl (2002) suggests the relevance of this effect increases with similarity of the goods produced by the two types of firms in the case of spillovers related to product and process technology. There are, however, other types of technology that may also spillover, such as management and marketing technology; in these cases, similarity of products may not be important (Crespo and Fontoura 2007).

Human Capital Channel: The manpower in foreign firms is generally more educated, skilled and well experienced in technology. The mobility of these trained workers from foreign firms to domestic firms can also lead to positive productivity spillovers. This is because these workers generally take the technology of the MNCs to domestic firms (Kathuria 2000). However, multinationals can prevent such labor mobility by paying higher wages which in turn may lead to a reverse labor turnover with employees of domestic firms moving to foreign firms. In this case there would be negative spillovers. Furthermore, if the training received by the laborers in foreign firms is in a more firm specific technology spillover via this channel would be less because it would be more costly for domestic firms to adopt that technology to their own production process.

Export Channel: The presence of foreign firms by spreading the information about foreign markets can boost the export activity of domestic firms and in an attempt to be competitive in the international market the domestic firms may improve their productivity.

Others: Spillovers can also arise by channel of financial market. Foreign firms' given their size and other advantages of being a part of a global system of production, usually

have preferential access to local capital through financial institutions in the host country. This may lead to credit rationing for small sized local firms by reducing their access to capital or raising costs of borrowing (UNCTAD 1999, Pradhan 2002).

Thus these channels in addition to spillovers in terms of change in productivity and exports, can also lead to improved managerial or organizational practices of domestic firms. This is because foreign firms exhibit improved practices like just-in-time, quality assurance, quality circles etc. which are pre-requisites for effective and efficient use of the newer technology by domestic firms (Kathuria 1996).

Thus as discussed above, spillovers (horizontal and vertical) can positively or negatively influence the overall conduct and performance of domestically-owned firms, however, their existence, sign and magnitude depends upon a multiplicity of factors such as features of host countries, industries and firms as well as on the characteristics of foreign firms, and of foreign investment. They can broadly be divided into following categories:-

Firm Specific Characteristics

Absorptive capacity of domestic firm and technological gap[2]: The ability of domestic firms to benefit from spillovers depends upon their absorptive capacity (Pant and Mondal 2010, Kathuria 2001). This is because technology is tacit in nature and needs to be de-codified. It requires R&D investment on the part of domestic firms to de-codify it. The more it invests in learning more it would be able to absorb potential spillovers. In other words, spillovers depend upon the technological gap of domestic firms vis-à-vis foreign firms. There is one line of argument which maintains that spillovers are negatively related to technological gap. It is argued that wide gap will obstruct domestic firms to absorb the technological advantage which is not automatic and requires capacity on the part of recipient to absorb it (Kathuria 1996, Lapan and Bradhan 1973). The other line of argument says that spillovers are positively related to technological gap because large gap opens more opportunity for the domestic firms to learn and reach higher level of

[2] Crespo and Fontoura, 2007

efficiency via imitation of foreign technology (Wang and Blomstrom 1992). Despite of varying line of arguments, the two lines of thoughts maintain that that a threshold level of technical gap is required to absorb spillovers (Kathuria 2000). A too small technological gap would lead to transfer of only few benefits to domestic firms (Kokko 1994).

Export capacity of domestic firms: It is argued that for an export intensive domestic firm, the relevance of domestic market decreases and so does the relevance of competition imposed by presence of foreign firms. So, the spillovers are likely to be less for this firm from the presence of foreign firms. However, it is also likely that the exporting firms which are already exposed to foreign competition will have greater ability to absorb the foreign technology and counter the competition provided by foreign firms in local market and thus would benefit more.

Size of domestic firms: Spillovers also depend upon the size of domestic firms. It may be difficult for small firms to compete with technologically advanced large foreign firms (mainly due to their low scale) and therefore are expected to suffer more from the presence of foreign firms (Aitken and Harrison 1999). Thus the large firms are expected to benefit more from the presence of foreign firms.

FDI Characteristics

Source of FDI: The source of FDI is a very important determinant of FDI spillovers because FDI comes from different countries with different levels of technology, different modes of transferring it, and into different industries (Banga 2003). Therefore, FDI from different countries can have different spillover effects. In an attempt to test this empirically Banga (2003) examined the spillover effects of Japanese and U.S. FDI on the total factor productivity growth of Indian firms. The results confirm that Japanese FDI has positive spillovers while U.S FDI has insignificant spillovers.

Entry mode of FDI: When foreign firms enter via mergers or acquisition, technology transfer occur gradually thereby restricting, or at least delaying, spillovers. While, when FDI occurs through the mode of green-field investment, the introduction of the new

technology is instantaneous. Note, however, that in the latter entry mode, the MNE typically adopts the home country technology and establishes a technological system that may differ substantially from that in the host country, thus limiting the scope for spillovers. When FDI occurs through a merger or acquisition, the starting point is the host country's technology, which creates a wider potential for FDI spillovers through demonstration (Crespo and Fontoura 2007). Furthermore, foreign firms due to their pre-integration in the local economy, in case of acquisition or merger, are likely to establish wider linkages with domestic firms than Greenfield investment and hence generate more spillovers.

Degree of foreign ownership: It has been argued in the literature that minor foreign ownership reduces the incentive for the parent firm to transfer more advanced technology to its affiliate and thus reduces the possibility of spillover (Ramachandran 1993). However, another line of argument is that greater domestic ownership can enable easier access to foreign technology and thereby can create wider inter-sectoral linkages with the local economy (Takii 2005, Toth and Semjen 1999).

Host Country Characteristics

Level of Development: FDI spillovers also depend upon the characteristics of host country. In less developed countries, the wages differential between domestic and foreign firms is usually high making the labor mobility from foreign to domestic firms difficult (Lipsey and Sjoholm 2004). Thus spillovers through the labor mobility channel are likely to be less in less developed countries.

Regional/ Distance Effect

Spillovers also depend on distance between the domestic and foreign firms. This is because the channels of spillover such as labor mobility, demonstration, competition, and vertical linkage are reinforced at the regional level (Girma 2003, Girma and Wakelin 2001, Jordaan 2005, Torlak 2004). The labor mobility, demonstration and competition

channels become weak with increasing distance between domestic and foreign firms. Similarly, vertical linkages are limited by high transport cost associated with greater distance.

Others

Trade policy: Spillovers are expected to be more in more liberal regime because in such a regime FDI is expected to be more as market size is no longer a constraint and investment resources could be used more efficiently. However, Kokko et. al (2001), asserts that in an inward looking regime spillovers are likely to be more because in such a regime foreign firms in order to succeed use technologies which are not available to domestic firms and thus creates vast potential for spillovers via imitation for domestic firms. Whereas in an outward oriented regime the advantages of foreign firms are more likely to be based on their better international distribution and marketing networks and less on new production technologies. This though could create export spillovers but they are expected to be of less importance than spillovers which are likely to occur in inward looking regime.

Focus of foreign firms: If foreign firms focus on export market and domestic firms on local market and the goods produced for the two markets use different production processes, spillovers are likely to be less via demonstration (Javorcik 2004). However, backward spillovers can occur in the above case if the inputs requirements imposed by foreign firms are greater.

Level of competition: The strong competition in the local market forces foreign firms to use more advanced technology in order to maintain their market share (Wang and Blomstrom 1992). Thus spillovers are expected to increase with competition in the local market. However, if foreign firms protect their technological advantage due to high level of competition, technological spillovers are likely to be low.

Motive of FDI: The Motive of a foreign firm to locate abroad also determines the existence of spillovers. FDI is generally believed to be technology exploiting i.e. when it locates abroad with firm-specific advantage which enables it to compete successfully

with local firms. However, it could be also be technology-sourcing i.e. when foreign firm locate abroad with the incentive to gain access to the technological advantages of local firms. Clearly, the spillovers are expected to occur when FDI is technology-exploiting (Driffield and Love 2003a, 2003b).

Intensity of using intermediate inputs: Spillovers through backward linkages are also dependent on intensity of intermediate inputs usage by foreign firms.

1.2 Literature Review

In the last four decades, significant amount of empirical work has been done to estimate spillovers from FDI and their determinants. On the international level, a large number of studies have been done on the relationship between FDI spillovers and local productivity growth for developed, developing and transition economies. They can be grouped into three categories – showing significant positive spillovers, showing significant negative spillovers and those showing insignificant or mixed results.

In the first group, one of the earliest studies on developed countries examining productivity spillovers from FDI to host country is of Caves (1974). Caves identified the impact of foreign presence on value added per worker in Australian local manufacturing industries and found positive spillovers. The study concludes that the presence of relatively high subsidiary shares is associated with higher levels of productivity in competing domestic firms. Globerman (1979) replicated the approach of Caves (1974) and investigated the existence of indirect economic benefits of FDI in Canada for a sample of Canadian manufacturing industries. The study concludes that a part of labor productivity differences across Canadian-owned plants is derived from spillover efficiency benefits associated with foreign direct investment. The studies on developing countries showing positive spillovers include Blomström and Persson (1983), Blomström and Wolff (1994), Blomström and Sjöholm (1999), and Chuang and Lin (1999). Blomström and Persson (1983) examined whether differences in technical efficiency of Mexican plants in part derive from spillover efficiency associated with foreign direct investment. The empirical evidence indicates that there are efficiency spillovers from

foreign-owned to domestically-owned plants. Blomström and Wolff (1994) examined the impact of the operations of foreign-owned multinational firms on the productivity growth of Mexican manufacturing industries during the period 1965-1984. The results indicate that productivity levels of locally-owned firms in Mexico have converged to those of foreign-owned firms. Blomström and Sjöholm (1999) using Indonesian data found that labor productivity is higher in establishments with foreign equity than in domestically owned firms and the latter benefit from spillovers from FDI. Chuang and Lin (1999) using Taiwanese firm-level data confirm that foreign direct investment and R&D have a positive impact, or spillover effect, on productivity.

The second group i.e. the studies showing negative spillovers includes Aitken and Harrison (1999) and Djankov and Hoekman (2000). Aitken and Harrison (1999) using panel data on Venezuelan plants tests for spillovers from joint ventures to plants with no foreign investment. The results indicate negative spillovers from foreign investment on the productivity of domestically owned plants. Djankov and Hoekman (2000) using firm-level data for the Czech Republic shows that joint ventures and foreign direct investment have negative spillover effect on the total factor productivity growth of firms that do not have foreign partnership.

The third group (studies showing insignificant or mixed results) includes studies such as Haddad and Harrison (1993), Girma and Wakelin (2000), Girma and Wakelin (2001), and Kinoshita (2001). Haddad and Harrison (1993) found that sectors with high levels of foreign investment have a lower dispersion of productivity levels across firms, moving domestically-owned firms closer to the efficiency frontier. However, there is no significant relationship in the sample between higher productivity growth in domestic firms and greater foreign presence in the sector. Although domestic firms do exhibit faster productivity growth, it cannot be attributed to a higher foreign share. Girma and Wakelin (2000) found evidence of positive spillovers from the presence of foreign firms for domestic firms in the same sector and region as the foreign firms. However, there are negative spillovers if the domestic firms are located in a different region but the same sector. Girma and Wakelin (2001) investigated whether an increase in foreign presence in a sector raises the productivity of domestic firms in UK. They found no aggregate

evidence of intra-industry spillovers, however, some are experiencing positive effects, others negative, but overall these are cancelling each other out. However, firms with low productivity relative to the sector average, in low-skill low foreign competition sectors gain less from foreign firms. Kinoshita (2001) using firm-level panel data on Czech manufacturing firms found no evidence of technology spillovers to local firms from having a foreign joint venture partner.

Thus the results of these studies are contradictory and there has been no consensus on the findings. However, the existence of spillovers is now very well established nevertheless debate still remains about their overall size and significance. The possible explanations given for the contradictory findings of these studies include differences in the characteristics of host country (as highlighted in the first section above), differences in methodology and data sources used. Some studies use cross-section data, while others use panel data. Some are aggregate in nature and while others are firm level analysis. Some have used partial measures of productivity such as labor productivity, while others have used total factor productivity.

In India the studies examining productivity spillovers from the presence of foreign firms are limited and are fairly mixed in their results. This section does a comprehensive review of FDI spillover literature in India to identify the research questions for this study.

Basant and Fikkert (1996) examined the impact on productivity of Indian firms' own R&D expenditures, their technology purchase (TP) expenditure, and foreign and domestic R&D spillovers using panel data for Indian manufacturing firms from the period 1974-75 to 1981-82 and R&D data from 9 countries. The results of the study show that private returns to technology purchases are high and statistically significant, while the private returns to firms own R&D expenditures are somewhat lower and are often insignificant. There is also evidence of both international and domestic spillovers.

Kathuria (1996) examined the influence of foreign presence on the dispersion of productivity of domestic firms. The study used Cobb-Douglas production function (for total factor productivity estimation) and panel estimation technique on the RBI data

drawn from the finances of 388 large public limited companies belonging to 8 major industries from 1984-85 to 1998-89. The results of the study suggest positive productivity spillovers with dispersion of productivity being lower in sectors with high foreign firms. The study also shows that the spillovers are positive only for the firms belonging to low-technology sectors. This implies that for spillovers to occur the technology gap between domestic and foreign firms should not be too high.

Kathuria (2000) examined whether domestic firms in the Indian industry have benefited from the two forms of disembodied technology transfer i.e. FDI or arm's length transaction or not. Therefore, it tests the hypothesis that the presence of foreign firms and foreign technical capital stock in a sector leads to reduced dispersion in efficiency in the sector over time and fall is more for the firms that invest in R&D activities. The study employed stochastic production frontier and panel estimation technique on data from the ISID (Institute for Studies in Industrial Development) for 368 large sized firms from 1975-76 to 1988-89. The results of the study show that there exist negative spillovers from the presence of foreign firms in the sector, but available foreign technical capital stock has a positive impact. However, differences emerge when the sample of firms is divided into scientific and non-scientific groups. Results indicate that for the scientific subgroup the spillovers are not automatic consequence of foreign firm's presence, but they depend to a large extent on the efforts of local firms to invest in learning or R&D activities so as to decodify the spilled knowledge. On the other hand, the evidence of spillovers to non-scientific non-FDI firms is not very strong.

Kathuria (2001) using panel data for 368 medium and large-sized Indian manufacturing firms for the period 1975-1976 to 1988-1989 from ISID tested for the spillover hypothesis that presence of foreign-owned firms and disembodied technology import in a sector leads to higher productivity growth for domestic firms'. The results indicate that there exists positive spillovers from the presence of foreign-owned firms but the nature and type of spillovers vary depending upon the industries to which the firms' belong. There exist significant positive spillovers for the domestic firms belonging to the 'scientific' subgroup provided the firms themselves possess significant R&D capabilities. However, for the 'non-scientific' sub group presence of foreign firms itself forces the

local firms to be more productive by inducing greater competition. However, the results change marginally when the initial level of productivity (i.e. the technology-gap) is considered. The results indicate that domestic firms in the 'scientific' sectors tend to learn from the foreign firms' presence but the gain is more for the firms that are relatively away from the efficiency frontier (i.e., gap is large) and having significant R&D capabilities. On the other hand, results show that for 'non-scientific' domestic firms, after their initial level of productivity is accounted for, it is the firms which are closer to the frontier that tend to gain more in terms of productivity improvement.

Kathuria (2002) examined whether liberalization has improved the productivity of local firms and whether the spillovers from technology transfer have increased in the liberal regime. The study used stochastic production frontier and panel estimation based on the Prowess database for 487 firms belonging to 24 three-digit manufacturing industries for the period 1989-90 to 1996-97. The results of the study show that there exist negative spillovers from both the presence of foreign firms and the foreign disembodied technology import in the sector. The results also suggest that only those firms that engage in R&D activities tend to gain from the presence of foreign firms in the sector. These results remain the same for non-FDI firms alone too. If the non-FDI sample is bifurcated into scientific and non-scientific firms, the results show that only scientific non-FDI firms have benefited from the liberalization. For the non-scientific firms, the impact is found to be productivity depressing.

Pradhan (2002) examined the spillovers effects of FDI in Indian pharmaceutical industry on the efficiency growth of local firms using the Prowess database from 1989-90 to 2000-01. The study used firm-specific productive efficiency growth and fixed effect model. The results of the study show that the FDI spillovers are not significant and have no independent effect on the efficiency growth of domestic pharmaceutical firms unless it is complemented by the latter's R&D activity or size. In other words, in an industry where majority of the firms are small sized and where majority of the firms do not engage in innovative activities the spillover benefits from a liberalizing FDI policy can at best be limited. Therefore, the study concludes that policy efforts to encourage R&D and some concentration of size of the domestic firms in the industry may be more desirable than

passively liberalizing the FDI policy from the point of view of increasing productive efficiency of local enterprises.

Banga (2003) examined whether the source of FDI is important in determining its spillover effects on domestic firms and empirically tested the spillover effects of Japanese and U.S. FDI on the total factor productivity growth of Indian firms, both at the firm and industry level. The study used time-variant firm specific technical efficiency approach and Capitaline database from 1993-94 to 1999-2000. The results of the study show that the presence of Japanese equity in the industry has positive spillovers while the market share of Japanese firms is negatively associated with the productivity growth of the Indian firms. However, the net spillover effect at the industry level is positive. Spillovers from the U.S FDI are however not significant both at the firm level and industry level.

Banga (2004) examined the impact of Japanese and U.S FDI on the total factor productivity growth of firms in Indian automobile, electrical and chemical industries in the post reform period. The study did firm level analysis using time-variant firm specific technical efficiency approach and Capitaline database for the year 1993-94 to 1999-2000. The results of the study show that Japanese affiliation has a significant positive impact on the productivity growth of a firm while the impact of US affiliation is not found to be statistically significant. Interestingly, domestic firms in these industries are found to have higher productivity growth as compared to U.S. affiliated firms. The analysis also shows that U.S. affiliated firms rely mainly on technological improvements to achieve productivity growth while the major thrust to productivity growth in Japanese affiliated firms comes from efficiency improvements. An important result arrived at by the study is that domestic firms have witnessed both efficiency growth as well as technological progress in the electrical and chemical industries in the post reform period. This indicates "catching-up" with high productivity levels of foreign firms in the same industry.

Siddharthan and Lal (2004) examined the impact of FDI spillovers on the productivity of Indian firms for the post liberalization years 1993-2000. The study using Capitaline database estimated both balanced and unbalanced panel models, however, it argues in favor of using an unbalanced panel that takes into account the entry and exit of firms. The

results of the study confirm the existence of positive spillovers from the presence of MNCs on the labor productivity of local firms. The study also shows that during the initial years of liberalization, spillovers effects were modest, but they increased sharply over time. Also firms with better endowments in terms of productivity and technology benefited from liberalization and MNE presence. Firms with large productivity gap became victim.

Crespo and Fontoura (2007) surveyed the arguments that support the factors determining the existence, dimension, and sign of FDI spillovers and the empirical evidence already produced on these. The review by the paper shows that FDI spillovers depend on many factors, with an undetermined effect. However, the absorptive capacities of domestic firms and regions are preconditions for accommodating the benefits of these FDI externalities. Regarding the remaining factors, the results show contrary effects or, in some cases, are still insufficient to draw reliable conclusions.

Sasidharan and Ramanathan (2007) examined the vertical and horizontal spillovers effects from the entry of foreign firms in the Indian manufacturing industries. The study used Prowess database for the period 1994-2002. Consistent with the findings of the previous studies which either shows negative or insignificant horizontal spillovers, the study found no evidence of significant horizontal spillover effects. The likely reason assigned for the lack of horizontal spillovers is that the foreign firms can prevent the leakage of technology to its competitors in the same industry. The study couldn't validate the recent debate that spillovers are more likely to occur across industries than within the same industry. It shows negative vertical spillovers, though they are not statistically significant. It can be because foreign firms are unable to find local suppliers which could satisfy their quality requirements. Furthermore, foreign firms picking only productive local firms to source inputs can also lead to less productive domestic firms experiencing no productivity improvement.

Bhattacharya et.al. (2008) examined spillovers from foreign direct investment, research and development, and exporting activities on productivity of both foreign and domestic manufacturing firms. The study used panel estimation using the Prowess database of

CMIE (Centre for Monitoring Indian Economy) from 1994 to 2006 for over 1000 manufacturing firms. The results of the study show that the liberalization of foreign investment has played a significant role in improving productivity and competitiveness of Indian manufacturing firms. The findings indicate that there are positive spillovers from the presence of foreign firms on the productivity of the Indian manufacturing firms compared to the alternative spillovers from R&D and exports which are negative.

Pant and Mondal (2010) examined spillover benefits of technology transfer and the determinants of such transfer via spillover to local firms. The study used Cobb Douglas production function and fixed effect model on the firm level data of five two-digit manufacturing industries' drawn from the Prowess database of CMIE for the time period 2000-01 to 2006-07. The findings of the study indicate that spillovers are more likely to be achieved by presence of foreign firms rather than by simple purchase of foreign technology. It also shows that the absorptive capacity of firms and the degree of competition in an industry are the significant determinant of technology spillovers and thus the study argues for an important enabling role of the government in determining technology transfer/spillover to local firms.

Thus it emerges clearly from the literature review that studies have examined spillovers from FDI in Indian manufacturing sector as a whole, while no study has so far examined spillovers from FDI in Indian automotive industry (OEMs and auto-component). The Indian automotive industry has received massive FDI inflows since 1991 and is vital for the overall growth of the economy given its contribution to GDP, employment generation, tax revenues etc. While, many studies have been done on the Indian automotive industry, most of them have focused on examining the impact of de-regulation/liberalization on the competitiveness or growth of automobile firms or on reviewing the policy environment and evolution of the industry. These studies are reviewed below:

Narayanan (1998) examined the impact of deregulation policy introduced in India during the mid 1980s on technology acquisition and competitiveness of firms in the Indian automobile industry. Using pooled regression technique and ten year data from

1980-81 to 1989-1990 for cars and other four wheeled drives, LCVs and HCVs from the annual reports and balance-sheets of individual companies, the results of the study show that technology acquisition explain much of the firm level differences in competitiveness in both licensed and liberalized periods. In addition, vertical integration also appears to be an important determinant of competitiveness. The study finds that during the 1980s, technology acquisition through imports of technology and in-house R&D efforts explains much of differences in competitiveness, as measured by changes in market share, at the firm level, in the Indian automobile industry. Based on an econometric analysis, which considers technology acquisition, skill intensity, component imports, firm size, product differentiation, age and vertical integration as the determinants of competitiveness, Narayanan finds that competitiveness has depended on the ability to build technological advantages, even in an era of capacity licensing. This is facilitated by complementing imported technology with in-house R&D efforts.

Narayanan (2001) using step-wise discriminant analysis compared the conduct and performance of Indian automobile firms operating under two different economic policy regimes i.e. regulated [1985-86 to 1990-91] and liberal [1991-92 to 1995-96]. The study covered all firms manufacturing cars, other four-wheeled utility vehicles, LCVs and M&HCVs and compared them on different elements of conduct and performance such as technology acquisition, import of components, vertical integration, product differentiation, capital intensity, profits, growth and exports. The results of the study confirm the hypothesis that the conduct and performance of firms in Indian automobile industry differ significantly between the two policy regimes with respect to foreign equity participation, in-house R&D efforts, technology imports, capital intensity, advertisement, exports, growth and profits.

Piplai (2001) studied the policy environment and examined the effect of liberalization on the Indian vehicle industry particularly in the spheres of production, export, marketing, technology tie-up, product upgradation and profitability together with the structural changes in the corporate focus to meet the fierce competition in the market and cater to the needs and aspirations of consumer. The study shows that in the post-liberalization period the automobile industry underwent a sea change. It evolved from a suppliers'

market to a buyers' market, number of models available in the market increased, and marketing and procurement strategy of the manufacturers also entailed a total change. However, the performance of the Indian vehicle industry de-stabilized in the post-liberalization period. The rate at which the vehicle market was growing in 1970s and 1980s couldn't be sustained and it came down substantially. The vehicle production during 1993-96 did grow due to freeing up of the economy from the long protective oppression and fulfilling of the unfilled demand of 1980s, however, in the later part of the decade, the demand could not be sustained at double digits. This is due to the absence of rise in real income, dismal performance of agriculture and poor infrastructural facility in the road sector etc. The expansion of production capacities by the Indian firms and the entry of foreign firms with huge installed capacity along with latest technology infused competition and instability in the industry. The fierce competition pushed up selling costs and brought down profitability of the industry. To stay competitive in the industry, the old Indian firms shifted focus towards cutting down expenditure, developing a strong brand quality war and followed a differentiation strategy with the help of their uniqueness in design, technology, features, customer services, dealer network etc. The study noted that except infusing a high degree of unsustainable competition, nothing remarkable is achieved by the industry in the post-liberalization till date.

Narayanan (2004) analyzed the determinants of growth of firms in the Indian automobile industry during three different policy regimes, namely, licensing (1980-81 to 1984-85), deregulation (1985-86 to 1990-91), and liberalization (1991-92 to 1995-96). The study used two-way fixed effect estimation of the growth function on the data drawn from the balance sheets and publications of ACMA (Automobile Components Manufacturers Association) and SIAM (Society of Indian Automobile Manufacturers). The results of the study show that differences among firms in terms of technology acquisition explain much of the firm level variation in growth. Role of technology is governed by the technological regime in which a firm operates. In a licensed regime, firms with foreign equity grew at a faster pace than others because of the resource advantage they had for growth. In a deregulated regime, import of capital goods was the only technology-related variable that enabled firms to achieve high growth. In a liberal

regime, growth is positively influenced by the intra-firm transfer of technology. Thus the changing role of technology acquisition variables in determining growth is also borne out by the results of the study.

Narayanan (2006) using Tobit model analyzed the determinants of export intensity of firms in the Indian automobile industry in three alternate policy regimes i.e. licensing (1980-81 to 1984-85), deregulation (1985-86 to 1990-91) and liberalization (1991-92 to 1995-96). This study was based on the grounds that there is a systematic difference in the characteristics and performance of firms that export and those which cater to the domestic market. The difference is mainly in terms of technological acquisition, which in turn depends on the policy regime in which a firm operates. The results of the study show that inter-firm variation in export intensity is mainly explained by technology acquisition, firm size, vertical integration, capital intensity, and import of components. The study also shows that there is a difference in the role played by all these variables in explaining export intensity across three policy regimes.

Sharma (2006) using Divisia-Tornquist index of the estimation of the total factor productivity growth, analyzed the productivity (both partial and total factor productivity) growth of the Indian automobile industry for the period 1990-91 to 2003-04. The results of the study show that the Indian automobile industry could not experience productivity gain over the study period. The results on partial factor productivity indices also corroborate the TFP deterioration in this industry. Among the partial factor productivity indices only labor productivity witnessed maximum gain, while the productivity of other three inputs i.e. capital, energy and materials didn't show any significant improvement. Labor productivity increased mainly due to increase in capital intensity.

Burange and Yamini (2008) in order to assess the competitiveness of firms in Indian automobile industry in domestic market, constructed a competitiveness index for a sample of fourteen firms for the year 2005-06. The results of the study show that about 50 percent of the fourteen sample firms have recorded above industry average performance from all the segments of the automobile industry. Maruti Udyog scored highest in the group due to its better performance on non-financial indicators such as

productivity performance, customer satisfaction etc. The study found a marginal difference between the competitiveness of different firms suggesting a tough competition among firms in the Indian automobile industry.

Narayanan and Vashisht (2008) analyzed the determinants of competiveness of Indian auto industry based on a field survey and a quantitative analysis of secondary data. The field survey covered 45 automotive firms from all over India, of which 31 were auto-component firms and 14 were Original Equipment Manufacturers (OEMs). The study tried to understand that how the automobile industry's success is quite directly linked to the trade and industrial policy reforms initiated in the early 1990s and highlights that all the segments of Indian auto sector are growing at a fairly high rates and their productivity as well as export intensity is on rise after the reforms. Domestic sales are also rising, but they have declined in certain sub-segments of vehicles. The R&D expenditure has been scarce. Effective rate of protection of automobile assembly is far higher than that of auto-components manufacturing. Unorganized sector, which is quite significant in auto-component manufacturing, has grown more rapidly in the urban areas than in the rural areas. The study also identified critical constraints that prevent the industry from further expansion in the global share and emerge as one of the major production and export hubs in the coming years. These include constraints such as the shortage of skilled manpower along with poor infrastructure, fluctuating steel prices and unavailability of land at reasonable price. The econometric analysis carried out in the study suggests various measures that could be taken by the government, particularly, the credit facilitation for SMEs. The study also suggests that the government could facilitate the industry in becoming more competitive by taking steps such as structural fiscal reforms, cut in import duties of raw materials and capital goods, promotion of R&D and FDI, training facilities, research-backed negotiations of FTAs, roadmap for harmonising emission norms across the country and infrastructure improvement. Industry, on the other hand, should improve its R&D capabilities and market research.

Rajalakshmi and Ramachandran (2011) discussed the causes and impact of FDI inflows on the Indian automobile sector and also on policy regulation. The study concludes that FDI inflows have shown significant growth in the Indian automobile

industry in the post liberalization period and the automobile manufacturers have acquired new success and confidence in the last five years. They are no longer afraid of competition from the international auto players. Although the foundation for strong auto industry was laid in early 1990s, real momentum has been building only since 2000. This is when the government has significantly changed its policies, taking steps to make manufacturing more internationally competitive by creating export promotion zones and expanding infrastructure. The Indian government also freed industry from excessive regulations five years ago. India's auto policy 2002, allows global automobile manufactures to have 100 percent ownership, which has created a healthy industry right from the start. Consequently, the automobile sales are expected to experience a boom in the coming years and it might see a couple more automotive giants invading the Indian territories and locking horns with the Indian titans.

1.3 Objectives of the Study

It is clear that no study has so far examined the impact of FDI on the productivity of domestic firms in the Indian automotive industry which witnessed several landmark policy changes during the last decade and displayed its best performance since its evolution. However, given the importance of automotive industry from the standpoint of overall industrial and economic growth of the country, it is important to examine this question that how has the opening up of the industry to foreign investment and foreign competition impacted the productivity of domestic firms in the industry.

This study fills this gap in literature and is the first one to examine productivity spillovers from FDI in Indian automotive industry (for both vehicle and auto-component segments separately). It examines only horizontal productivity spillovers which are one of the important and acknowledged spillovers in the literature. It considers three set of issues:

1. What is the impact of FDI on the productivity of domestic firms in the Indian automotive industry or whether the government's initiative to open up the sector to 100 percent FDI during the last decade has paid off or not?

2. What are the determinants of productivity spillovers in Indian automotive industry?
3. What policy initiatives are required to ensure or facilitate that domestic firms' benefit from FDI spillovers?

Hypothesis

With the presence of more technologically advanced foreign firms the domestic firms face stiff competition which forces them either to improve their productivity by using their existing resources more efficiently or by investing to upgrade/ adopt new production techniques or leave the industry (Kathuria 1996). In either case, the dispersion of productivity in an industry should go down. Given the Indian automotive industry received massive FDI inflows and witnessed immense entry of foreign firms - mostly with advanced technology and capital, in the last decade which threatened the sustainability of domestic firms and encouraged them to upgrade their technological base, it is expected that the productivity of domestic firms in the industry would have improved. Thus the hypothesis to be tested is:-

H_0: the presence of foreign firms has reduced the dispersion of productivity in the Indian automotive industry. In other words, there are positive productivity spillovers from the presence of foreign firms in the Indian automotive industry. On the contrary, negative spillovers are said to occur if the dispersion of productivity increase with the entry of foreign firms.

1.4 Plan of the Study

After setting the background of the study in Chapter 1, Chapter 2 discusses data sources and methodology used in the study with details on construction of variables. Chapter 3 details the history of evolution of the Indian automotive industry from various policy frameworks and their impact on the development of this industry. Chapter 4 analyzes the current structure and performance of the industry during the last decade when various key

policy decisions have been undertaken. It also identifies the constraints faced by the industry alongwith key policy initiatives taken by the government to stimulate it. Chapter 5 presents the empirical findings of the study. Chapter 6 concludes.

Chapter 2

Data Sources and Methodology

2.1 Introduction

To estimate spillovers from FDI an important proxy considered in the literature is the effect of foreign presence on the dispersion of productivity in an industry. The study uses this proxy and tests the hypothesis that the presence of foreign firms reduces the dispersion of productivity in Indian automotive industry. The ensuing sections detail the data sources and methodology used in this study to test this hypothesis.

2.2 Data Sources and Description

The study uses secondary data sources. The firm-level data for econometric analysis has been drawn from the Prowess database of the Centre for Monitoring Indian Economy[3]. The initial sample of automobile firms consisted of 50 firms, but most of them were dropped due to the discontinuity of data for several years[4]. Nevertheless, the final sample, which consists of 20 automobile firms (7 foreign firms and 13 domestic firms), comprises major firms of each segment (details given in Appendix A). Similarly, in case of auto-component firms' initial sample consisted of 434 firms and after dropping the firms for which continuous data was not available, the study left with a final sample of 84 firms (25 foreign firms and 59 domestic firms, details given in Appendix B).

For analyzing the current structure of the industry in terms of production, sales, and exports, data from SIAM (Society of Indian Automobile manufacturers) has been taken. The other data sources used in the study are ASI (Annual Survey of Industries) and Office of the Economic Advisor.

[3] The database covers mainly listed firms. This is why it doesn't include some of the automobile firms which have high market share but not listed on stock exchange. For example, Toyota Kirloskar.

[4] The criteria's applied for deleting a firm from the sample are (1) GFA, sales and salaries and wages data missing for consecutive two yrs and (2) foreign equity participation data missing completely.

The study covers a ten year time period from 2001 to 2010 and constitutes balanced panel. The choice of the time period is guided by twin considerations of (a) opening up of the automotive industry to 100 percent FDI during the aforesaid period and subsequent massive inflow of FDI into the industry (b) non availability of firm level time series data for a large number of firms for prior 2001 period.

2.3 Model Specification

The first step to estimate productivity spillovers is to estimate productivity and relative productivity dispersion. Since labor and capital both are important factors of production, total factor productivity (TFP) is estimated at a firm level instead of using partial factor productivities (labor productivity has been used as a measure of firm level productivity in many spillover estimating studies in literature). In line with the other studies, Cobb Douglas production function has been used to estimate TFP (Pant and Mondal 2010). The production function has been estimated for all the firms included in the sample to get the firm specific productivity. The production function can be written as

$Y_{it} = A_{it} F(L^{\alpha}_{it}, K^{\beta}_{it})$

Where Y_{it} = Real Gross Value Added of firm i at time t

L_{it} = Labor input used by firm i at time t

K_{it} = Capital input used by firm i at time t

A_{it} = Productivity of firm i at time t. It is assumed to vary across firms because different firms differ in terms of their technical capabilities, organizational skills, quality of human resource etc.

The function in its log form can be written as

$$\ln Y_{it} = \ln A_{it} + \alpha_{it} \ln L_{it} + \beta_{it} \ln K_{it} \quad \text{..... (2.1)}$$

The estimation of the above equation gives us TFP of each firm for each year where the residual measures the TFP.

2.3.1 Relative Productivity Dispersion

To estimate relative productivity dispersion, the firm with highest productivity is considered as the most efficient firm i.e. the firm which is on the production frontier, while the other firms are considered to be the laggard firms. The gap between the two measures the absolute productivity dispersion and the presence of foreign firms which leads to increased competition and induces local firms to operate more efficiently is expected to reduce this gap over time.

If there is N number of firms, there would be N productivity estimates given by a_{1t}, a_{2t}.....a_{Nt} for year t. From this, we can get the productivity of the most efficient firm in the industry for the year t i.e. a_t = max (a_{it}) and the dispersion of firm i from the most efficient firm can be calculated as:

$$Z_{it} = a_t - a_{it} \qquad (i = 1.....N, t= 2001....2010)..... (2.2)$$

A high value of Z_{it} in absolute terms implies that the firm i is very inefficient relative to the most efficient firm at the industry at time t. The relative dispersion of the firm level productivity from the best practice frontier can be measured by $P_{it} = Z_{it} / a_t$. This variable P_{it} has been used as the dependant variable in estimation (Kathuria 1996, Pant and Mondal 2010).

2.3.2 Factors Affecting Productivity Dispersion

The second step to examine productivity spillovers from FDI is to check the impact of foreign firms' presence on the dispersion of productivity in the automotive industry. The dispersion of productivity in an industry, in addition to spillovers from FDI, depends on a number of firm specific factors. The following are the firm specific factors that have been controlled for in the present study:

Firm Specific Factors

Capital Intensity (K/L): As the capital goods encompass latest technological developments which stimulate productivity growth, the higher capital intensity in a firm is expected to be associated with higher productivity of that firm.

R&D Expenditure (R&D): The productivity of a firm also depends upon its R&D expenditure. The firms which spend more on R&D have greater capability to develop new products and technology and also absorb technological development. Thus the firms spending more on R&D are likely to be more productive than other firms.

Size of the firm (SIZE): The productivity of a firm depends upon its size. The large sized firms because of their size have greater scope to go in for technological innovation and upgradation and they can enjoy the economies of scale. Hence they are expected to exhibit higher productivity than the smaller firms.

Export Intensity (EXPINT): The productivity of a firm depends upon its export intensity. An export intensive firm is likely to be more productive than a firm which serves only local market. This is because export oriented firms have access to crucial information about foreign markets such as latest technology, skills and products. Further, they operate in highly competitive international export market which forces them to be constantly productive and competitive to survive in international market. Export intensive firm can also achieve strong economies of scale by expanding the market for its product through international trade which can cut down its production cost/ increase productivity. Thus the productivity of a firm is expected to be positively associated with its export intensity. This is also confirmed by many empirical studies which suggest that firms serving export market are more productive than firms exclusively serving domestic markets (Girma et. al., 2002, Kraay 1999).

Capital Goods Import Intensity (KGM): Just like in-house R&D which shows firm's own technology development, the import of capital goods shows import of embodied

foreign technology by a firm. Thus capital goods import intensity is also expected to be positively associated with the productivity of a firm.

Spillover Variables

The study uses two proxy variables for the presence of foreign firms in the Indian automotive industry:

(1) Spill_1 = It is a measure of the physical presence of foreign firms in the industry. It is calculated as the share of 'foreign firms' sales in total industrial sales. A foreign firm is defined as one where the foreign equity participation is 10 percent or more since the last three years[5] (Pant and Mondal, 2010 and Pant and Pattnayak 2005)

(2) Spill_2 = Disembodied technology imports

The spillovers from the presence of foreign firms don't take place automatically rather they depend upon a number of firm specific factors such as R&D capability of domestic firms, their size etc. Illustratively, the technology brought in by the foreign firms is tacit in nature and needs to be decodified. This requires R&D investment by the local firms to decodify it. That's why the firms with higher R&D activities are likely to be in a better position to benefit from the presence of foreign firms. To capture this, the study uses interaction variables between R&D expenditure and spillover variables i.e. Spill_1*R&D and Spill_2*R&D.

Similarly, the large sized firms can benefit more from the presence of foreign firms. This is because large sized firms enjoy economies of scale and therefore are better placed to imitate the technology brought in by the foreign firms. Also they can better compete with technologically advanced foreign firms. To capture this effect, two interaction variables i.e. Spill_1*SIZE and Spill_2*SIZE have been used in the study.

Thus, the final estimated model is defined as below:

[5] This is the commonly used threshold level in most of the studies.

$$P_{it} = \mu + K/L_{it} + R\&D_{it} + SIZE_{it} + EXPINT_{it} + KGM_{it} + Spill\_1_t + Spill\_2_{it} + Spill\_1_t * R\&D_{it} + Spill\_2_{it} * R\&D_{it} + Spill\_1_t * SIZE_{it} + Spill\_2_{it} * SIZE_{it} + \delta_{it} \quad \ldots\ldots (2.3)$$

2.4 Construction of Variables

Real Gross Value Added (RGVA): Gross value added of a firm is obtained as Total Sales – (raw material expenses + power and fuel expenditure)[6]. The nominal GVA so obtained is then deflated by industry specific wholesale price deflators (WPI, 1993-94 = 100) available from the Office of Economic Advisor.

Labor Input: The Prowess database doesn't provide data on total numbers of workers employed by firms. It only reports expenditure on wages and salaries. So, to get a measure of labor input a mapping of firms with the 3-digit industries of Annual Survey of Industries (ASI) is done. By dividing the data on total emoluments by total person engaged of the corresponding industry to which these firms belong from ASI, emolument per person or wage rate for the relevant industry group has been obtained. Then the series on salaries and wages obtained from the Prowess database for each firm is divided by the computed wage rate to get a measure of labor input for each firm (Kathuria 2000).

Capital Input: For estimating capital input, the method used by Kathuria (2000, 2002) and Basant and Fikkert (1996) has been used. As the capital stock {proxied by Gross Fixed Assets (GFA) as in Kathuria 1996 and 2000} reported in companies' annual reports is at historical cost, this need to be brought at their replacement cost i.e. at constant 2000-01 market prices in case of present study as this is the initial period of this study.

Using the available information for 2001 and in absence of the knowledge of exact age distribution of the capital assets for a particular firm as on 2001, average age (AA) of each firm's capital stock has been calculated using the below mentioned formula. It is assumed that full depreciation of capital stock takes 16 years. This implies that if we assume straight-line depreciation method, then capital is depreciating at a rate of 6 percent per annum.

[6] Pant and Mondal (2010).

Thus, average age of the firm would be

$(GC_{2001} / 16) * AA = AD_{2001}$ ..... (2.4)

Where GC is gross fixed assets in 2001, AD_{2001} is the accumulated depreciation of capital in the first year of data, 2001

Using the value of AA obtained from equation (2.4), a price deflator of capital[7] was constructed for each firm's capital stock to deflate from the year "2001-AA" to the year "2001." If this capital deflator for firm i is called CDi and if the depreciation rate is 6 percent, then the net capital stock for firm i in 2001, C_{2001} is equal to

$C_{2001} = (GC_{2001}/CDi)*(1 - 0.06)^{AA}$ ..... (2.5)

If PC_{2002} is the price deflator for investment for 2002, then C_{2002} for firm i is

$C_{2002} = C_{2001} (1 - 0.06) + (GC_{2002} - GC_{2001})/PC_{2002}$ ..... (2.6)

Equation (2.6) was also used to compute C_{it} for the subsequent years, giving a capital-stock series net of depreciation and expressed in constant 2001 prices.

Table 2.1
Construction of the Explanatory Variables

Variable	Definition
$(K/L)_{it}$	Capital–Labor ratio of the i^{th} firm at time t
$R\&D_{it}$	Measured as ratio of i^{th} firm's R&D expenditure (Current and Capital) to total sales of the i^{th} firm for the year t
$SIZE_{it}$	Share of i^{th} firm's sales in total industrial sales at time t
$EXPINT_{it}$	Share of i^{th} firm's forex revenue from exports in total sales of the i^{th} firm for the year t
KGM_{it}	Share of i^{th} firm's forex expenditure on import of capital goods in total sales of the i^{th} firm for the year t
$Spill\_1_t$	Share of foreign firms' sales in total industrial sales[8] for year t
$Spill\_2_{it}$	Ratio of i^{th} firm's forex expenditure on royalties, technical fees and licensing fees to total sales turnover of the i^{th} firm for the year t

[7] WPI of Machine and Machine Tools
[8] Industrial sales refer to total sales of the sample firms not the total industrial sales.

Chapter 3

Evolution of the Indian Automotive Industry[9]

3.1 Introduction

The Indian automotive industry is more than six decades old and has undergone a major transformation from its nascent state at the time of independence in 1947 to its present day dynamic form. Illustratively, the production of vehicles in India increased exponentially from meager 10000 vehicles imported/ assembled in 1950 to around 18 million vehicles produced in 2010-11 and India surpassed France, UK and Italy to become the 6th largest manufacturer of vehicles in the world. Today, India is the largest manufacturer of tractors and three wheelers, 2nd largest manufacturer of two wheelers, 5th largest manufacturer of commercial vehicles and the 4th largest passenger car market in Asia (GOI 2012). The industry has 19 manufacturers of passenger cars and MUVs, as compared to hardly three to four companies in 1980s. It is home to almost all major global OEMs (Original Equipment Manufacturers) which along with strong and growing domestic firms are producing a wide range of automobile and auto-components catering to both domestic and international market. Thus, the industry is now operating in the dynamics of an open market and is scripting one of the remarkable chapters in its history of evolution. It has the potential to emerge as one of the largest in the world.

The Indian automotive industry acquired the aforementioned dynamism from early 1980s and particularly after 1991 when the Indian economy was liberalized and opened to foreign trade and investment. However, prior to that it was a highly regulated, closed and supplier's market. It was protected from both internal and external competition and used to be characterized by very few firms suffering from low volume of production, and

[9] Consists of both vehicle and auto-component segment. The historical account of various policies presented in this chapter with respect to the Indian automotive industry is drawn mainly from the works of Ranawat and Tiwari (2009), Narayanan and Vashisht (2008), Narayana (1989), Sumantran et al. (1993), Kathuria (1996), Pinglé (1999), Piplai (2001), and Singh (2004).

obsolete and substandard technology (Narayanan and Vashisht, 2008)[10]. The industry embarked on a new growth journey with de-licensing in 1991 and subsequent opening up of the sector to 100 percent FDI through automatic route under the Auto Policy 2002. With the liberalization of the foreign investment policy, FDI in Indian automotive industry has increased and an increasing number of foreign firms have entered into the industry either by way of technical or financial collaborations with the domestic firms or as a wholly owned subsidiary. They have entered either as a market seeker or as a low cost seeker. Because of the resulting intense competition, the firms are reorienting their strategy to offer customer specific products to lure them. Thus the face of Indian automotive industry has changed completely as we see it today.

The evolution of the Indian automotive industry from a poor performing industry to a dynamic flourishing industry, through the various five year plans, can be broadly divided into three phases i.e. (1) Regulation phase – pre 1980 (2) Limited deregulation – 1980s, and (3) Liberalization phase – post 1991. The division is based on major policy changes undertaken and their significance in shaping the evolution of Indian automotive industry.

3.2 Regulation Phase: Pre 1980

The evolution of automobile in India dates back to the end of 19th century when the first motor car was imported into the country in 1898. Then for next 30 years there was no attempt in the country to either assemble or manufacture vehicles. It was only in 1928 and 1930 when General Motors (GM) and Ford respectively established their assembly plants in the country seeing the promising automobile demand. The beginning of Indian automotive industry was marked only in early 1940s with the establishment of Hindustan Motors Ltd. (HML) by the Birlas in 1942 and Premier Automobiles Ltd (PAL) by the Walchand Hirachand Group in 1944. The two companies established their manufacturing plants in technical collaboration with GM and FIAT respectively. Notwithstanding, the production by these companies started only after India's independence (PAL started

[10] Pre1983, the Indian automobile industry was dominated by following key manufacturers – Hindustan Motors, Premier Automobiles, Telco (now Tata Motors), Ashok Leyland, Mahindra and Mahindra (M&M), Standard Motor Products of India, and Bajaj Auto.

production in 1947 and HM in1948, Ranawat and Tiwari 2009). Thus till the end of 1940s, vehicles were either fully imported or assembled from parts imported in CKD (completely knocked down) condition by foreign assemblers and there was no manufacturing of vehicles undertaken in India.

After independence, India moved on a planned development path and so does the Indian automotive industry. The Industrial Policy Resolution (IPR) of 1948 recognized the strategic importance of automotive industry and classified it as the industry of basic importance. Accordingly, it was subjected to regulation and control by the central government. The role of state was more of a controller and the initiatives within the sector were left to the private enterprises. Then in accordance with the objectives laid out by IPR 1948 i.e. to conserve nation's foreign exchange reserves, prevent unfair foreign competition and incentivize assembly over mere imports, the Ministry of Industry prepared its first automotive policy in 1949. Under the policy, the tariff barriers on import of fully-built vehicles (CBU form) were raised nearly banning their import into the country. This eliminated the unfair foreign competition in the automobile market and protected the final product i.e. the complete vehicle.

The IPR 1948 was followed by the Industries Development and Regulation Act (IDRA) 1951 which introduced the licensing system in the Indian industry. According to this Act, automotive firms were required to obtain licenses from the government for establishing a new unit, to expand output by more than 5 percent annually, for capacity expansion, diversification, change location, foreign collaborations, imports of machinery and components etc. The underlying rationale behind the licensing on the part of the government was to protect the Indian industry from foreign competition and thus to avoid fragmentation and uneconomic scales of production. However, excessive protection created little incentive for the domestic firms to innovate and upgrade and led to inefficiencies in production. This was evident rom the poor and outdated models of vehicles at that time.

In order to provide further protection and encouragement to indigenization in the Indian automotive industry, the government adopted the programme of progressive manufacturing recommended by the Tariff Commission in its first report submitted in

1953. Under the programme, only those units which had a plan of progressive manufacturing of complete vehicles and auto-components were allowed to operate. In addition, a minimum 50 percent indigenous content requirement as per the Tariff Commission recommendation was introduced. As a result, foreign assemblers like GM and Ford due to low levels of demand closed down their operations and exited the market. Thus during this phase a combination of high tariff on import of CBUs and exit of foreign assemblers protected the Indian automotive industry from foreign competition and had a significant influence on the development of indigenous industry. The commission approved the manufacturing plans of HML, PAL, Automobile Products of India (API), Ashok Motors, Standard Motor Products of India, M&M and TELCO and thus by the end of 1955 there were only six approved manufactures in the industry.

The industrial policy was revised in 1956. The revised industrial policy provided the automotive industry with necessary autonomy for functioning and it was left to the initiatives of the private sector with state retaining the right to intervene as and when necessary (Ranawat and Tiwari 2009). Amid this, the Second Five Year Plan (1956-1961) was launched which laid emphasis on the industrial development and targeted raising local content requirement of the automobiles to 80 percent by the end of plan in 1960-61. The plan laid more emphasis on the production of trucks.

Due to increasing emphasis on local manufacturing, the automobile prices started rising during this period and the government imposed lower import duties on the components still being imported to keep prices low and to encourage domestic production. It approached the Tariff Commission for the second time in 1955 to recommend a price policy for the automobiles. The commission in line with its first report recommended against the price controls. The problem of rising automobile prices intensified during the balance of payment crisis that emerged during the Second Five Year Plan in 1956-57. To deal with the crisis the government imposed various restrictions on automobile industry such as permitting firms to produce only one model each, cut in foreign exchange allocation to automobile industry leading to less import of components etc. However, these steps led to demand supply gap in automobile industry and there was a steep rise in prices of automobiles. The government also imposed informal price control to keep them

under check but the prices continued to be high and performance of industry continued to be lackluster during the entire 1950s.

Then the government appointed L.K. Jha Committee to look into the question of prices of automobiles, reduction in costs etc. (Ranawat and Tiwari 2009). In its report submitted in 1960, the Committee sighted the lack of competition and consequent poor operational efficiency, as the main contributor to high costs of automobiles. Furthermore, the vertically integrated industrial structure promoted by (a) lack of well-developed ancillary segment (b) the indigenization policy, and (c) foreign exchange allocation incentives of in-house manufacture, was also identified as one of the contributors to high cost. Accordingly in line with the recommendation of the Committee, encouragement was given to the development of a separate auto-component industry in India. This marked the beginning of auto-component sector in India.

In order to encourage the participation of small scale sector in the auto-component sector, which was so far limited to the replacement market and small scale jobs from the large auto-component manufacturers, various kinds of financial incentives were given. The small-scale and ancillary sectors were also freed from the licensing requirements. Apart from these, the government also provided protective rate of tariff on aftermarket ancillaries produced by the small-scale sector. Furthermore, 60 to 80 components were exclusively reserved for manufacture by the small-scale sector in 1965. These steps while giving boost to the small-scale sector, created a fragmented auto-component industry– a feature continue to characterize the Indian auto-component industry even today.

In between the Third Five Year Plan (1961-66) was launched which also emphasized on indigenization to relieve pressure on already stressed foreign exchange reserves. Accordingly, it aimed at raising the local content requirement to 85 percent by the end of 1966. The plan laid emphasis on the production of CVs and two-wheelers. Post this plan, the regulations on Indian automotive industry increased further.

An important change came in the development of Indian automotive industry with the election of Mrs. Indira Gandhi as the Prime Minister of India in 1967. During her ten year rule till 1977, some important policy changes were undertaken which increased the

regulation of the automotive industry. In 1966, the government referred to the 3rd Tariff Commission the question of continuing protection to the automotive industry, enquiring the cost structure and determining the reasonable selling price of different types of automobiles. The Commission recommended price control on passenger cars and suggested that the government should help industry attain a minimum efficient scale by limiting the number of models to an absolute minimum (Ranawat and Tiwari 2009). The government following the recommendations imposed price controls on passenger cars in 1969.

More strict controls on foreign equity collaboration were also imposed in 1968 following the recommendations of the Mudaliar Committee appointed by the government. Accordingly, the Foreign Investment Promotion Board (FIPB) was set up in 1968 to monitor and review foreign technology acquisition by foreign equity participation. Monopoly and Restrictive Trade Practices Act (MRTP) was also enacted in 1969 to prevent concentration of economic power in few hands, which brought many automotive firms under the purview of MRTP Commission. The enactment of Foreign Exchange Regulation Act (FERA), 1973 also strengthened regulations. The FERA Act with the objective of ensuring judicious use of nation's foreign reserves regulated the imports which in turn imposed further restrictions on the automotive industry in the form of constraints on the import of raw materials, auto-components, and technology. Thus the enactment of FERA, MRTP, and FIPB increased regulations on the Indian automotive industry.

The implementation of the Fourth Five Year Plan in 1967 was delayed due to the financial crisis in the country by mid 1960s. Poor agricultural productivity and India's war with China and Pakistan were mainly responsible for this. After three Annual Plans from 1967 to 1969, the Fourth Five Year Plan was implemented in 1969. The plan, in line with the previous plans, laid emphasis on CVs and two-wheelers which were considered to be the means of affordable public and personal transport. The passenger car segment continued to be regulated and no additional capacity was planned for this segment.

The Oil Crisis in 1973 impacted the Indian automotive industry very badly. The Ministry of Industry in order to deal with the rising import bill of crude oil and consequently rising

balance of payment crisis decided to promote low fuel efficiency in Indian automobiles. The auto industry was accordingly divided into luxury and non-luxury segments. The growth and development of the non-luxury segment was encouraged by the ministry by various means such as favorable treatment of their applications for capacity expansion, foreign collaborations etc. However, Oil Crisis led to a slowdown in the auto industry across all segments by raising the fuel prices. Slowdown in demand impacted the passenger car segment the most. In 1975 price controls on passenger car segment and two and three wheeler segments were removed. This helped the passenger car segment.

The Fifth Five Year Plan (1974-79), gave encouragement to the growth of two-wheelers to provide fuel efficient and affordable mobility to the fast growing middle class. Consequently, the plan saw the entry of many new firms like Maharashtra Scooters and Majestic Auto. The existing firms also diversified into two-wheeler segment. For example, Bajaj Auto diversified into the production of motorcycles. During the plan some relaxations in the licensing regulations were also made. For example, the 'automatic growth rule' was applicable to CVs, tractors and ancillaries since 1975 and capacity expansion without limit was allowed for non-MRTP and non-FERA companies in these segments. However, the relaxations were subject to certain conditions such as the product should not be the one reserved for the small-scale sector etc.

Thus this phase (prior to 1980) marked the beginning of India's indigenous automotive industry[11]. It was characterized by increased protection (ban on import of CBUs, creation of FIPB), regulation (Licensing, MRTP, FERA), and indigenization (phased manufacturing programme, local content requirement). As a result of these efforts to achieve self-reliance by the government, an indigenization level of above 90 percent was achieved in almost all automobiles and components by the end of this phase (Narayana 1989). During this phase there was a clear bias towards the development of CVs and two-wheelers while the passenger car segment - considered to be a luxury segment, was regulated.

[11] Consists of both automobile and auto-component segment.

However, the performance of automotive industry during this phase was mixed. While the excessive protection provided created little incentive for the automotive firms to innovate and upgrade and hence created inefficiencies in production, it also led to the development of indigenous industry with strong manufacturing and limited design capabilities. Various auto centric institutions like ACMA, SIAM, Vehicle Research and Development Establishment (VRDE), and Development Council for Automobiles were also established during this phase.

3.3 Limited Deregulation Phase – 1980s

The aforementioned first stage in the history of development of the Indian automotive industry led to the poor performance of the industry by subjecting it to excessive controls and regulations and thereby ensuring lack of competition. Only limited number of firms were operating in the Indian automotive industry prior to 1980s with little incentive for technological up-gradation. Therefore the government in early 1980s decided to take steps to make the industry more competitive. The IPR 1980 and the Sixth Five Year Plan (1980-85) represented this by policy shift and focused towards easing controls on licensing and foreign collaborations, easing restrictions on import of capital goods, foreign technology and raw-material, encouraging exports, and ensuring optimal utilization of installed capacities.

These steps brought important changes in the Indian automotive industry. Particularly, the passenger car segment which was hitherto treated as luxury segment underwent a major change. It along with UVs and 2/3-wheeler segments was included in the Appendix-1 list[12]. The government also participated in the segment in order to improve its competitiveness. Consequently, state-owned enterprise Maruti Udyog Ltd. (MUL) entered into collaboration with Suzuki of Japan in 1982[13]. The first car was rolled out by the JV in 1984 and this changed the face of India's automotive industry.

[12] The segments included in the list are treated more favorably with respect to applications for capacity expansion, foreign collaboration etc.

[13] Until 1982, only three manufacturers i.e. Hindustan Motors, Premier Automobiles and Standard Motors had tenanted the motor car sector.

The most important change during the phase was drive for modernization and consequent easing of restrictions on import of technology to encourage the existing firms to upgrade their technology. The idea was to induce competition and more fuel efficient technologies in the industry. In order to encourage and enable passenger car firms to import technology and upgrade their technological base and improve fuel efficiency, fiscal incentives were provided. As a result of these measures several Joint Ventures (JVs) were established between domestic firms and Japanese firms for technology transfer and equity participation and the domestic firms upgraded their technological base. The two-wheeler segment also saw many new entries. For example, LML in collaboration with Vespa, Kinetic Honda and Hero Honda in collaboration with Honda Motors of Japan entered the market. The existing firms also entered into collaborations with Japanese automotive firms like Bajaj Auto with Kawasaki, TVS Motors with Suzuki and Escorts with Yamaha. With regard to the CV segment, Ashok Leyland collaborated with Hino (Japan) for new engines. TELCO on the other hand made greater investments in its internal R&D capability (Ranawat and Tiwari, 2009).

Thus, the entry of Japanese collaborators brought about fundamental change in the structure of the Indian automotive industry. The structure of passenger car segment particularly changed. With the entry of new firms, old firms faced significant competition and two big car manufacturers i.e. HML and PAL lost their market leadership position to MUL. The industry witnessed concentration and near monopoly position in the car segment. Whereas in LCV segment the existence of several manufacturers created fragmentation and low-economic volumes of production.

The auto-component segment also witnessed considerable change in manufacturing technologies during this phase. The changes in product designs to make vehicles fuel efficient increased the demand for components made of plastics, fibers and aluminium which in turn necessitated the technology upgrade for the auto-component manufacturer as well. They also entered into collaborations with foreign firms. Furthermore, the segment also saw the entry of Japanese auto-component manufacturers who entered the market following their OEMs and partnered with Indian firms. Thus the Japanese world class technology made its way into the Indian automotive industry. However, the

insistence on high quality components and timely deliveries created unrest within the segment and then came the Motor Vehicle Act, 1988. The Act mandated the components used in the Indian vehicles should be certified under the standards laid by Bureau of Indian Standards. Apart from this the auto-component segment was de-licensed in 1985 under IDRA for non-MRTP and non-FERA companies with the condition that the firm was not located within urban or municipal limits. Further, for MRTP/FERA companies the de-licensing was applicable for investment in backward areas. Encouragement to the small-scale sector was also continued during this phase (Ranawat and Tiwari 2009).

The automotive industry was a net user of foreign exchange during this phase and was experiencing uneconomic scale of production due to low domestic demand. Therefore both the Sixth and Seventh Five Year Plans, in order to attain favorable terms of trade and to support a higher utilization of production capacities, laid emphasis on exports. Various measures to promote exports were implemented which included simplification of procedures for exports, easy availability of licenses for 100 percent export-oriented units and easy expansion of existing units for the purpose of exports, amongst others. As a result the export of the automotive industry doubled over the period 1984-85 to 1988-89.

In order to ensure the fullest utilization of installed capacities, the policy of broad-banding was introduced by the government in 1985 to allow the manufacturers to use their installed capacity flexibly. Under the broad-banding policy, the licenses were issued to automotive firms for a broader product group instead of issuing licenses for a single product. Within the broader product group, the automotive firms were free from licenses to diversify as long as that diversification didn't necessitate any new investment in machinery. Thus manufactures could decide the product mix to be produced and therefore, could make optimal utilization of their installed capacities. Under the policy, three automotive segments i.e. CVs, UVs, and passenger cars were grouped into one product group. Using this opportunity, TELCO diversified into the LCV and UV segment. Similarly, 2/3 wheelers were grouped into one group.

In addition to the above relaxations and measures to improve the performance of the industry during this phase, some other relaxations were also undertaken. These included exemption of all the automobile and auto-component manufacturers from the MRTP

approvals from 1985 and launching of 'minimum economic scale' scheme to encourage firms to achieve economic scale of operations.

Thus this phase was characterized by limited liberalization measures. However, the policy decisions taken during this phase had a considerable impact on the development of Indian automotive industry. Particularly, the modernization drive played an important role in upgrading the technological base and infusing competition in the industry. Others measures such as broad-banding policy, relaxation in MRTP approvals, relaxation in import of capital goods, raw material, machinery etc. supported this drive. As a result of liberal measures, passenger car segment became a core industry and the consumers had a wide range of advanced and fuel-efficient products to choose from. The emphasis on indigenization continued during this phase. Under the phased manufacturing programme, all the vehicle and component JVs were required to achieve 95 percent indigenization within five years of start of production

3.4 Liberalization Phase – Post 1991

This phase began with the balance of payment crisis and subsequent liberalization of the Indian economy. In 1991, the Government of India launched a massive economic reform programme. The reform programme was wide ranging consisting of deregulation of the industrial sector, financial sector reforms, trade and investment policy reforms, foreign exchange reforms, and tax reforms. Thus under the reform programme, most of the regulations and controls were removed and market forces were assigned a central role for the first time since independence.

The New Industrial Policy launched in 1991, with the aim of creating a more competitive environment, removed the barriers to entry and growth. The important policy changes introduced were removal of the industrial licensing for all the industries except a few industries of strategic importance, automatic approval of FDI upto 51 percent in high-priority industries (all automotive segments fall under this category), amendment of MRTP Act, automatic clearance for imported capital goods with the condition that the

foreign exchange required is available through foreign equity, and disinvestment in public sector enterprises.

These policy changes had a significant influence on the functioning of Indian automotive industry which was highly regulated and protected in the prior two phases. With the removal of licensing and MRTP approvals the automotive industry was free for entry, expansion, diversification, relocation, and for merger or acquisition. This encouraged domestic firms to undertake entrepreneurial ventures. The removal of phased manufacturing programme (in 1991 for new units and in 1994 for the existing units) encouraged global firms like GM and Ford who had earlier left the market to re-enter. The removal of restrictions on foreign investment i.e. the automatic approval of FDI upto 51 percent in the industry encouraged many global firms to enter into the Indian automotive market and thus infused world-class technology into the industry. The tariff rates on various auto-related imports and import of capital goods were also reduced. For example, the tariff on auto-related imports went down from a peak of 150 percent in 1991 to 50 percent in 1995 (Kathuria 1996).

Thus the opening up of the economy to foreign investment, reduction in tariff barriers, and existence of vast untapped domestic market attracted major global auto firms in the Indian automotive market and led to intense competition – in terms of both price and quality. The intense competition in turn led to a shifting focus of the firms towards cutting down cost and delivering products of high quality to attract customers. The attempts towards cutting cost led to a total complete change in the procurement and marketing strategy of industry. The procurement activity emerged from a fragmented one earlier to a total value chain.

The passenger car segment with vast untapped potential witnessed the highest entry of foreign firms which transformed it from an oligopolistic segment earlier to one of the most competitive segment in the industry. The foreign entry was mainly by way of joint ventures with the local firms. For example, Mercedes-Benz with TELCO (1994), General Motors with HML (1994), Peugeot with PAL (1994), Daewoo with acquisition of DCM-Toyota (1995), Honda Motors with Siel Ltd. (1995), Ford with M&M (1996), Hyundai with a 100 percent -owned subsidiary (1996), Fiat with Tata Motors (1997) and Toyota

with Kirloskar Group (1997). In the CV segment, Tatra in collaboration with Vectra Motors (1997) and Volvo with its 100 percent -owned subsidiary (1997) made their foray into the Indian market (Ranawat and Tiwari, 2009). However, since most of these JVs initially proposed to assemble only SKD/CKD kits, the government considering the balance of payment situation imposed foreign exchange neutrality on them under which these companies were required to commit an equivalent amount of exports. The objective was also to emphasize localization of components. This enabled the domestic auto-component industry to further develop capability to manufacture the new breed of auto-components required for the new generation vehicles (GOI 2006a). In the two/three-wheeler segment, foreign collaborators of 1980s either acquired majority stake in the JVs or established independent subsidiaries into the country.

The automotive policy in this phase improved from time to time to create investor-friendly environment. Particularly, starting the last decade (2000-2010), several key policy changes have been done. For example, the requirement of foreign exchange neutrality was abolished for the new investors in 2000 and for the already-existing foreign investors in 2002. Furthermore, import of automotive vehicles in Semi Knocked Down (SKD)/ Completely Knocked Down (CKD) form or in CBU form was also put on the Open General License list (import of capital goods and auto-components were put under this list in 1997 i.e. no license was required on their imports while vehicle manufactures were required to undertake a Memorandum of Understanding with the Director General of Foreign Trade to import vehicles in CBU or SKD/CKD form) for the new investors since 2001. The quantitative restrictions on imports were also removed from 2001.The auto policy was launched in 2002 with the vision of establishing a globally competitive automotive industry in India under which automatic approval for foreign equity investment upto 100 percent of manufacture of automobiles and component was granted. The 'Automotive Mission Plan 2006-2016' was launched in 2006 by the government to accelerate and sustain growth in the automotive sector (see section 4.6 of chapter 4 for more details). During this period, the auto companies collaborated with financial firms to provide auto financing and insurance services to customers. The manufacturers also introduced systems to improve capacity utilization and adopted quality and environmental management systems (GOI 2006a). In addition to

the above measures, the government also rationalized domestic tax structure to enable domestic manufactures to compete with international firms. For example, the excise duty on passenger cars came down from its peak rate of 66 percent in 1991-92 to 24 percent in 2008-09.

Thus this phase is characterized by the liberalization of economic policies and creation of investor friendly and competitive environment in the Indian automotive industry. The removal of controls and regulations with respect to foreign investment, import of critical inputs, licensing, and abolishment of local content requirement brought about a dramatic change in this industry. They led to the restructuring of the industry by increasing the number of foreign firms and by encouraging the domestic firms to undertake expansion and new ventures etc. This has resulted in fierce competition in the industry and has raised the technological competence of India's automotive industry. With rising competition and technological competence, the Indian consumer has benefited most with large variety of vehicle to choose from.

The impact of these liberalization measures on the structure and performance of the Indian automotive industry, alongwith growth drivers and challenges faced by the industry is discussed in next chapter in detail. The policy initiatives to deal with the emerging problems are also discussed in the next chapter.

Chapter 4

Current Overview of the Indian Automotive Industry[14]

4.1 Introduction

The Indian automotive industry entered into a new growth phase with the liberalization of the industry in 1991. Within two decades of economic reforms the production of vehicles has increased exponentially from just 2 million vehicles manufactured in 1991 to about 18 million vehicles manufactured in 2010-11[15]. The automotive industry attained a total turnover of USD 73 billion in 2010-11 of which the turnover of the automobile industry was USD 53.1 billion[16] and that of auto-component industry was USD 40 Billion[17]. The exports of the industry amounted to USD 11 billion in 2010-11 of which the exports of vehicles and auto components stood at USD 6 billion and USD 5 billion respectively (GOI 2012).

India has become the center of attraction for the global auto makers who are penetrating into the market and setting up their production facilities either through joint ventures with local partners or as subsidiary of their parent companies. Illustratively, global auto majors such as Ford, Toyota, Suzuki and Hyundai have set up their car manufacturing plants in India and using it as an important manufacturing base to source their market requirements both for India as well as the global market (Rajalakshmi and Ramachandran, 2011). This global entry has been driven by a combination of both pull and push factors. On the pull side, high growth of the Indian economy since 1991 and consequently rising per capita income and middle class have attracted the global auto majors to Indian market. Furthermore, the availability of trained manpower at cheap cost, proximity of India to key markets such as growing Asian economies and emerging markets like Africa, a well

[14] Consists of both vehicle and auto-component manufacturers.

[15] 2010—11 is the latest period for which data is available.

[16] This also includes a portion of turnover of auto-component industry. Therefore the sum of turnover of automobile and auto-component industries separately is more than the turnover indicated for the whole industry.

[17] ACMA.

developed auto-component industry, and cost effectiveness have added to the attraction of the Indian market. On the push side, the near stagnation of auto markets in countries like USA, EU and Japan has forced the auto makers to look for new markets (GOI 2006a).

The resulting intense competition in the industry has encouraged Indian auto manufactures to upgrade their technology base to withstand the competition. The technology is being upgraded either through in-house R&D efforts or through technology acquisition. While the R&D efforts of domestic firms earlier used to be directed mainly towards adapting the design (obtained from foreign partners) for in-house production or local demand conditions, the threats and opportunities presented by globalization have encouraged domestic firms to develop in-house core R&D skills - product design and development skills (Ranawat and Tiwari 2009). The success of these efforts is manifested in the increasing number of 100 percent indigenously designed, developed and productionized vehicles being launched successfully and that too at very competitive rates. The first fully indigenously developed car 'Indica' was launched by Tata Motors in 1999. Subsequently, many indigenously developed models have been launched such as Mahindra Scorpio, Tata Indigo, TVS Scooty, Bajaj Pulsar, Tata Ace etc[18]. The growing technological capability of Indian manufacturers was widely acknowledged worldwide with the launch of world's cheapest car 'Nano' by Tata Motors in 2009. This has provided an average Indian consumer a broad range of automobile models to choose from at a competitive price and have raised their expectations. Thus both market forces and consumer preferences are driving innovation in the vehicle market and the market which was earlier a supply side driven market with only few models, has transformed to a buyer side driven market.

The high growth in the industry has been driven by a combination of demand and supply side factors. On the demand side, a buoyant economy, rising per capita income, growing middle class, increasing urbanization, new products launches, and easy availability of attractive finance (after the financial sector reforms of 1991) have contributed to the growth of the sector. On the supply side, the opening up of the sector to foreign firms has

[18] The cost of development of these platforms in India is one-tenth of global cost (Chenoy 2007).

pushed the technical efficiency of the sector by infusing competition and providing access to advanced technology. The productivity in the automotive industry is improving by almost 20 percent per year, which is one of the highest in Indian manufacturing sector (GOI 2006a).

The automotive industry with its deep forward and backward linkages with several other segments of the economy (such as iron, steel, glass, plastics, rubber etc.) and consequent strong multiplier effect of industrial growth has been recognized by the government as an industry with a very high potential to increase the share of manufacturing in GDP, exports and employment. The productivity in automotive industry in India is substantially higher than other sectors and it has a huge potential for further improvement, which in turn can pull up the competitiveness of the entire manufacturing sector through enhanced movement of goods and people in the economy. Further, it helps in attaining two critical goals of the common minimum programme i.e. of increasing manufacturing output and of providing employment. Indirectly, it also facilitates the third objective of increasing agricultural productivity through farm mechanization and the needs of agri produce transportation (GOI 2006b). Thus automotive industry is one of the key sectors of the Indian economy. In 2010-11, the contribution of the automotive industry to manufacturing GDP and excise duty was at 22 percent and 21 percent respectively. The contribution of automotive industry to national GDP is 6 percent (up from 2.8 percent in 1992-93). It is a significant generator of employment and provides direct and indirect employment to approximately 13.1 million people in the country (GOI 2012)[19].

Despite of this high growth of the industry in post 1991, its contribution in global terms remains low. In 2010-11, even though the production of passenger cars reached close to 3 million, India's share in world's production of passenger cars was just 5 percent. Similarly, the share of India's automotive exports in global automotive trade is only 0.5 percent.

[19] For every additional commercial vehicle produced in the country 13 new jobs are created, every additional car adds five jobs, every two wheelers creates one job and a three wheeler around 4 jobs (Chenoy 2007).

The ensuing sections provide an account of the current structure and performance of the Indian automotive industry during the last decade when certain key policy decisions were taken.

4.2 Current Structure of the Indian Automotive Industry

The Indian automotive industry is characterized by the presence of both domestic and foreign firms. The resulting intense and healthy competition in the industry has ensured availability of vehicles of all price ranges to suit customer's preferences. The introduction of investor friendly trade and investment policies since 1991 has contributed to this and has led to increasing FDI inflows in the Indian auto industry. For example, during January 2000-December 2010, the Indian automotive industry received cumulative FDI equity inflows of USD 5.74 billion which accounted for about 4.5 percent of the total FDI inflows (Table 4.1). The passenger car segment received highest FDI inflows explaining the concentration of foreign firms in this segment. Illustratively, after lifting of the licensing in 1993, 17 new ventures came up in India till 2002 of which 16 were for manufacture of cars (Auto Policy 2002). The auto-component industry received 0.5 percent of total FDI equity inflows during Jan 2000 – December 2010. The main investor in Indian automotive industry has been Japan which alone accounted for 24 percent of cumulative FDI inflows received by the automotive industry during January 2000-December 2010 (Table 4.2). The highest attracter of automotive FDI has been the Mumbai region which alone accounted for approximately 37 percent of total FDI inflows received by the automotive industry during Jan 2000 – December 2010 (Table 4.3).

The automobile industry in India is dominated by the two-wheeler segment in terms of volume of production. It alone accounts for 75 percent of total vehicles produced in the country (Chart 4.1). A sub-segment wise breakup of the two wheeler production shows that motorcycles dominate over scooters and mopeds (Chart 4.2). Motorcycles constitute nearly 79 percent of two-wheelers produced in the country. The two-wheeler market in India has around 10 firms' competing for a share in the industry with Hero MotoCorp being the major firm with a market share of 45 percent (Table 4.4).

Table 4.1
FDI Equity Inflows in Indian Automobile Industry
(From January 2000 to December 2010)

	Amount of FDI inflows	%age of total FDI inflows
Sub sectors	USD in million	
Automobile industry	1,479.2	1.16
Passenger cars	**3,008.0**	**2.37**
Auto ancillaries/parts	635.4	0.50
Others (transport)	617.5	0.49
Total	5,740.2	4.52

Source: DIPP, SIA Newsletter Annual Issue 2010.

Table 4.2
Top 5 Investing Countries in Indian Automobile Industry
(From January 2000 to December 2010)

Country	Amount of FDI inflows	%age of total FDI inflows to automobile industry
	USD in million	
Japan	**1,359.7**	**23.69**
U.S.A	838.7	14.61
Netherlands	722.3	12.58
Italy	634.0	11.05
Mauritius	495.3	8.63
Total	4,050.0	70.56

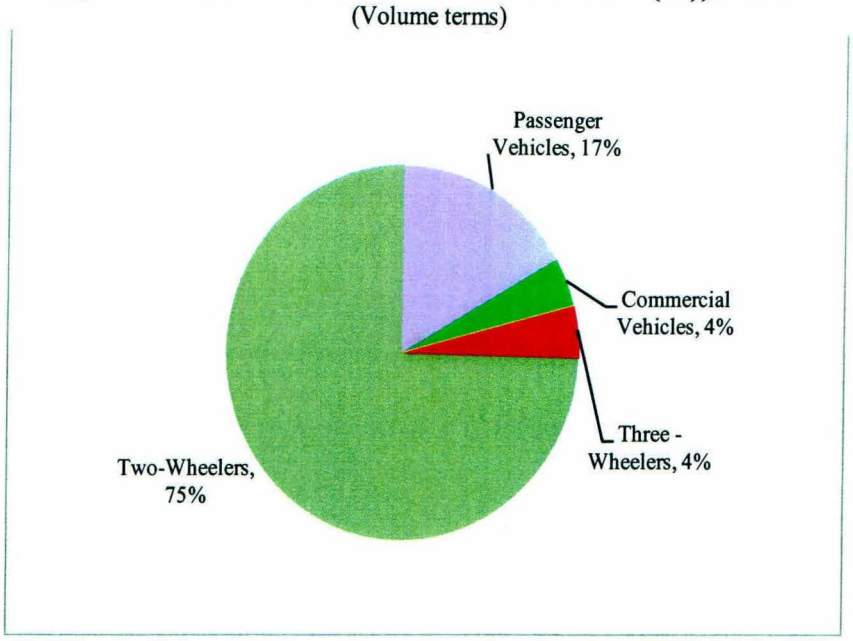
Source: DIPP, SIA Newsletter Annual Issue 2010.

Table 4.3
Top 5 Regions in receiving FDI Equity Inflows in Indian Automobile Industry
(From January 2000 to December 2010)

RBI's Regions	Amount of FDI inflows	%age of total FDI inflows to automobile industry
	USD in million	
Mumbai	**2,115.4**	**36.9**
New Delhi	1,463.8	25.5
Chennai	978.2	17.0
Ahmedabad	479.6	8.4
Bangalore	234.2	4.1
Total	5,271.2	91.8

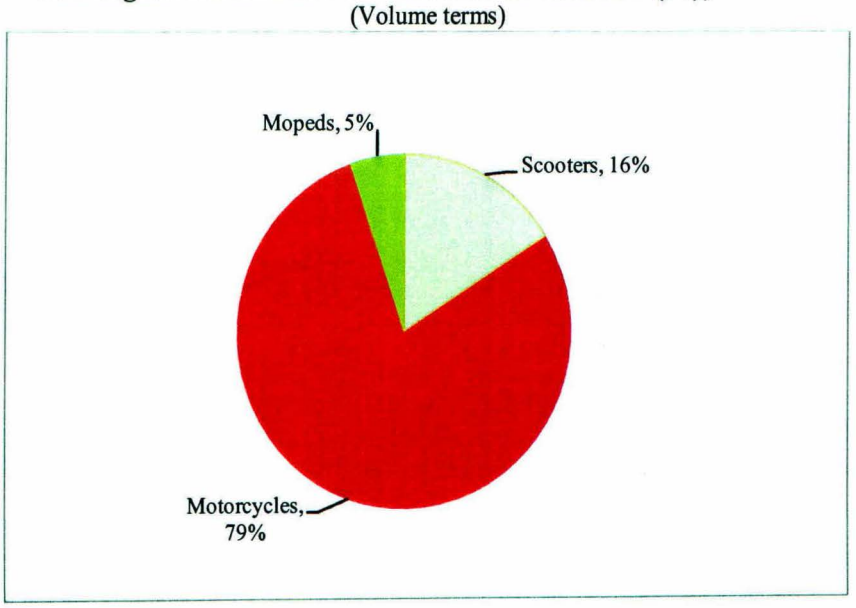
Source: DIPP, SIA Newsletter Annual Issue 2010. Note: Regions are as per DIPP definition and cover states.

Chart 4.1
Segment-Wise Share in Automobile Production (%), 2010-11
(Volume terms)



Source: Calculations based on SIAM data

Chart 4.2
Sub-segment Share in Two-wheelers Production (%), 2010-11
(Volume terms)



Source: Calculations based on SIAM data

Table 4.4
Market Share of Major Firms in Different Automobile Segments

Two wheelers Market 2010-11	
Hero MotoCorp Ltd	45%
Bajaj Auto Ltd	21%
TVS Motor Co. Ltd	15%
HMSIL	13%
Others	6%

Passenger Vehicles Market 2010-11	
Maruti Suzuki India Ltd.	45%
Tata Motors Ltd.	14%
Hyundai Motor India Ltd.	14%
M&M	7%
Others	20%

Commercial Vehicles Market 2010-11	
Tata Motors Ltd.	58%
M&M Ltd.	15%
Ashok Leyland Ltd.	12%
VE CVs - Eicher	6%
Others	9%

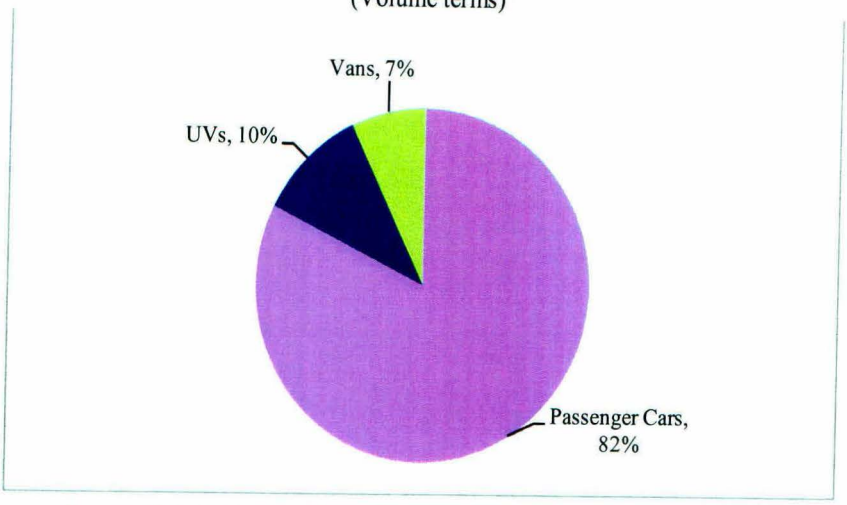
Three wheelers Market 2010-11	
Bajaj Auto	39%
Piaggio Vehicles	39%
M&M	12%
Others	10%

Source: SIAM, Note: HMSIL – Honda Motorcycle and Scooters India (Pvt.) Ltd.

In the passenger vehicle segment which is the second largest automobile segment (share of 17 percent in total production), passenger cars score over UVs and Vans/MPVs with a share of 82 percent in total PVs production (Chart 4.3). Furthermore, within passenger cars, compact cars are increasing as a percent of domestic sales. In 2010-11, compact cars accounted for 41 percent of passenger cars domestic sales (Chart 4.4). The PVs market has 19 firms with Maruti Suzuki being the biggest with a market share of around 45 percent (Table 4.4). Another important aspect of the PVs market is that a major portion of the market comprises of buyers who already own a car and are buying their second car[20].

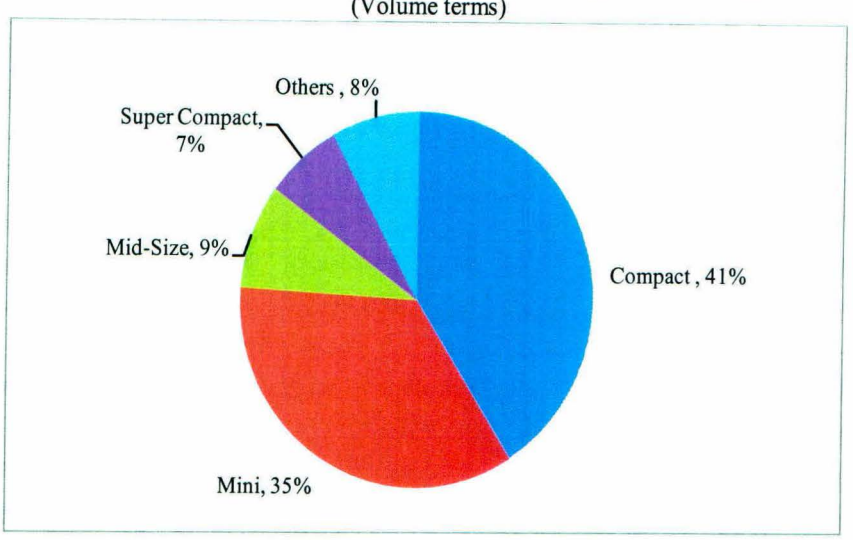
[20] Around 40 percent of the market comprises of consumers, who already own one car and are buying their second car. Those replacing their current car comprise 28 per cent of the market. Buyers, who replace their cars, usually upgrade to a higher segment (IBEF 2008).

Chart 4.3
Sub-segment Share in Passenger Vehicles Production (%), 2010-11
(Volume terms)



Source: Calculations based on SIAM data

Chart 4.4
Sub-segment Share in Domestic Sales of Passenger Cars (%), 2010-11
(Volume terms)

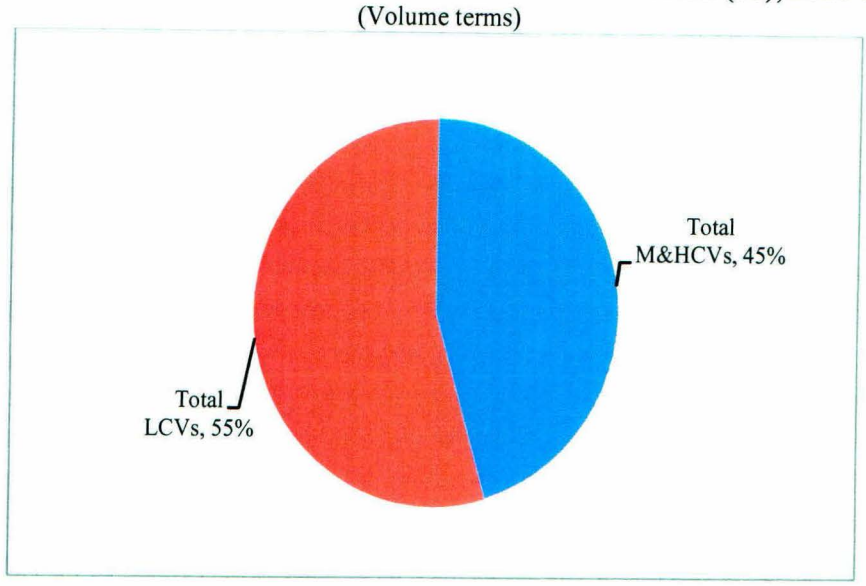


Source: Calculations based on SIAM data

In the CVs segment, which accounts for around 4 percent of total vehicle production, LCV sub-segment dominates with a market share of 55 percent (Chart 4.5). Within LCV sub-segment, goods carriers dominate over passenger carriers (share of 89 percent in LCVs production vis-à-vis 11 percent). Similarly, in M&HCVs segment goods carriers dominate (share of 84 percent in M&HCVs production vis-à-vis 16 percent). So, overall goods carrier sub-segment dominates over passenger carrier sub-segment in CV segment

with a share of around 87 percent in CVs total production. There are 14 firms in this segment with Tata Motors being the biggest firm with a market share of 58 percent (Table 4.4).

Chart 4.5
Sub-segment Share in Commercial Vehicles Production (%), 2010-11
(Volume terms)



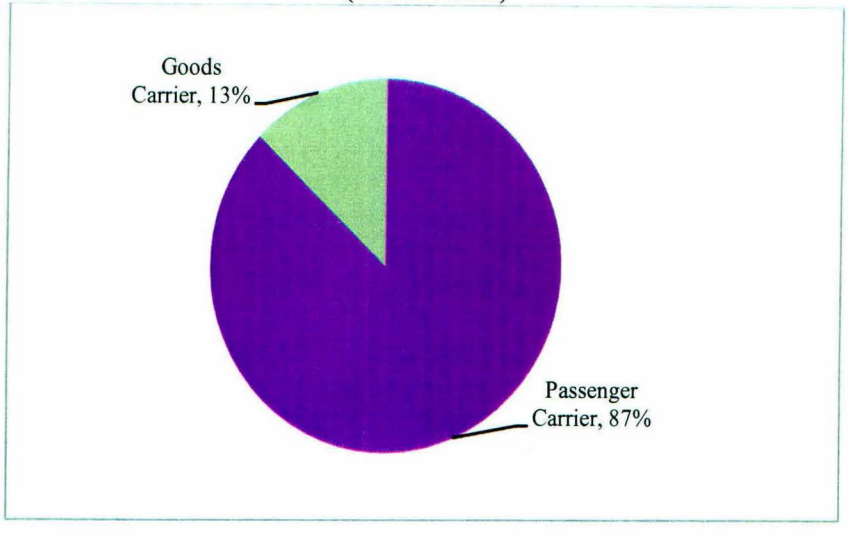
Source: Calculations based on SIAM data

In the three-wheeler segment, passenger carrier sub-segment dominates over goods carrier sub- segment with a market share of 87 percent vis-a-vis 13 percent (Chart 4.6). The market has around 7 firms with Bajaj Auto and Piaggio Vehicles being the major firms with market shares of 39 percent each (Table 4.4).

Most of these firms in the Indian automobile industry are present in more than one segment. For example, Tata Motors is present in both passenger vehicle segment and commercial vehicle segment. Furthermore, the industry is witnessing continuous drive towards diversification into other segments by firms. Illustratively, M&M entered into the three-wheeler segment with the launch of world's first hydrogen powered three-wheeler "HyAlfa". Bajaj Auto has made debut in four-wheeler segment by launching low-cost and eco-friendly automobile - RE60. Also, Hero Moto Corp after its split from Honda in 2010 has been planning to divest its portfolio by introducing vehicles in the three wheeler segment. With fast growing Indian automotive industry, passenger car and

commercial vehicle segments are poised to witness the maximum entry of new firms (IBEF 2008).

Chart 4.6
Sub-segment Share in Three-wheelers Production (%), 2010-11
(Volume terms)

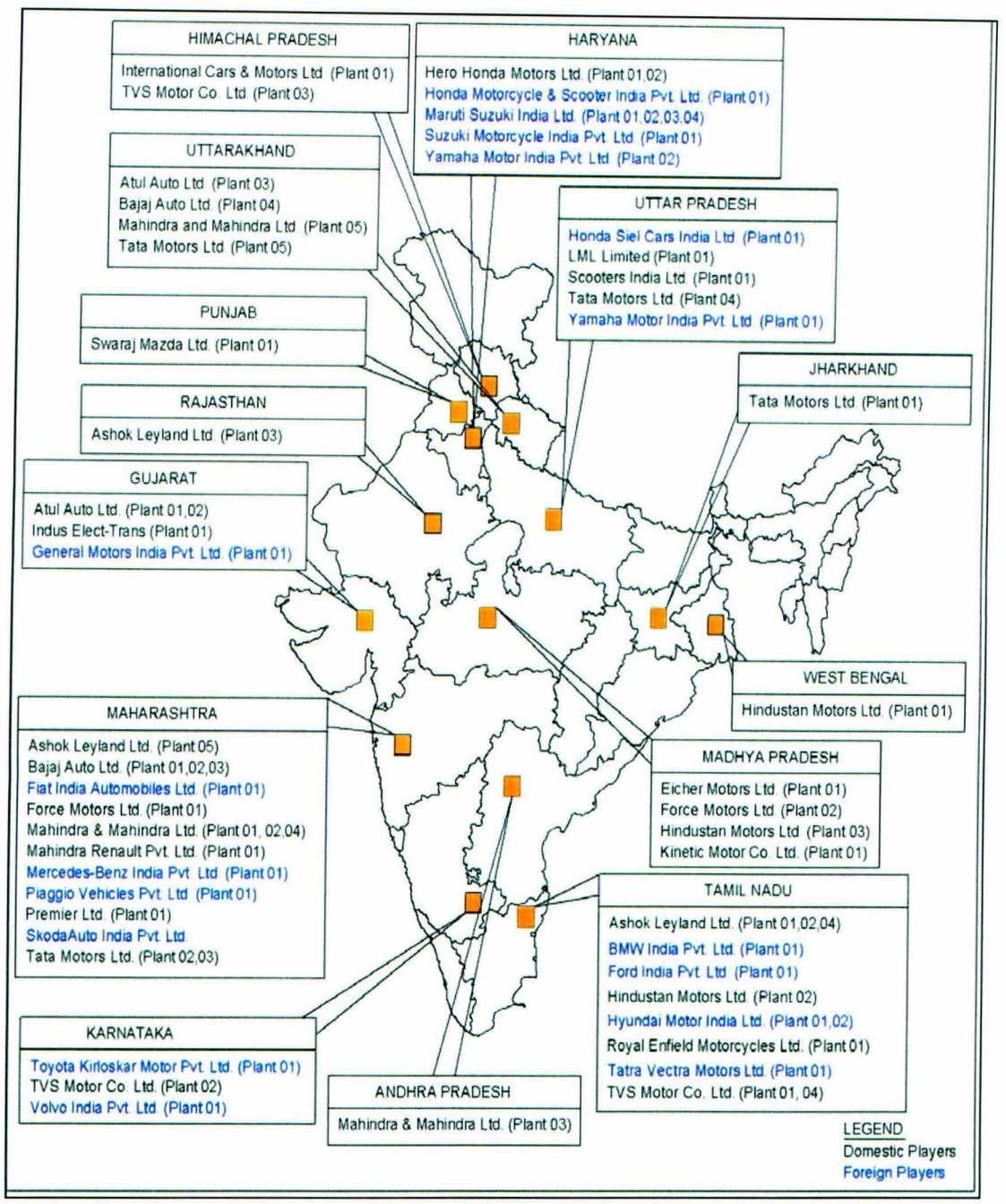


Source: Calculations based on SIAM data

The Indian automobile industry has grown in clusters of interconnected companies with major clusters located in and around Manesar in North, Chennai in South, Jamshedpur-Kolkata in East, Pune in West, and Indore in Central India (GOI 2006a). There is another auto cluster coming up at Sanand in Gujarat which is all set to become the next major auto hub after Chennai. The distribution of manufacturing plants of major domestic and global automobile firms across different states of India is depicted in Chart 4.7.

Certain states which offer greater locational advantages in terms of good quality of infrastructure, availability of cheap and skilled labor, investor friendly policies etc. have lead in attracting such investments. Nevertheless, the automobile manufacturing units are located in all regions of the country and ACMA has rightly described such a pattern of auto investment as 'regionally balanced'.

Chart 4.7
Distribution of Manufacturing Plants across Indian States

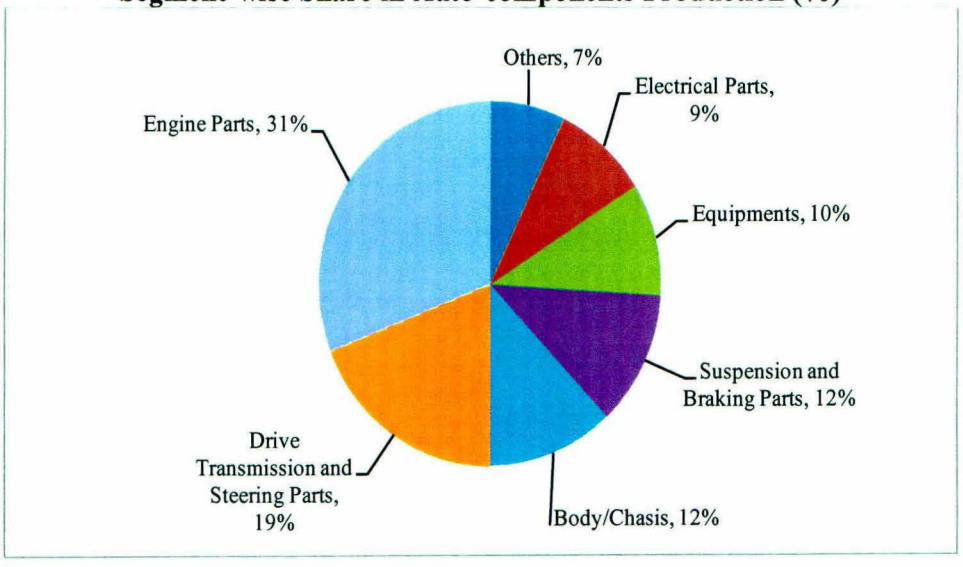


Source: Ranawat and Tiwari 2009.

The efficiency of vehicle production is closely linked to that of supplier base (Singh 2004) and the Indian auto-component industry is quite strong. It is quite comprehensive with around 500 firms in the organized sector producing practically all parts and more

than 10000 firms in small unorganized sector, in tierized format (GOI 2006b). In line with the global trend, the Indian auto-component industry has also undergone tierisation, with Tier-1 suppliers at the apex and unorganized firms at the base of the supply pyramid[21] (Ranawat and Tiwari 2009). The industry over the years has developed holistic capability to manufacture a comprehensive range of auto-components required by the automobile industry (Chart 4.8). This is manifested in the high level of indigenization achieved in Indian vehicle industry as well as the components developed for the completely Indian made vehicles like Tata Indica, Tata Indigo, Mahindra Scorpio, Bajaj Pulsar, TVS Centra etc.

Chart 4.8
Segment-wise Share in Auto-components Production (%)



Source: ACMA, 2012

The structure of the Indian auto-component industry is more or less same as that of automobile industry with presence of both domestic and foreign firms. Some of the domestic firms are promoted by Indian OEMs and most of them in general have some form of technical collaboration with foreign counterparts. The market hosts almost all major global Tier-1 suppliers which have entered the Indian market either following their global OEMs or to cater to the growing demand of the Indian automobile industry. The resulting increased competition in the domestic market and growing international market

[21] Tier-1 suppliers are those who make direct supplies to the OEMs or in other words directly invoice the OEMs.

for their products has encouraged the domestic auto-component manufactures to upgrade their technological base. The improving quality of the industry is evident from the fact that more than 95 percent companies are certified with ISO 9000 system and more than 70 percent are certified as per ISO/TS 16949 standards. The industry also has the distinction of having the maximum number of (11) Deming award winning companies (EXIM Bank 2008). The consequent growing acceptance of their products in the international market has made them a part of the global supply chains of automobile and auto-components.

4.3 Current Trends in the Indian Automobile Industry

The industry produces a wide range of vehicles and caters to the needs of all the segments of the society. It encompasses passenger cars, commercial vehicles (CVs) – light, medium, and heavy, utility vehicles (UVs) such as jeeps, two wheelers such as scooters, mopeds, motorcycles, and electric two wheelers and three wheelers. The industry at present houses 19 manufacturers of passenger cars and multi utility vehicles, 14 manufacturers of commercial vehicles, 16 of 2/3 wheelers and 12 of tractors besides 5 manufacturers of engines. This includes almost all the major global Original Equipment Manufacturers (OEMs) and also home grown companies (GOI 2012). The automobile industry has witnessed high growth in the last decade when despite the global financial crisis of 2008-09[22], it grew at a CAGR of 14 percent.

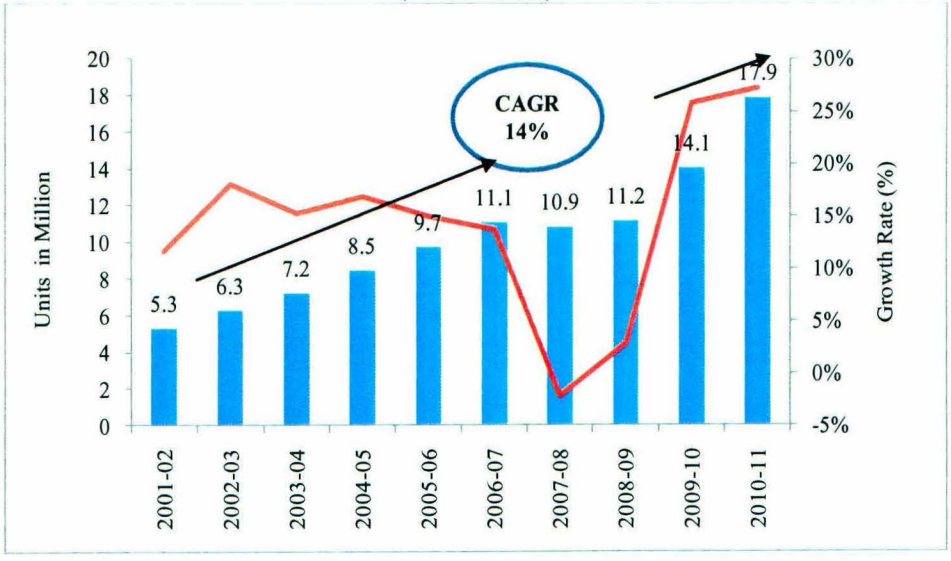
4.3.1 Production

There has been an increasing trend in the production of vehicles in India which increased at a CAGR of 14 percent during 2001-02 to 2010-11 (Chart 4.9). However, it suffered during 2007-09 owing to the global financial crisis which led to a slowdown in both domestic and foreign demand. Nevertheless, it is one of the few manufacturing sectors to recover fast from the crisis and posted an annual average growth rate of around 27 percent in the last two years (2009-10 and 2010-11). The growth is noticeable across all

[22] CAGR of vehicles production.

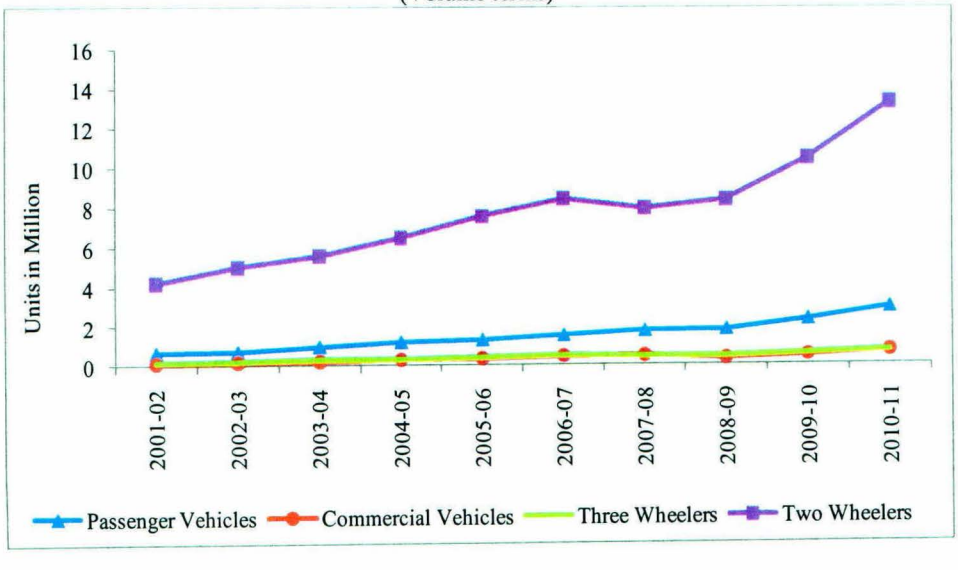
the segments of the industry with passenger vehicle, commercial vehicle, three-wheeler and two-wheeler segments all growing at CAGRs of 18 percent, 19 percent, 16 percent and 13 percent respectively during 2001-02 to 2010-11 (Chart 4.10). Clearly, the production of PVs and CVs has grown faster than rest of the two segments.

Chart 4.9
Trend in Automobile Production
(Volume terms)



Source: Calculations based on SIAM data.

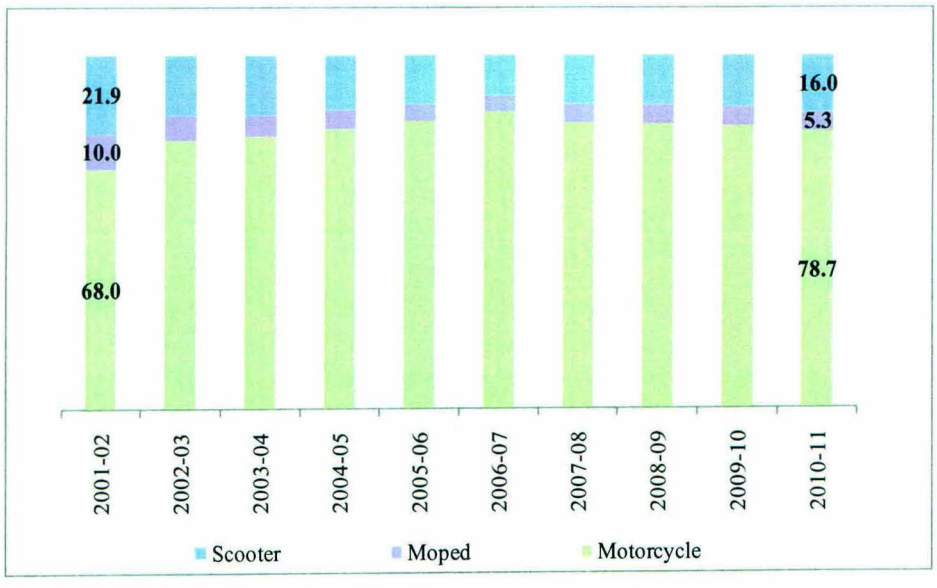
Chart 4.10
Segment-wise Trends in Automobile Production
(Volume terms)



Source: SIAM

A sub-segment wise look at the production reflects the changing consumer preferences. In the two-wheeler segment, the production of motorcycles increased over the last decade while that of scooters and mopeds went down in terms of share in two-wheelers production (Chart 4.11). For example, the share of motorcycles in total two-wheeler production increased from 68 percent in 2001-02 to 79 percent in 2010-11[23]. In the passenger vehicle segment, the share of passenger cars in PVs production increased from 75 percent in 2001-02 to 82 percent in 2010-11 (Chart 4.12). In the three-wheeler segment, the share of passenger carriers in total three-wheeler production increased from 76 percent in 2002-03 to 87 percent in 2010-11 (Chart 4.13). In the CV segment, the production of LCVs bypassed M&HCVs during the last decade and their share in CVs production increased from 41 percent in 2001-02 to 55 percent in 2010-11 (Chart 4.14).

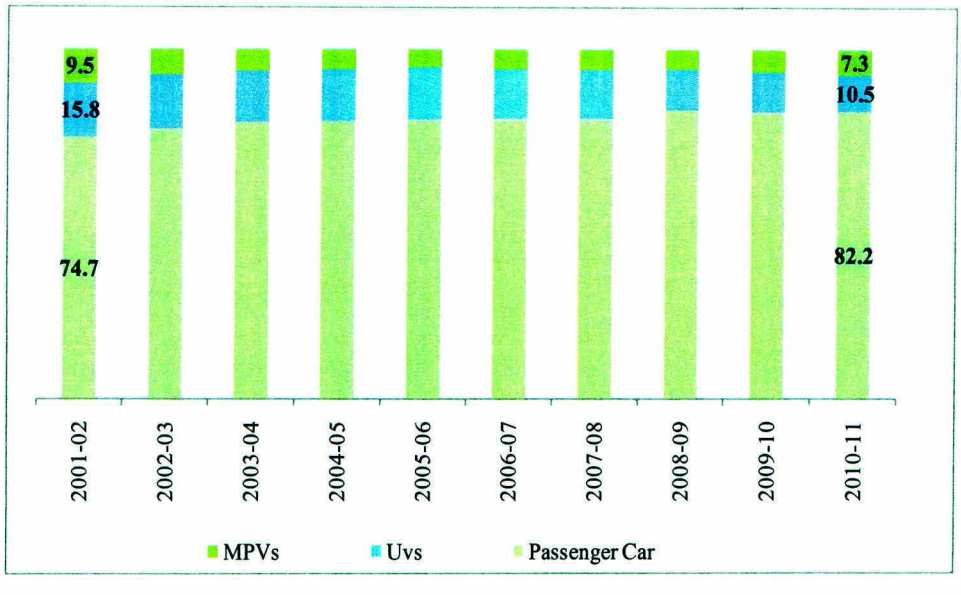
Chart 4.11
Trends in Sub-Segments Share in Two-Wheelers Production (%)
(Volume terms)



Source: Calculations based on SIAM data

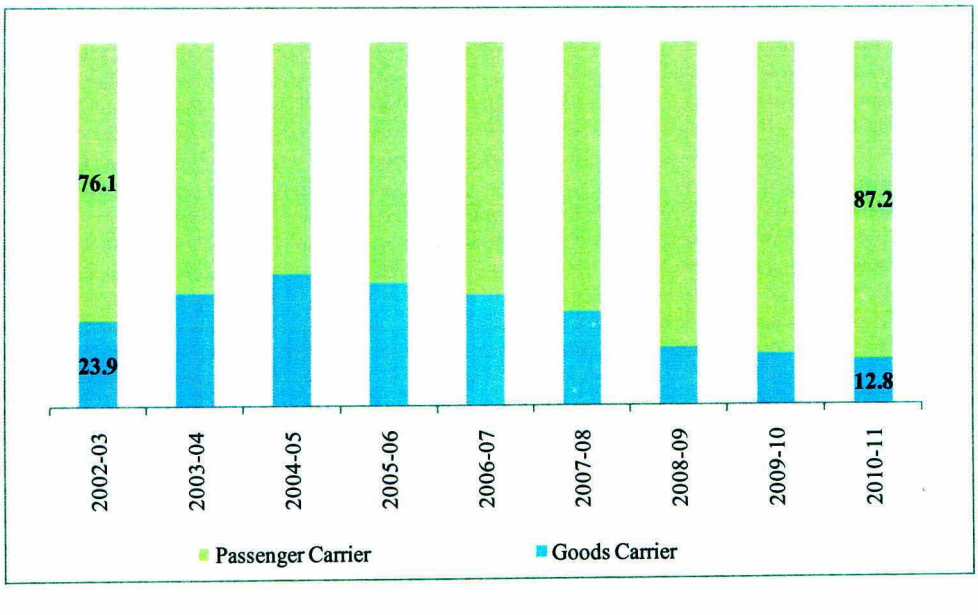
[23] SIAM

Chart 4.12
Trends in Sub-Segments Share in Passenger Vehicles Production (%)
(Volume terms)



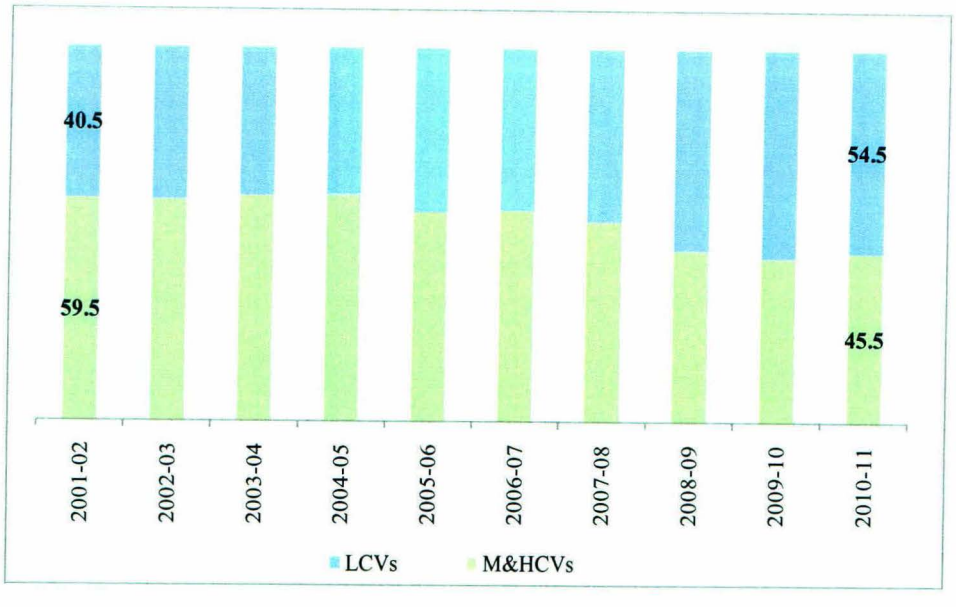
Source: Calculations based on SIAM data

Chart 4.13
Trends in Sub-Segments Share in Three-Wheelers Production (%)
(Volume terms)



Source: Calculations based on SIAM data

Chart 4.14
Trends in Sub-Segments Share in Commercial Vehicles Production (%)
(Volume terms)



Source: Calculations based on SIAM data

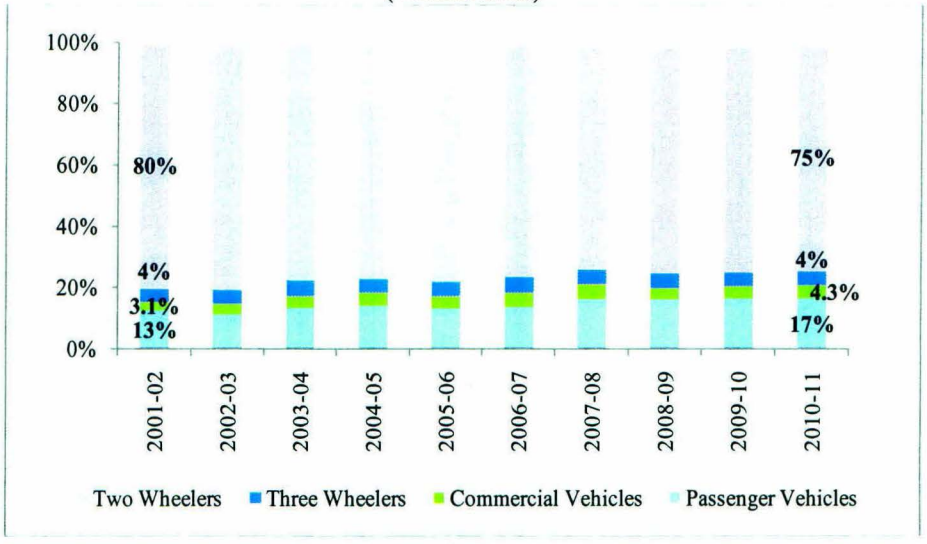
The structure of Indian automobile industry with minor changes remains same in terms of shares of different segments in total vehicle production. The two-wheeler segment dominates total vehicle production with a share of around 75 percent though it has declined during the last decade from a share of around 80 percent in 2001-02 (Chart 4.15). The passenger car segment has improved its share. It increased from 13 percent in 2001-02 to 17 percent in 2010-11. The shares of rest of the two segments have improved only marginally during the last decade.

The production of vehicles is expected to increase further since both domestic and foreign auto manufacturers, considering the recent growth and potential for future development in the industry are setting up their new manufacturing / assembly facilities in India and have massive plans for expansion[24]. The expected growth in the country alongwith India emerging as an outsourcing destination is likely to contribute to it. As the Report of the Working Group on Automotive Sector for the 12th FYP, lays down the

[24] India has a low penetration rate of cars - 11 / 1000 persons, GOI 2012.

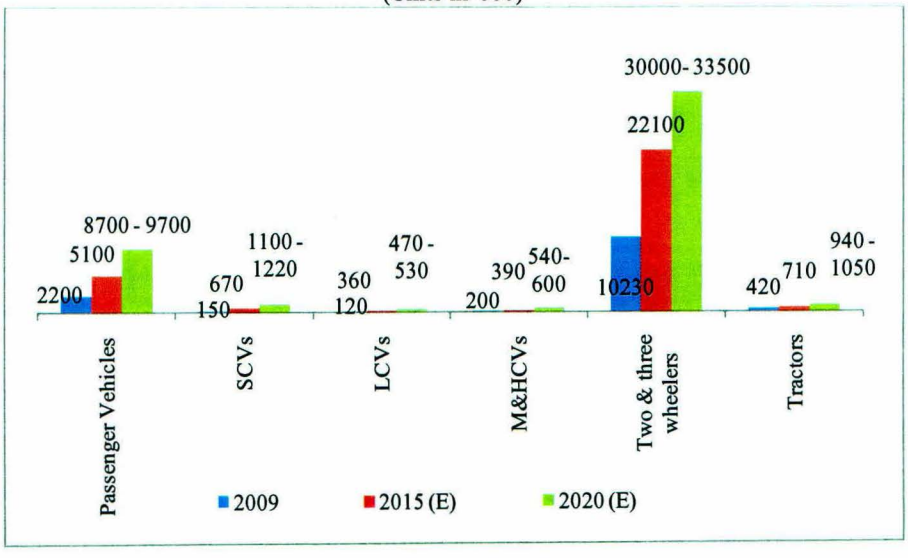
outlook of the industry, the production of all the segments is expected to increase (Chart 4.16).

Chart 4.15
Trends in Segment-wise Share in Automobile Production (%)
(Volume terms)



Source: Calculations based on SIAM data

Chart 4.16
Projected Vehicle Production
(Units in '000)

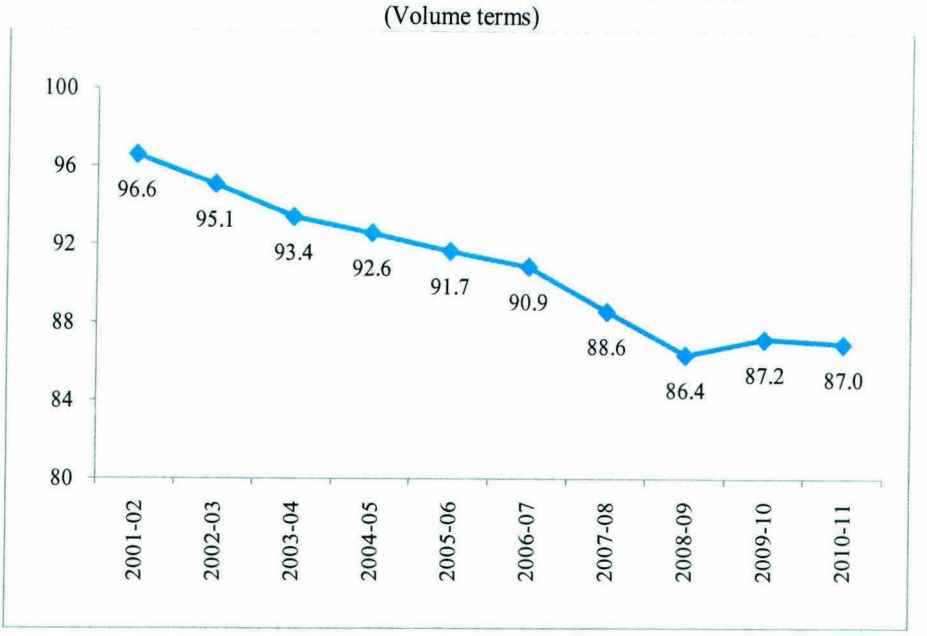


Source: ACMA-EY Study

4.3.2 Domestic Sales

The Indian automobile industry has a strong domestic demand base owing to its large population, which lays down the foundation of the growth of the industry. For example, the domestic sales of vehicles constituted nearly 87 percent of total vehicles produced in the country in 2010-11, however, they have been on a downward trend due to increasing focus of the industry towards exports (Chart 4.17).

Chart 4.17
Domestic Sales as % of Automobile Production
(Volume terms)

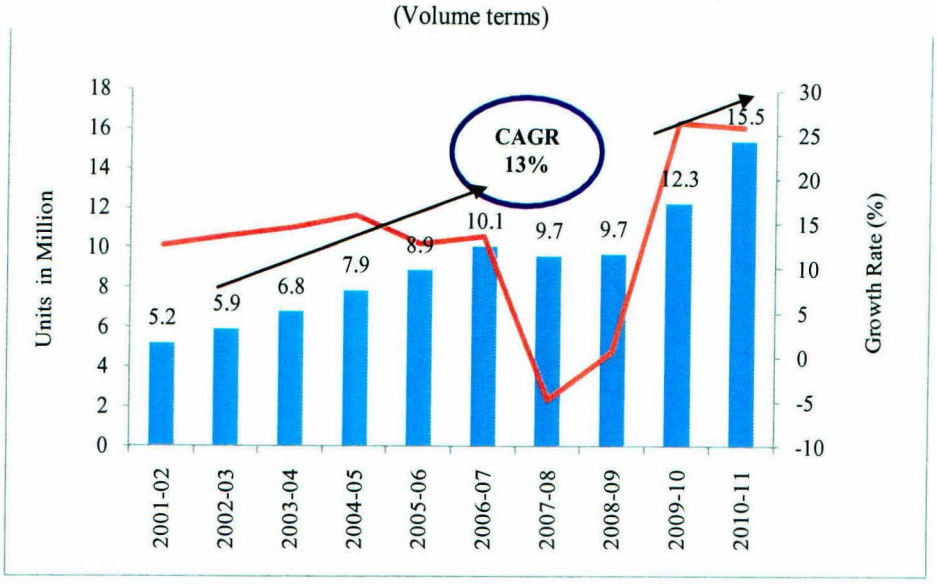


Source: Calculations based on SIAM data

The domestic automobile sales in India have been on an upward trend during the last decade except a marginal slowdown witnessed during the global financial crisis of 2007-09. They increased at a CAGR of 13 percent during 2001-02 to 2010-11 (Chart 4.18). The increase is noticeable across all the segments of vehicles (Chart 4.19). However, the market for PVs and CVs witnessed rapid growth during the decade. Their domestic sales increased at a CAGR of 16 percent and 19 percent respectively during the last decade as

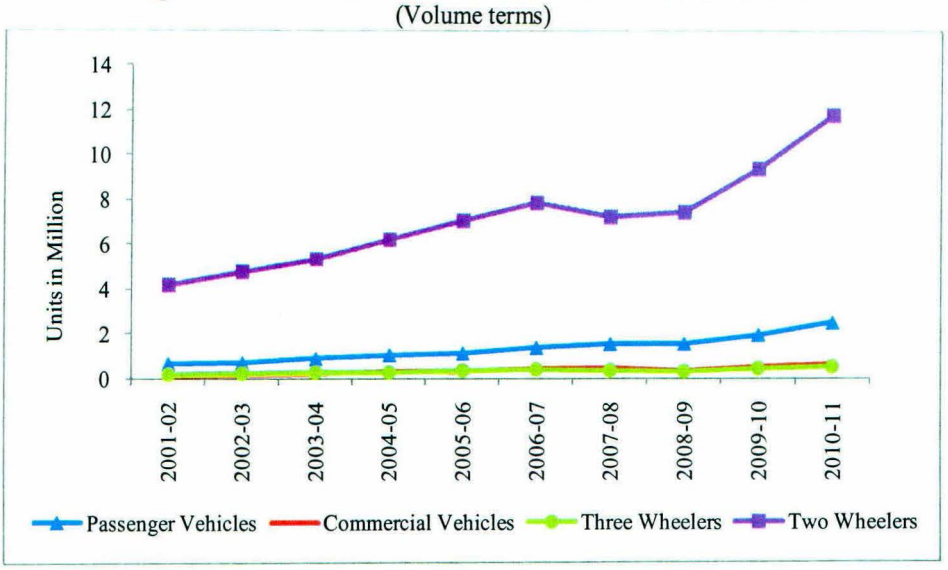
against a CAGR of 11 percent and 12 percent noticed in three-wheeler and two-wheeler segments respectively[25].

Chart 4.18
Trend in Domestic Sales of Automobiles
(Volume terms)



Source: Calculations based on SIAM data

Chart 4.19
Segment-wise Trends in Domestic Sales of Automobiles
(Volume terms)



Source: SIAM

[25] Despite of high growth, the vehicle penetration in India continues to be lower than many Asian countries such as China, Vietnam, Thailand, Indonesia etc.

The growth in PVs segment in domestic market has mainly been fueled by country's robust economic growth, rising income levels, growing middle class, easy availability of consumer finance, increase in the number of available models etc. While, better performance of the economic activity in the country during the last decade, increased industrial production, growth in investment in infrastructure development, emergence of road as primary mode of transportation[26], implementation of regulations on overloading and usage of old CVs, easy availability of cheap credit[27] etc. have contributed to the growth of CV segment. The growth in two-wheeler segment has majorly been driven by country's rising young population, greater affordability of vehicles (due to more or less stagnant prices and increasing avenues of financing), rapid product launches and shortening product life cycle, poor public transport system, rising demand from rural and semi-urban areas etc. The growth in three-wheeler segment on the other hand has been driven by factors such as enforcement of age limit on usage of three wheelers in large cities, government incentives and regulations to encourage usage of cleaner fuels such as CNG and LPG, growing demand for economically viable means of transportation of goods across the country etc. With evolving hub and transport model in India, where CVs serve as a mean of inter-city movement of goods, the demand for three-wheelers is increasing to fulfill the need for last mile connectivity in goods transport.

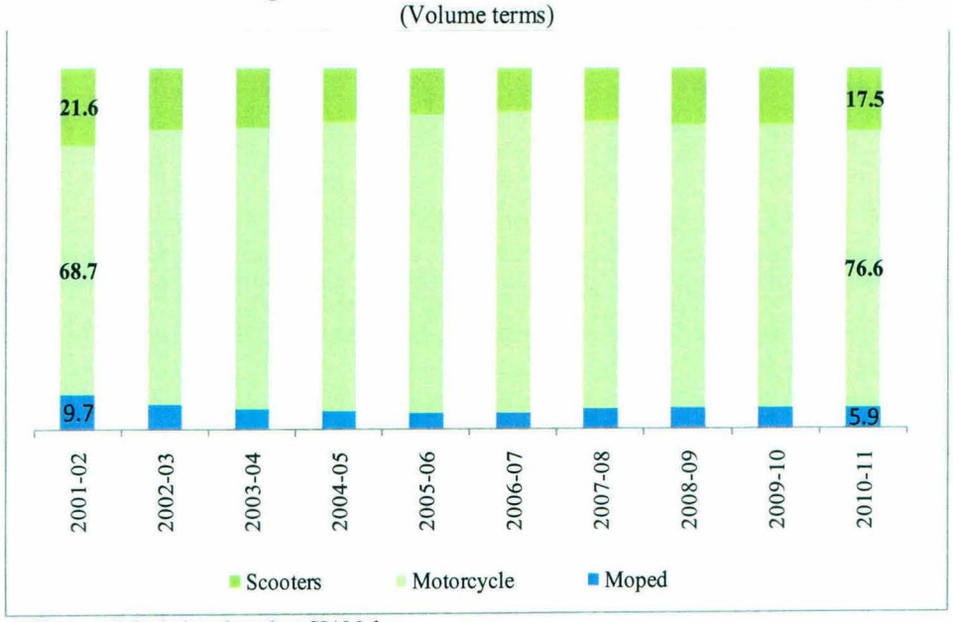
A sub-segment wise break-up of the domestic sales shows that within two-wheeler segment, the sales of motorcycles increased during the last decade. Illustratively, the share of motorcycles in domestic sales of two-wheelers increased from 69 percent in 2001-02 to 77 percent in 2010-11 while that of other two segments i.e. scooters and mopeds went down (Chart 4.20). This is explained by increasing preference of consumers for motorcycles due to their stylish features, high load bearing capacity, better fuel efficiency etc. Another important trend in the two-wheeler market is the growing demand

[26] Road transportation accounts for almost 60 percent of overall transportation of goods in the country as compared to just 15
percent in 1950s. The increase is mainly due to improvement in road infrastructure, advantages of last mile connectivity etc.
(IBEF 2008).

[27] More than 90 percent of the CVs and PVs purchases are on credit (IBEF 2008, Chenoy 2007).

for the replacement purchase (IBEF 2008)[28]. In the passenger vehicle segment, sales of passenger cars increased during the last decade as evident from the share of passenger cars sales in PVs total domestic sales rising from 75 percent in 2001-02 to 79 percent in 2010-11 (Chart 4.21). Within passenger cars, sale of compact cars is rising (Chart 4.4). This is explained by country's young population {(70 percent of Indian population is below the age of 35 yrs, (GOI 2006a)} and rising middle class. In the three-wheeler segment, already dominating passenger carrier segment consolidated its position over the last decade as manifested in its increasing share in three-wheelers total domestic sales (Chart 4.22). In the CV segment, LCVs overtook H&MCVs and their share in CVs total domestic sales increased from 39 percent in 2001-02 to 53 percent in 2010-11 (Chart 4.23).

Chart 4.20
Trends in Sub-Segments Share in Two-Wheelers Domestic Sales (%)
(Volume terms)



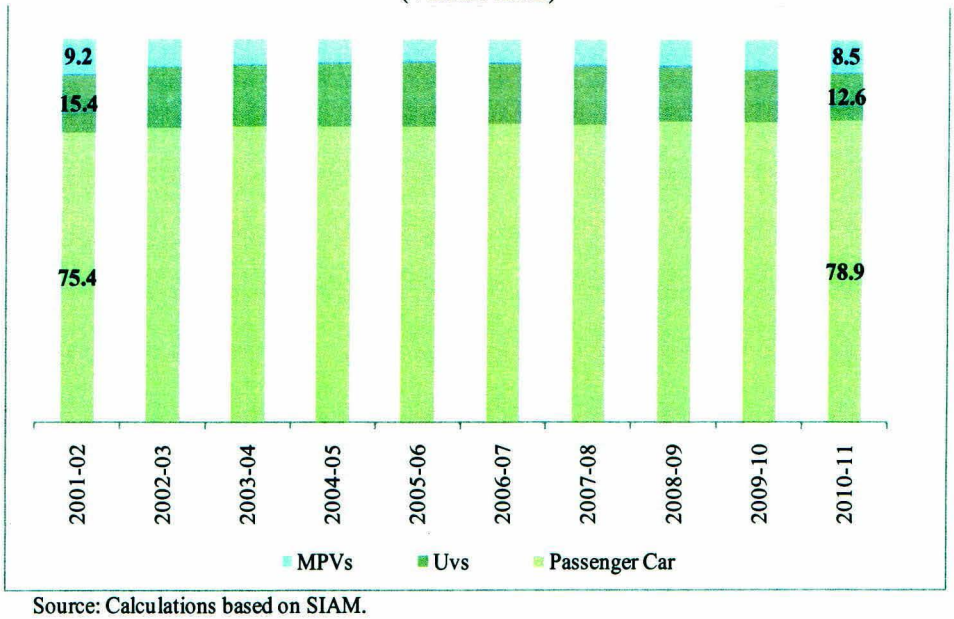
Source: Calculations based on SIAM data.

[28] In 2003, first time buyers of two wheelers constituted 74 per cent of total sales, whereas those purchasing a two wheeler as a replacement of an existing two wheeler were only 26 percent. While in 2006, the replacement market had grown considerably to 36 percent of the overall market (IBEF 2008).

Chart 4.21

Trends in Sub-Segments Share in Passenger Vehicles Domestic Sales (%)

(Volume terms)

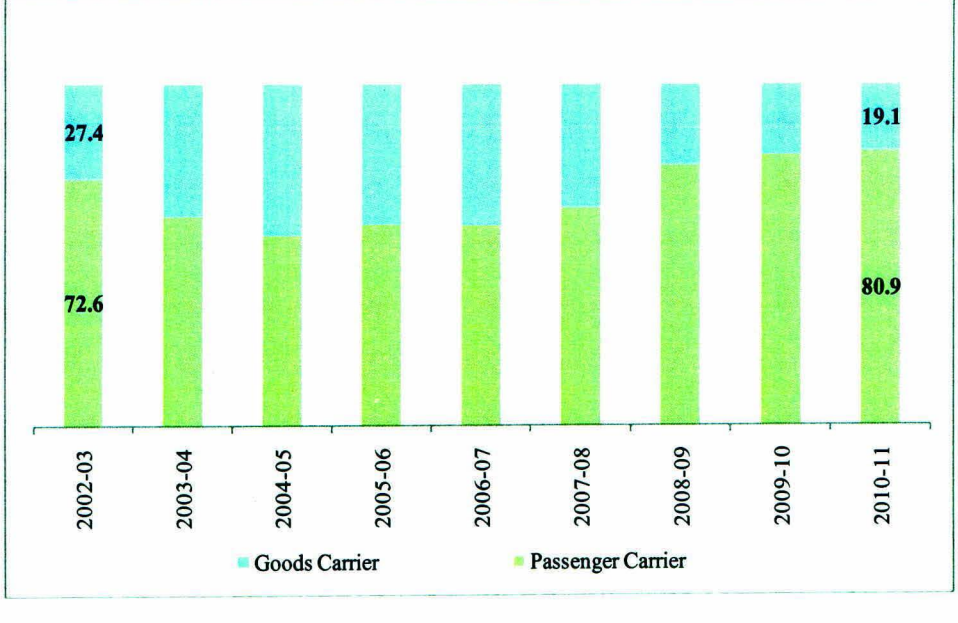


Source: Calculations based on SIAM.

Chart 4.22

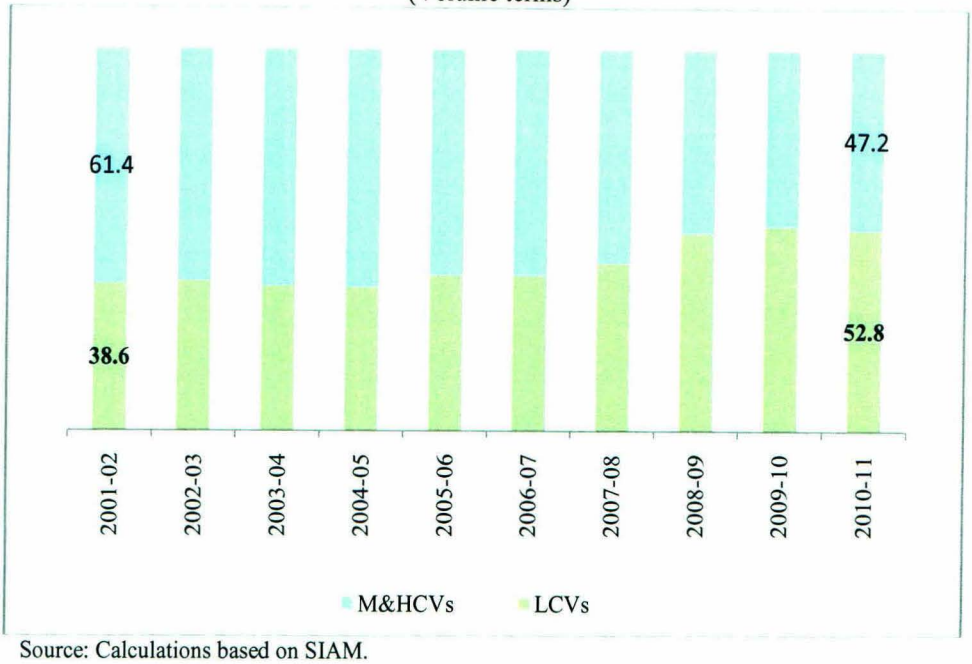
Trends in Sub-Segments Share in Three-Wheelers Domestic Sales (%)

(Volume terms)



Source: Calculations based on SIAM.

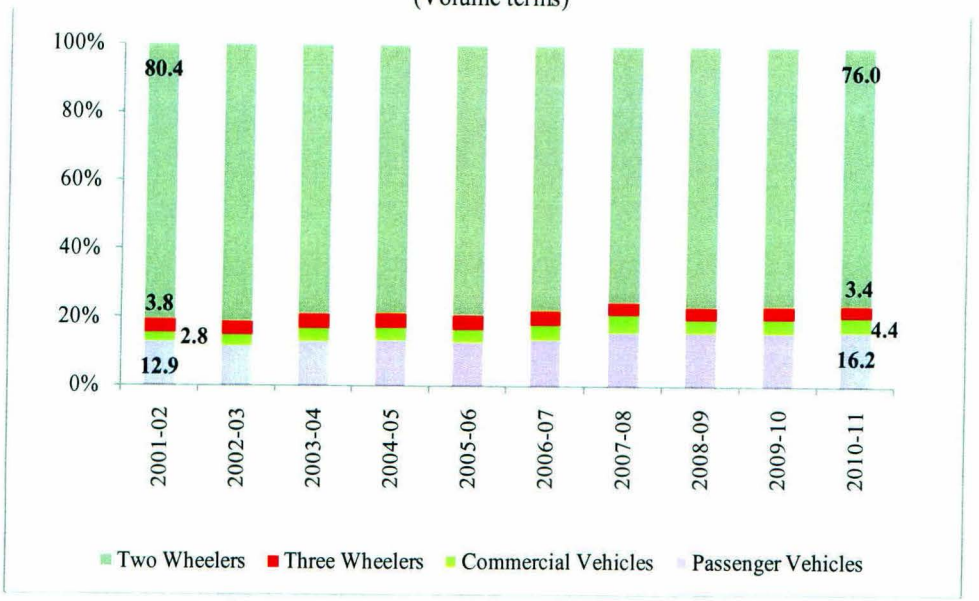
Chart 4.23
Trends in Sub-Segments Share in Commercial Vehicles Domestic Sales (%)
(Volume terms)



Source: Calculations based on SIAM.

Domestic sales of automobiles in India are dominated by the two-wheeler segment with a share of 76 percent in volume terms. This is explained by country's poor population and its need for a fuel efficient and affordable mean of personal transport in the absence of good public transport system. However, there has been a marginal decline in two-wheelers share in total domestic sales during the last decade (76 percent in 2010-11 from 80 percent in 2001-02). The PVs segment and CVs segment on the other hand have noticed modest increases in their shares given the country's rising middle class and economic activity. The share of three-wheelers however has declined (Chart 4.24). In value terms, the market for PVs and CVs exceed that of two-wheelers (GOI 2006a).

Chart 4.24
Trends in Segment-wise Share in Domestic Sales of Automobiles (%)
(Volume terms)

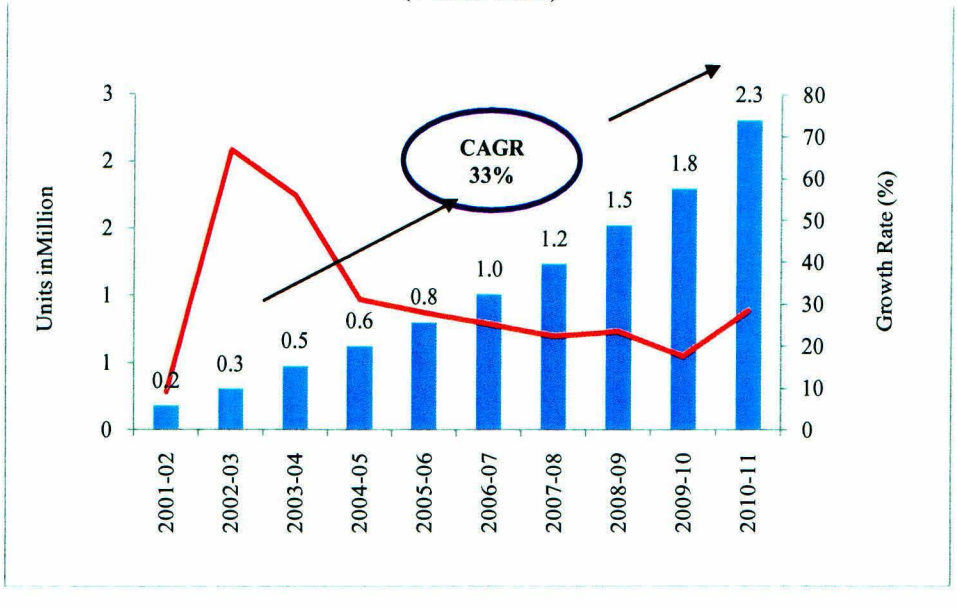


Source: Calculations based on SIAM data

4.3.3 Exports

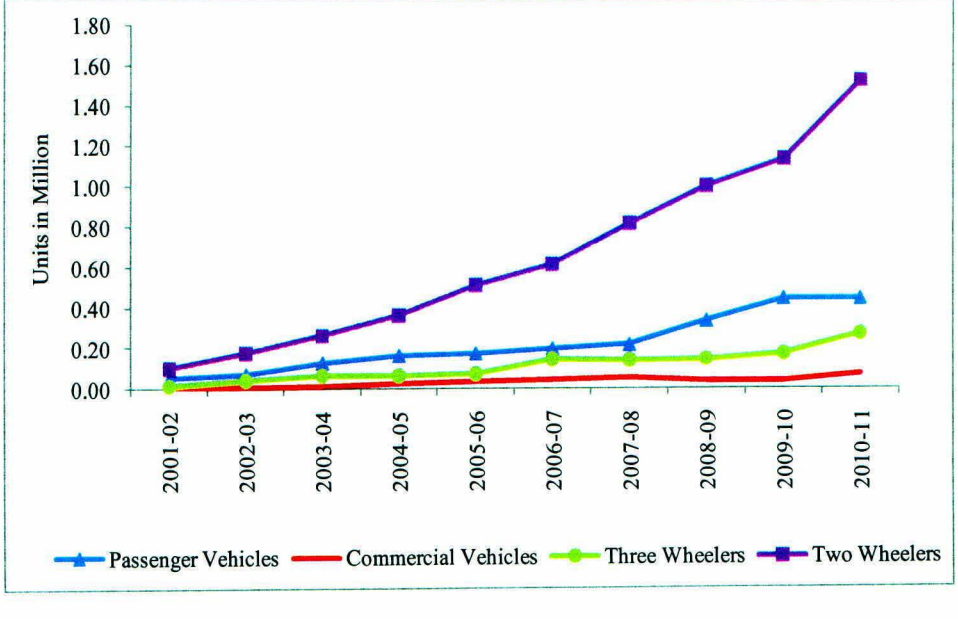
During the last decade, the Indian automobile exports experienced a healthy growth. From just 0.18 million units exported from the country in 2001-02, the figure reached to 2.32 million units in 2010-11, a CAGR of 33 percent (Chart 4.25). The increase is across all the segments, however, three-wheeler exports have grown at a highest CAGR of 38 percent followed by two-wheelers (35 percent), PVs (27 percent) and CVs (22 percent) (Chart 4.26). Both domestic and foreign automobile manufacturers have contributed to this growth either through direct or indirect exports (Ranawat and Tiwari 2009). As a result, exports as a percentage of production increased from 3.5 percent in 2001-02 to 13 percent in 2010-11 (Chart 4.27). This indicates the growing acceptance of Indian vehicles in global market. The growth in exports has been fueled by various incentives provided by the government for encouraging automobile exports such as export linked fiscal incentives, trade agreements with other countries, setting up of auto parks and SEZs etc.

Chart 4.25
Trend in Automobile Exports
(Volume terms)



Source: Calculations based on SIAM data.

Chart 4.26
Trends in Segment-wise Automobile Exports
(Volume terms)



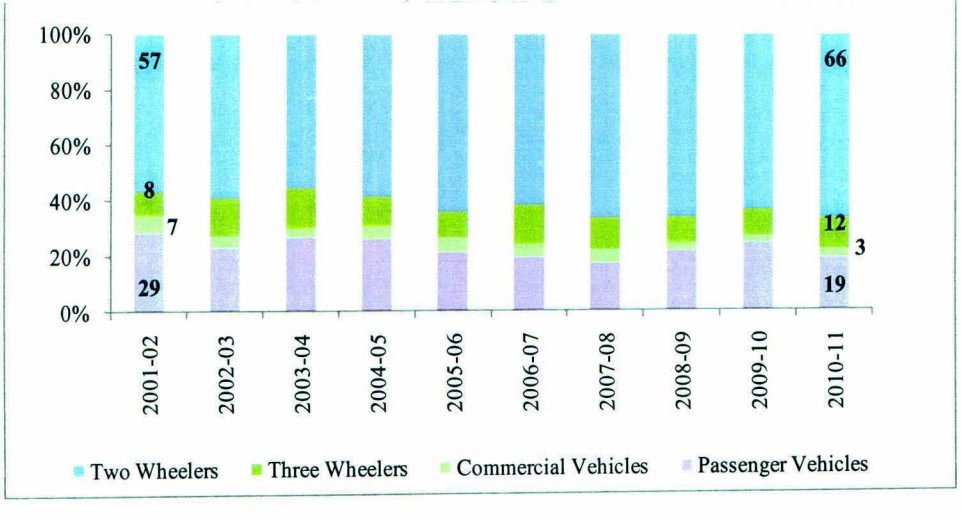
Source: SIAM.

Chart 4.27
Exports as % of Production
(Volume terms)

Source: Calculations based on SIAM data.

The Indian automobile exports are dominated by two-wheelers export and their share in total vehicle exports improved during the last decade from 57 percent in 2001-02 to 66 percent in 2010-11 (Chart 4.28). The share of three-wheeler segment also increased while that of PVs and CVs declined.

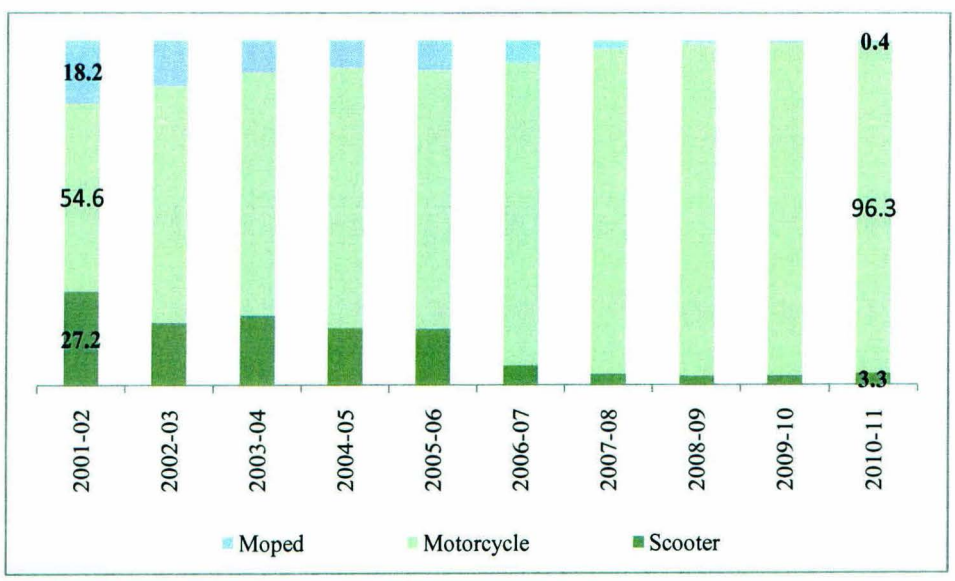
Chart 4.28
Trends in Segment-wise Share in Automobile Export (%)
(Volume terms)



Source: Calculations based on SIAM data.

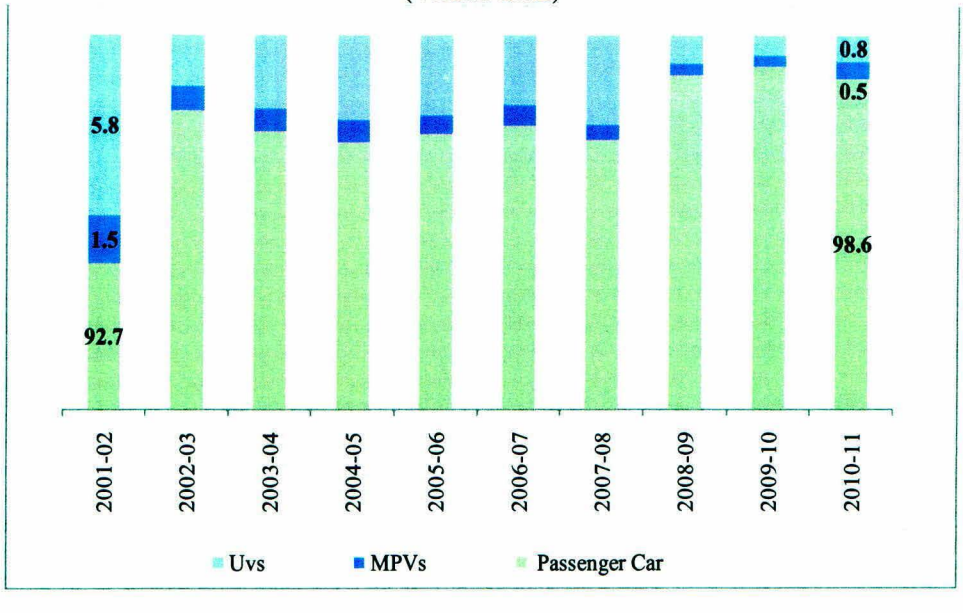
A sub-segment wise analysis shows that within two-wheeler segment, export of motorcycles increased tremendously during the last decade (Chart 4.29). Illustratively, the share of motorcycles in two-wheelers export increased from 55 percent in 2001-02 to 96 percent in 2010-11. In the passenger vehicle segment, the share of passenger cars in PVs export increased from 93 percent in 2001-02 to 99 percent in 2010-11 and within that the export of compact cars dominates (Chart 4.30). In the three-wheeler exports, the export of passenger carriers dominates and its share in total three-wheelers exports increased from 98.7 percent in 2002-03 to 99.4 percent in 2010-11 indicating the need for low cost public transportation in other developing countries as well (Chart 4.31). In the CVs exports, the share of LCVs increased from 59 percent in 2001-02 to 62 percent in 2010-11 (Chart 4.32).

Chart 4.29
Trends in Sub-Segments Share in Two-Wheelers Exports (%)
(Volume terms)



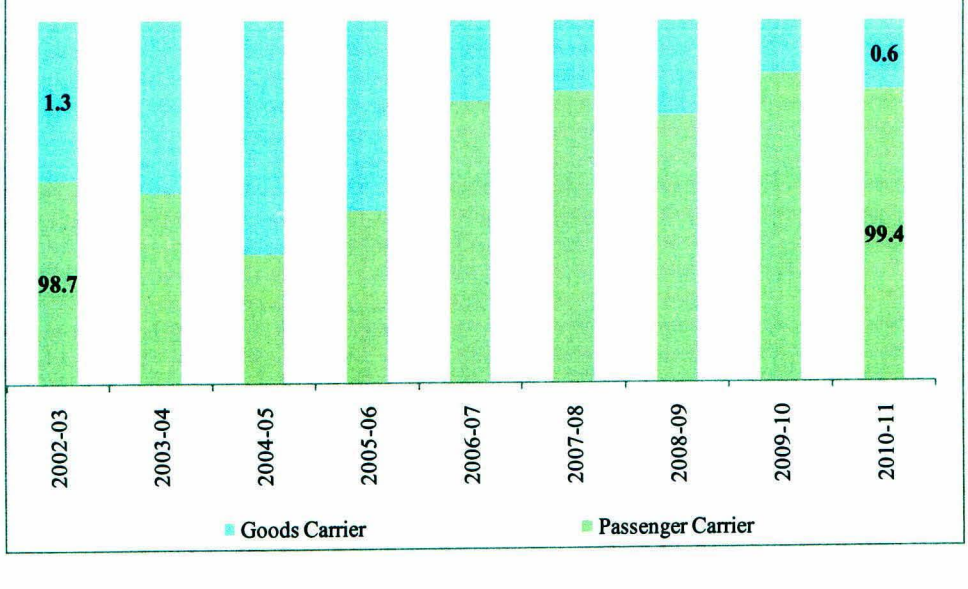
Source: Calculations based on SIAM data.

Chart 4.30
Trends in Sub-Segments Share in Passenger Vehicles Exports (%)
(Volume terms)



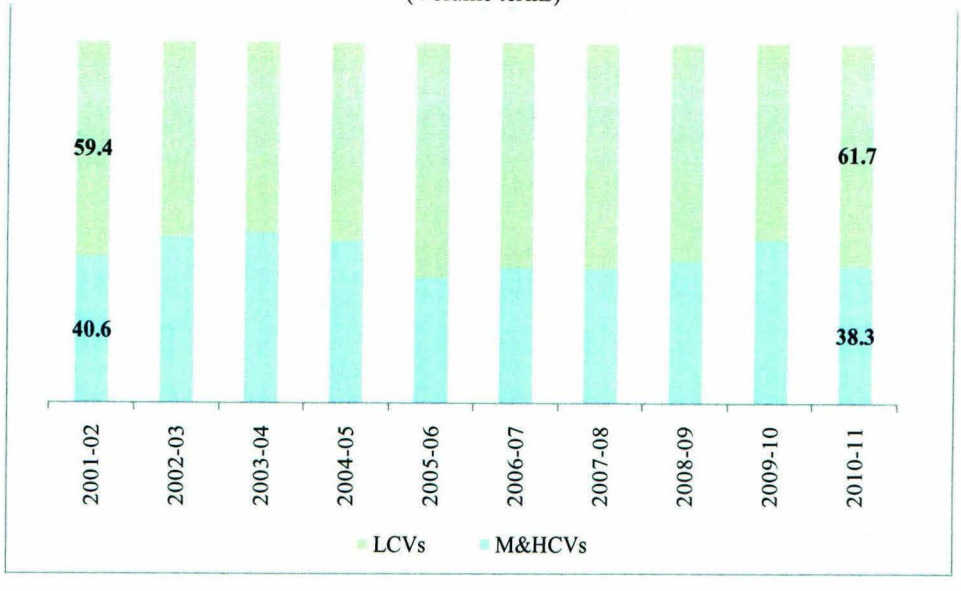
Source: Calculations based on SIAM data.

Chart 4.31
Trends in Sub-Segments Share in Three-Wheelers Exports (%)
(Volume terms)



Source: Calculations based on SIAM data.

Chart 4.32
Trends in Sub-Segments Share in Commercial Vehicles Exports (%)
(Volume terms)



Source: Calculations based on SIAM data.

The Indian automobile exports are to varied regions/ countries such as South Asia, EU (Germany, UK, Belgium, Italy, etc.), Middle East, North America, Russia and South Africa (Chenoy 2007). The main destinations for different categories of vehicles are:

1. Passenger Vehicles - South Africa, South America, Latin America, Algeria and Italy
2. Commercial Vehicles - Sri Lanka, Bangladesh, Gulf Countries, Africa, and Italy
3. Three-Wheelers - Sri Lanka, Egypt and Sudan
4. Two-Wheelers - Sri Lanka, Colombia, Bangladesh, Bhutan, Nepal

In terms of major exporters in each segment, Hyundai, Maruti Suzuki, and Tata Motors are the key exporters for passenger cars; Tata Motors, Ashok Leyland, and M&M for CVs; M&M for MUVs; Bajaj Auto for two and three-wheelers; and M&M and TAFE for tractors (GOI 2006a, IBEF 2008).

Thus with the above mentioned growth trends in the Indian automobile industry, India is expected to emerge as the third largest vehicle market in the world by 2020 with an

overall industry turnover of USD 162 billion. The auto-component industry is expected to attain a turnover of USD 113 billion (GOI 2012).

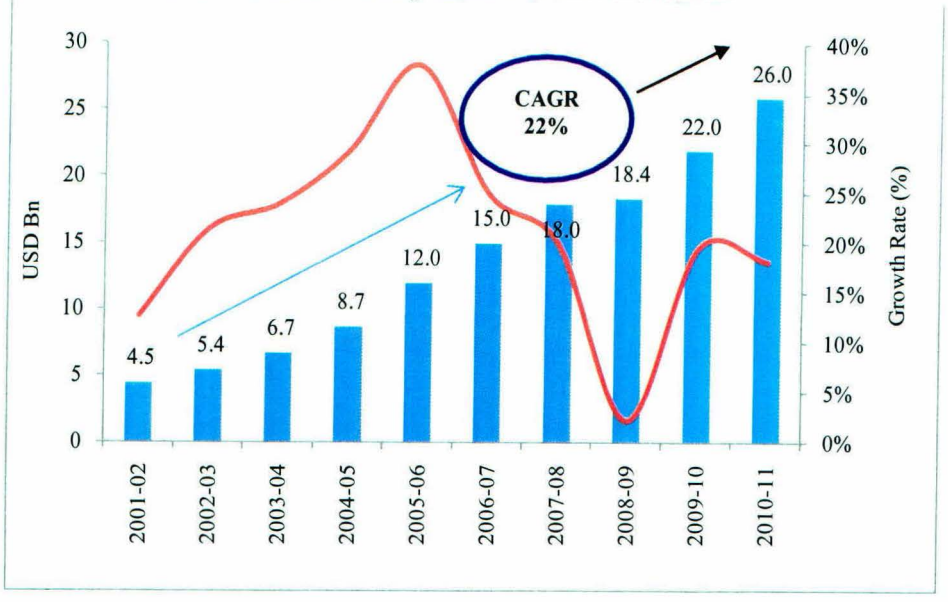
4.4 Current Trends in the Indian Auto-component Industry

The auto-component industry supplies to three kinds of buyers – original equipment manufacturers (OEM), Tier-I and Tier–II vendors, and the replacement market. Thus the growth of the auto-component industry is closely linked to the performance of automobile industry as more than 65 percent of its sales are to OEMs (GOI 2006a). Accordingly, in line with the tremendous performance of the automobile industry in the last decade, the auto-component industry has witnessed high growth. Besides, the increasing sourcing of components from India by the global OEMs and Tier-I suppliers on low cost consideration has led to increased turnover, exports and investment in the industry. The Indian auto-component manufacturers have scaled up their operations and many global manufacturers have established their manufacturing centres in India, either through joint ventures or through wholly owned subsidiaries (EXIM Bank 2008). The increasing policy support to the industry in the form of low excise duties and establishment of special auto parks and virtual SEZs for auto-components has also fueled growth in the industry. The next sections describe the performance of the auto-component industry on certain key parameters.

4.4.1 Turnover

The turnover of the Indian auto-component industry witnessed steep growth during the last decade and grew at a remarkable CAGR of 22 percent. It crossed USD 10 billion mark in 2005-06 and stood at 26 billion in 2010-11(Chart 4.33). The growth of the turnover has been quite impressive throughout the last decade except the crisis year of 2008-09 when it plunged below double digit. However, it rebounded quickly and posted impressive growth rates of 20 percent and 18 percent respectively in the subsequent two years.

Chart 4.33
Trend in Auto-component Turnover in India

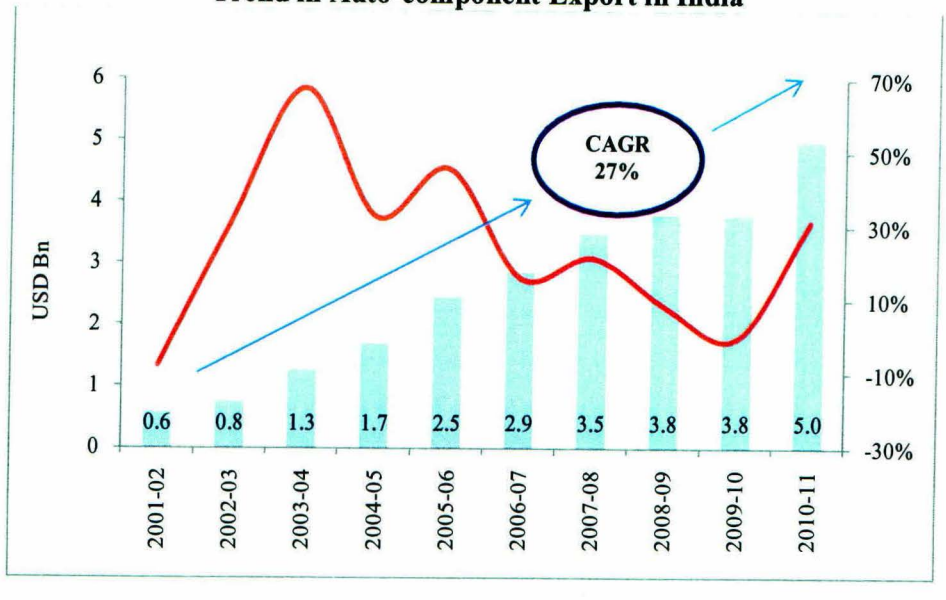


Source: ACMA, 2012

4.4.2 Exports and Imports

The auto-component exports from India are increasing. During the last decade, they grew at a CAGR of 27 percent, rising from USD 0.6 billion in 2001-02 to USD 5 billion in 2010-11 (Chart 4.34). The upward trend in exports is mainly due to increasing sourcing of auto-components from India by major global OEMs and Tier 1 suppliers for their global production. According to the latest data, over 30 IPOs (International Purchasing Offices) of Global OEMs and Tier-I are procuring from India (ACMA, 2012). The share of exports in total turnover of the industry has also increased from 13 percent in 2001-02 to19 percent in 2010-11 (Chart 4.35). However, the figure of auto-component exports is very low as compared to world trade of USD 185 billion in auto components (GOI 2006a).

Chart 4.34
Trend in Auto-component Export in India



Source: ACMA.

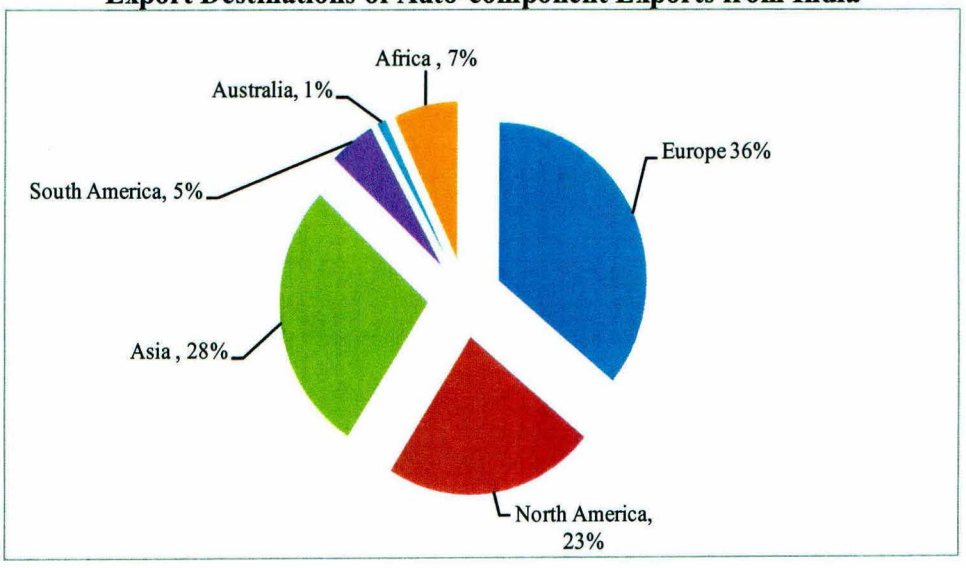
Chart 4.35
Export as % of Production
(Value terms)

Source: ACMA

The auto-component exports from India are directed to regions such as Europe, North America, Asia, South America, Australia, and Africa (Chart 4.36). Thus USA and Europe

together account for 64 percent of Indian auto-component exports. Furthermore, the global customer base for Indian auto-component exports is changing. Illustratively, in the 1990s more than 80 percent of the exports were to international aftermarket. However, as per the latest data in 2012, 80 percent of exports are to OEM/Tier 1 companies and just 20 percent are to the aftermarket (GOI 2006b, ACMA 2012). This indicates the growing level of maturity in the Indian auto-component industry in terms of quality, productivity and design and engineering, helping it to be a part of the global supply chain.

Chart 4.36
Export Destinations of Auto-component Exports from India



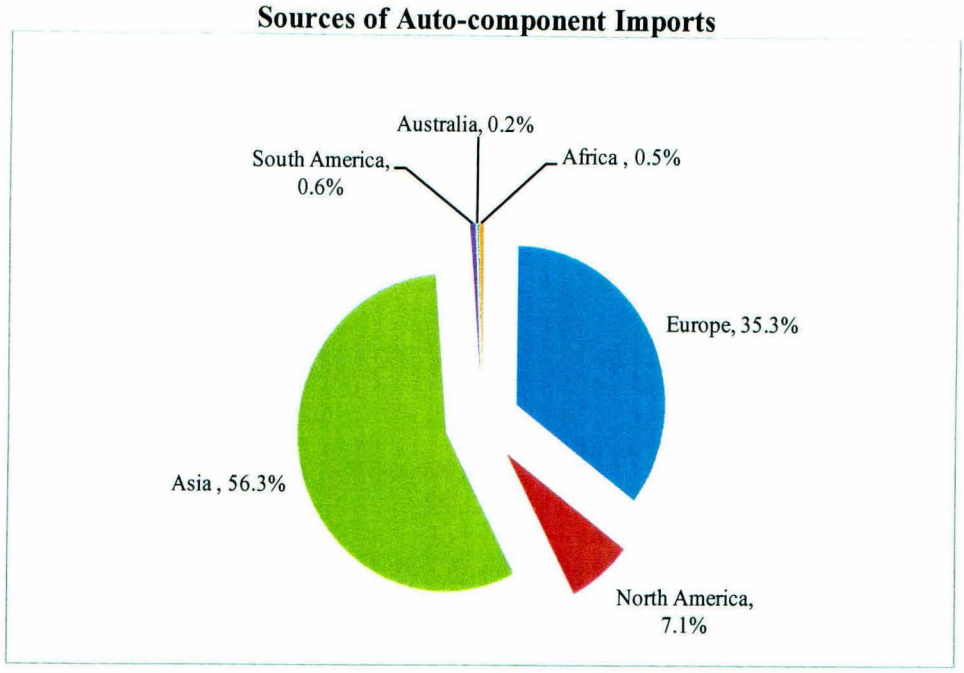
Source: ACMA.

India is also an importer of auto-components which alongwith the domestic production meet the demand of both OEMs and the replacement market. In line with the growth of the automobile industry, imports of auto-component have also witnessed steep growth in India. In 2010-11, the total imports of auto-component stood at USD 8.5 billion registering a CAGR of 11 percent from 2007-08 to 2010-11 (ACMA 2012). The major imports are from Asia followed by Europe and other regions (Chart 4.37).

The Indian auto-component industry suffers from negative trade deficit with imports being higher than exports. This is mainly because the Indian auto-component industry lacks adequate capacity to meet a large portion of domestic demand. Further, it lacks

design capabilities which forces OEMs to source from abroad. Additionally, it faces stiff competition from other low-cost countries such as China.

Chart 4.37
Sources of Auto-component Imports

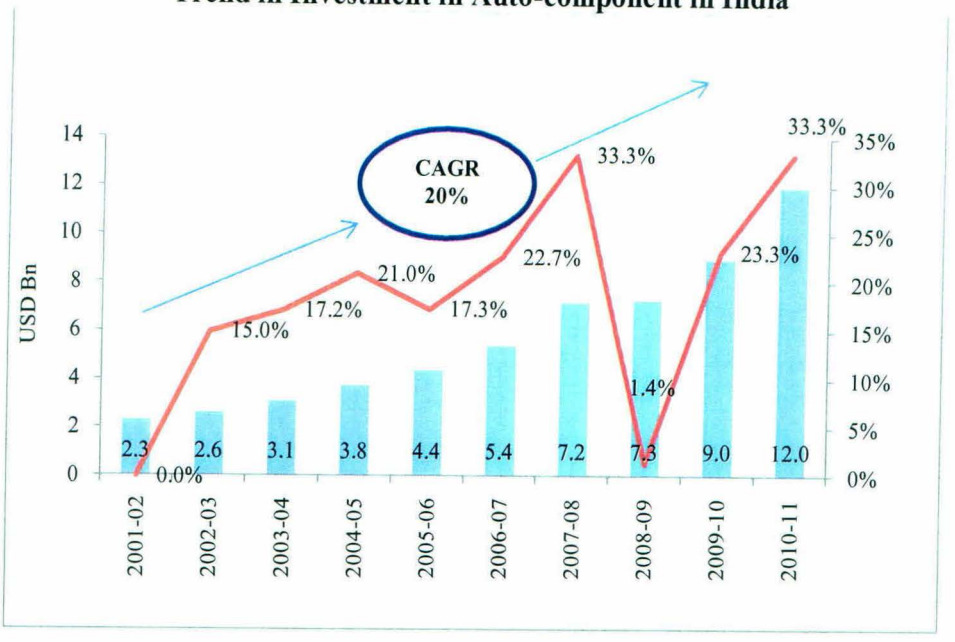


Source: ACMA, 2012

4.4.3 Investment

The investment in Indian auto-component industry is rising. The growing domestic demand for vehicles and potential for exports is mainly driving this trend by encouraging the auto-component companies in India to invest in their capacity enhancements and new green-field projects (ACMA 2008a, EXIM Bank 2008). As a result, the investment in Indian auto-component industry has risen from USD 2.3 billion in 2001-02 to USD 12 billion in 2010-11, growing at a CAGR of around 20 percent during the period (Chart 4.38).

Chart 4.38
Trend in Investment in Auto-component in India



Source: ACMA, 2012.

Thus with the above upward path, India is estimated to have the potential to emerge as one of the top auto-component economies by 2020. According to a recent study by E&Y and ACMA, the Indian auto-component industry has a potential to grow at a CAGR of 14 percent to cross USD 110 billion by 2020. The exports of the industry are also expected to grow 6 fold to reach USD 28 billion by 2020 (CAGR of 20 percent). Domestic market for auto-components on the other hand is expected to attain a turnover of USD 82 billion by 2020.

To conclude, besides the tremendous growth noticed by the automotive industry during the last decade, the industry has huge potential for growth in terms of domestic sales and exports[29]. Given the low vehicle penetration of just 11 cars and 32 two-wheelers per thousand persons in India, there is potential for high growth in the domestic market (GOI 2012). This requires introducing innovative products which suit the requirements of all the segments of society. For example, develop fuel efficient low cost vehicles to meet demand from the rural areas. Export opportunities also lie particularly in the export of

[29] AMP project automotive industry to be USD 145 billion by 2016.

small cars in which India has expertise and advantage over other low cost countries. The increasing global auto-component sourcing from low cost countries is an attractive opportunity for India. However, there are a lot of constraints in tapping these opportunities such as lack of adequate infrastructure, lack of technological capabilities, non availability of skilled human resource, high incidence of taxes, environmental and safety issues etc. The next section talks about these constraints alongwith the efforts made by the government to deal with them.

4.5 Constraints

The fast growing automotive industry in India faces a lot of challenges which creates doubts on the sustainability of its high growth. Further, it faces stiff competition from countries like China and Thailand whose automotive market is far more competitive than India. The following are the main factors constraining the growth of Indian automotive industry and needs to be addressed.

4.5.1 Poor Quality of Infrastructure

Infrastructure in the form of road, rail and ports is very critical for the growth of automotive industry. However, in India the quality and quantity of infrastructure is very bad. There are long delays in rail and road network completion and in capacity addition adversely impacting the connectivity between auto hubs and ports. This contributes to high cost of vehicles and negatively impacts the competitiveness of sector. The export infrastructure at ports is particularly bad with lack of adequate space for parking and setting up of workshops to repair damage caused during transportation from the manufacturing centre to the port. All this negatively impacts automotive exports and can hinder India from tapping its huge potential in automotive exports.

4.5.2 Lack of Design and Development Capabilities

The competitiveness of automotive industry depends upon its ability to innovate and upgrade which in turn depends upon R&D investment. In India, though the domestic automotive firms have started developing in-house core R&D skills, the domestic design and manufacturing capabilities are not very strong. The domestic firms still spend a relatively low amount of their sales on R&D as compared to that of the global auto majors. This raises the cost of automotive products manufactured in India and adversely impacts their competitiveness vis-à-vis their global competitors such as China and Thailand.

4.5.3 Affordability

In India the incidence of taxes is very high. They are currently levied at three level i.e. the city level (octroi), state level (sales tax, registration), and the central level (excise). This raises the cost of ownership of a vehicle substantially and adversely impacts automotive industry's demand. For example, taxes amount to 36 to 40 percent of the cost of a vehicle on an average and in cases where octroi is levied it increases to 40-45 percent (GOI 2006b). This also impacts the export competitiveness of industry adversely. Clearly this is a very high figure and hampers the growth of the industry.

4.5.4 Lack of Trained Human Resource

The adequate availability of trained manpower is critical for the growth of automotive industry. However, in India there is lack of manpower trained in skill set required by the automotive industry. The courses at Industrial Training Institutes (ITIs) are old and outdated and are no longer as per the demand of the growing automotive industry. In addition to the lack of human training infrastructure, the existing labor laws adversely impact the competitiveness of Indian automotive industry.

4.5.5 Others

The Indian automotive industry also faces issues such as rising fuel prices, rising input costs, and high cost of capital which impact the growth of the industry. The changing consumer preferences, increasing competition, and environmental issues also pose significant challenges to the growth of the Indian automotive industry.

4.6 Key Automotive Policy Initiatives

The Government of India in order to deal with the above challenges and promote India as a global automotive hub has taken various policy initiatives. These include Auto Policy 2002, National Automotive Testing and R&D Infrastructure Development Project (NATRiP), and Automotive Mission Plan 2006-16 (AMP) among others. These are discussed below in detail:-

4.6.1 Auto Policy 2002[30]

The Government of India with the vision of establishing a globally competitive automotive industry in India launched the "Auto Policy" in 2002. The policy aims at promoting India's automotive industry as globally competitive and a global source for auto-components. Furthermore, it aims at promoting modernization of the industry, facilitate indigenous design and development, establishing domestic safety and environmental standards at par with the international ones, ensure a balanced transition to open trade at a minimal risk to the Indian economy and local industry, steer India's software industry into automotive technology, and ensure development of vehicles propelled by alternate energy sources. It also targets at making India as an international hub for manufacturing of small, affordable passenger cars and a key center for manufacturing of Tractors and Two-wheelers in the world.

[30] Ministry of Heavy Industries and Public Enterprises.

Accordingly, the policy proposed various initiatives relating to investment, tariffs, duties and imports to achieve these objectives. Foreign equity investment upto 100 percent was permitted under the automatic route for the manufacture of automobiles and auto-components. The policy proposed to fix import tariff in a way that facilitates development of manufacturing capabilities within the country as opposed to mere assembly, however, without providing excessive protection. This was mainly applicable to WTO-unbound segments such as cars, two/ three wheelers and UVs. With respect to WTO-bound items such as Buses, Trucks, Tractors, CBUs and Auto components, the government proposed to give adequate accommodation to indigenous industry to attain global standards. The policy laid emphasis on automotive R&D for indigenous design and development and foreign technology adaptation and planned apt fiscal and financial incentives for promoting industry R&D efforts. The policy also planned to increase allocations to automotive cess fund created for R&D of automotive industry and to expand the scope of activities covered under it (Ranawat and Tiwari, 2009). It also recognized the importance of strengthened environmental and safety standards for the development of modern automotive industry.

4.6.2 National Automotive Testing and R&D Infrastructure Development Project (NATRiP)

The Government of India in order to remove one of the most critical challenge in the growth of the Indian automotive industry i.e. lack of common testing and R&D infrastructure launched this initiative in 2005. This project envisages setting up of world-class automotive testing and homologation facilities in India (at a total investment of Rs. 17.18 bn) to deepen manufacturing, encourage localized R&D, boost exports, converge India's unparalleled strengths in IT and electronics with automotive engineering sectors to firmly place India in USD 6 trillion global automotive business. NATRIP aims at facilitating introduction of world-class automotive safety, emission and performance standards in India as also ensure seamless integration of Indian automotive industry with the global industry (GOI 2006b).

NATRiP envisages setting up of independent automotive testing centres within the three automotive hubs in the country, at Manesar in Northern India, Chennai in Southern India and Pune and Ahmednagar in Western India. In addition, it envisages setting up of a world class Proving Ground or testing tracks at Indore in Central India and comprehensive Testing and Validation facilities including Field Tracks for Agricultural Tractors, Trailers, Construction Equipments and various other off-road vehicles at Rae Bareilly in Northern India. The Rae Bareilly centre will house India's first state of the art Road Accident Data Analysis facility. Two specialized Driving Training Centres have also been proposed to set up at Silchar in North Eastern India (for specialized Hill Area Driving) and Rae Bareilly in Northern India (for specialized Vehicles and Cargo). A model Inspection and Maintenance (I&M) Centre for vehicles will also form part of NATRiP facilities at Silchar[31].

The project was initially expected to complete by September 2011, however, due to delays in procuring land and other issues the project is now expected to complete by December 2012 and as of now, a number of facilities have already been commissioned under the project. These include Hill Road Track in Silchar; commissioning of Accident Data Analysis Centre in Rae Bareilly; Hill Driving Institute, Mechanics Institute and Inspection and Maintenance Centre at Silchar etc.

4.6.3 Automotive Mission Plan 2006-16 (AMP)[32]

In 2006, the 'Automotive Mission Plan 2006-2016', a ten year roadmap was prepared by the government and industry jointly to accelerate and sustain growth in the Indian automotive industry. The mission, released by the Prime Minister of India in January 2007, envisaged at making India as the destination of choice in world for design and manufacture of automobiles and automotive components with output reaching a level of USD 145 billion accounting for more than 10 percent of the GDP and providing additional employment to 25 million people by 2016.

[31] http://natrip.in/website/overview.asp
[32] http://www.siamindia.com/upload/AMP.pdf

The AMP covers every critical aspect of the growth of automotive industry including simplification of labor laws; creation of adequate infrastructure to ensure availability of human resources with the requisite skills and competence; up-gradation of road, rail, port and power infrastructure to ensure last mile connectivity between ports and auto hubs; setting up of NATRiP to address R&D infrastructure issues; harmonization of safety standards with global ones; formulation of Long Term Emission roadmap beyond 2010 based on the Auto Fuel Policy; direction of fiscal and monetary policy to encourage investment, R&D and introduction of low cost products; expansion of domestic demand and exports etc.

The plan has contributed immensely to the growth of the automotive industry during the last five years of its operation and has been the basis of interventions on the part of all ministries concerned. Many of its recommendations have been implemented such as setting up of NATRiP, encouragement to R&D through Income Tax deductions on R&D expenditure, focus on alternate fuel vehicles leading to the launch of National Mission for Electric Mobility in the country, progressive up-gradation to BS IV emission norms by 2010 - supported by availability of better quality fuels, establishment of the Automotive Skills Development Council (ASDC), maintaining of a differential lower Excise Duty on small cars to encourage demand, and maintaining of consistent and stable international trade policies that include a favorable Customs Duty structure on an MFN level, consistent policies for negotiations under FTAs and at WTO (GOI 2012). The recommendations yet to be implemented include labor laws reforms, up-gradation of infrastructure, and formulation of a long term Emission roadmap beyond 2010 based on Auto Fuel Policy. Meanwhile, the Ministry has also started working on formulating AMP-II (2017-2017) in close association with the industry.

To conclude, the Indian automotive industry has made rapid strides during the last two decades. Since the opening up of the sector to foreign investment in 1991, a large number of foreign firms have entered into the industry and have infused foreign competition and dynamism in the industry. Illustratively, since liberalization over 20 new firms entered into the passenger car segment of the industry alone (EXIM Bank 2008). This raises an important question that is how have the domestic firms in the Indian automotive industry

been impacted by the presence of foreign firms. Ideally the presence of foreign firms is expected to have positive spillover impact on the productivity of domestic firms via channels of competition, labor mobility, and demonstration (discussed in Chapter 1 in detail). However, no study has so far tested this hypothesis for the Indian automotive industry. The next chapter tests this hypothesis econometrically.

Chapter 5

Empirical Findings

5.1 Introduction

The study tests the hypothesis that the presence of foreign firms reduces the dispersion of productivity in Indian automotive industry. The hypothesis has been estimated for the automobile and auto-component firms separately given the differences in the nature of two segments in terms of their size, organizational structure etc. The ensuing sections present the results of the econometric exercise carried out in the study.

5.2 Automobile Firms Results

The Cobb Douglas production function given in the equation 2.1 has been estimated for 20 automobile firms using the standard panel estimation techniques of fixed and random effects (Table 5.1). The low value of Hausman test suggests that the random effect model is better than the fixed effect model in the present case. Further the random effect equation is statistically significant by Chi-Square test suggesting the overall robustness of the regression model. Thus the estimated elasticity of output with respect to labor and capital are 0.65 and 0.39 respectively. These elasticities have been used to estimate residuals from the random effect model which is nothing but a measure of firm specific productivity in present study. The productivity so obtained has been used to estimate relative productivity dispersion from the equation 2.2.

After obtaining relative productivity dispersion, the final model i.e. equation 2.3 has been estimated using the standard panel estimation techniques (Table 5.2). The Hausman test strongly favors random effect model over fixed effect model. Further the random effect equation is statistically significant by Chi-Square test suggesting that the various determinants of productivity taken together contribute significantly to the explanation of relative productivity dispersion in the Indian automobile industry. The explanatory power of the estimated equation is approximately 31 percent.

Table 5.1
Estimation of Cobb-Douglas Production Function: All Automobile Firms

Dependent Variable: LN RGVA		
Independent Variables	Coefficients	
	Fixed Effect	Random Effect
Log L	0.7387855* (0.000)	0.6529516* (0.000)
Log K	0.3098636* (0.000)	0.3924855* (0.000)
Constant	-0.2143582 (0.667)	-0.1790846 (0.646)
F-value	130.08	
Prob>F	0.00000	
Wald Chi2 (2)		511.58
Prob>Chi2		0.00000
R-squared	0.8914	0.8975
Observations	200	200
Fixed vs. Random Effects (Hausman)	5.08	5.08
Number of Groups	20	20

* Significant at 5% level of significance, Note: Figures in the parenthesis are p values.

The results from the random effect model show that of the various firm specific variables controlled for in the estimation, only firm size and export intensity have statistically significant impact on the relative productivity dispersion in the Indian automobile industry (Table 5.2). However, the coefficients of these significant variables are contrary to expectations. The positive and statistically significant coefficient of firm size variable suggests that the large size in Indian automobile industry is associated with greater productivity dispersion in the industry. While it is expected that as firms size increase their productivity improves and the dispersion of productivity in an industry goes down. This is expected because with large size, firms can enjoy the economies of scale and afford greater technological innovation and upgradation.

Similarly, the positive and statistically significant coefficient of export intensity variable suggests that high export intensity is associated with greater productivity dispersion in the Indian automobile industry. While it is expected that as firms export intensity increase their productivity improves and the dispersion of productivity in an industry goes down. This is expected because the export intensive firms are better placed than local market focused firms in accessing crucial information about foreign markets and they operate in

a fierce international competition which forces them to be constantly productive and competitive to survive. Further, the export intensive firms can enjoy the economies of scale by expanding the market for their products through international trade.

Table 5.2
Estimation of Relative Productivity Dispersion's Relation with Spillover Variables: All Automobile Firms

Dependent Variable: Relative Productivity Dispersion (P_{it})		
Independent Variables	Coefficients (All Firms)	
	Fixed Effects	Random Effects
K/L_{it}	0.0000	0.0000
$R\&D_{it}$	-0.0473	0.1091
$SIZE_{it}$	0.5348*	0.5263*
$EXPINT_{it}$	0.0174*	0.0191*
KGM_{it}	-0.0003	-0.0030
$Spill\_1_t$	0.1516*	0.1527*
$Spill\_2_{it}$	-0.2158	-0.2495**
$Spill\_1_t*R\&D_{it}$	0.0012	-0.0018
$Spill\_2_{it}*R\&D_{it}$	0.0356	0.0687
$Spill\_1_t*Size_{it}$	-0.0108*	-0.0105*
$Spill\_2_{it}*Size_{it}$	-0.0006	-0.0018
Constant	-6.6756*	-6.7350*
F -value	6.6	
Prob>F	0.00000	
Wald Chi2 (2)		80.64
Prob>Chi2		0.00000
R-squared	0.2835	0.3077
Observations	200	200
Fixed vs. Random Effects (Hausman)	1.86	1.86
Number of Groups	20	20

* Significant at 5% level of significance, ** significant at 10% level of significance

The results from the random effect model show that strong productivity spillovers occur from the presence of foreign firms in the Indian automobile industry, however, the spillovers are negative. This implies that high foreign presence leads to increased productivity dispersion in the Indian automobile industry. This is against the usual expectation and hypothesis that foreign presence improves the productivity of domestic firms via. channels of competition, demonstration, labor mobility etc. and thereby leads

to reduced productivity dispersion in the Indian automobile industry. On the contrary, significant positive productivity spillovers occur from the import of disembodied technology. This is in line with the expectations that a part of the imported technology could spill over to the laggard firms in the industry and hence can reduce productivity dispersion.

These results are important and suggest that the decision of the Indian government to open up the automobile industry to 100 percent FDI (foreign firms) and foreign competition during the last decade has negatively impacted the productivity of automobile firms and thereby has led to increased productivity dispersion in the industry. However, since with the liberalization of the industry to FDI, multinational firms can have majority equity holdings and therefore can influence management of the firm, it is expected that this ability to influence the management may have led to transfer of design and drawings to such firms. This in turn could have accelerated the diffusion of technological knowledge and also enabled such concerns to develop export markets in association with the Indian firms (Narayanan 2001). But, this doesn't seem to be the case as evident from the results. On the contrary, the government's decision to freely allow import of disembodied technology has positively benefited the Indian automobile industry.

An interesting observation is that the coefficient of interaction variable – Spill_1 * Size (one of the four interaction variables) is negative and significant. This implies that while foreign presence and size variables by themselves have negative influence on relative productivity dispersion of Indian automobile industry, together they generate positive spillovers. This means the firms which are large in size benefit from the presence of foreign firms and thereby lead to reduced productivity dispersion in the industry. Thus size is an important determinant of spillovers from foreign presence in Indian automobile industry. The large sized firms also benefit more from positive productivity spillovers generated by the import of disembodied technology although the coefficient of interaction variable – Spill_2 * Size is insignificant.

Similarly, though R&D and foreign presence variables by themselves have negative impact on productivity dispersion, together they generate positive spillovers, however,

the coefficient of interaction variable - Spill_1*R&D is insignificant. This implies that the firms which invest in R&D have greater capability to absorb and benefit from new technological advancements introduced by foreign firms and hence reduce productivity dispersion in the industry. This result is in line with the results of Pant and Mondal's (2010) study.

The aforementioned results are for all automobile firms (20 in our study consisting of 13 domestic and 7 foreign firms). However, considering the possibility that these results may have been dominated by effects on foreign firms, separate estimation has been done for domestic automobile firms.

'Domestic Automobile Firms' Results

The Cobb Douglas production function given in the equation 2.1 has been estimated separately for 13 domestic automobile firms using the panel estimation techniques (Table 5.3). The Hausman test favors random effect model in this case which is robust by Chi-Square test. The estimated elasticity of output with respect to labor and capital are 0.60 and 0.42 respectively. These elasticities have been used to estimate residuals - a measure of firm specific productivity in present study. The productivity so obtained has been used to estimate relative productivity dispersion from the equation 2.2.

After obtaining relative productivity dispersion, the final model i.e. equation 2.3 has been estimated (Table 5.4). The low value of Hausman test suggests the appropriateness of random effect model and the significance of random effect model is evident from the Chi-Square test. The explanatory power of the estimated equation is approximately 18 percent.

Table 5.3
Estimation of Cobb-Douglas Production Function: Domestic Automobile Firms

Dependent Variable: LN RGVA		
Independent Variables	Coefficients	
	Fixed Effect	Random Effect
Log L	0.6881227* (0.000)	0.605364* (0.000)
Log K	0.3682329* (0.002)	0.4174685* (0.000)
Constant	-0.4902943 (0.453)	-0.2377175 (0.620)
F-value	73.01	
Prob>F	0.00000	
Wald Chi2 (2)		300.42
Prob>Chi2		0.00000
R-squared	0.8917	0.8941
Observations	130	130
Fixed vs. Random Effects (Hausman)	1.57	1.57
Number of Groups	13	13

* Significant at 5% level of significance, Note: Figures in the parenthesis are p values.

The results from the random effect model for the domestic firms confirm the aforementioned results with respect to spillovers from foreign presence. There exist strong negative productivity spillovers for the domestic automobile firms from the presence of foreign firms in the Indian automobile industry. This is against the hypothesis that the domestic automobile firms have benefited from the presence of foreign firms via channel of intense competition encouraging them to upgrade their technology base and via access to a more updated and new technology. Apart from this, only export intensity variable emerged significant, however, again with a positive and unexpected sign.

Table 5.4
Estimation of Relative Productivity Dispersion's Relation with Spillover Variables: Domestic Automobile Firms

Dependent Variable: Relative Productivity Dispersion (P_{it})		
Independent Variables	Coefficients (Domestic Firms)	
	Fixed Effects	Random Effects
K/L_{it}	0.0000	0.000000
$R\&D_{it}$	1.0655	1.086345
$SIZE_{it}$	0.0423	0.063899
$EXPINT_{it}$	0.0240*	0.025551*
KGM_{it}	0.0613	0.046636
$Spill\_1_t$	0.0629**	0.064146*
$Spill\_2_{it}$	-0.2385	-0.271772
$Spill\_1_t$*$R\&D_{it}$	-0.0202	-0.020691
$Spill\_2_{it}$*$R\&D_{it}$	0.0415	0.069184
$Spill\_1_t$*$Size_{it}$	-0.0024	-0.002017
$Spill\_2_{it}$*$Size_{it}$	-0.0134	-0.025169
Constant	-1.9962	-2.196604
F -value	2.49	
Prob>F	0.0081	
Wald Chi2 (2)		29.62
Prob>Chi2		0.0018
R-squared	0.1488	0.1827
Observations	130	130
Fixed vs. Random Effects (Hausman)	0.78	0.78
Number of Groups	13	13

* Significant at 5% level of significance, ** significant at 10% level of significance

The rest of the significant variables in 'all automobile firms' regression appeared insignificant in case of domestic firms, however, they have similar signs. For example, the size variable, though insignificant, has positive coefficient and together with foreign presence variable leads to reduced productivity dispersion among domestic firms in the Indian automobile industry. Similarly, though the coefficient – Spill_1*R&D is insignificant, it suggests that the firms which invest in R&D benefit from the presence of foreign firms.

5.3 Auto-component Firms Results

The Cobb Douglas production function given in the equation 2.1 has been estimated for 84 auto-component firms using the panel estimation techniques (Table 5.5). The Hausman test suggests the use of fixed effect model. Further the fixed effect model is statistically significant by F-test. Thus the estimated elasticity of output with respect to labor and capital are 0.68 and 0.21 respectively. These elasticities have been used to estimate residuals - a measure of firm specific productivity in the present study. Then equation 2.2 has been used to estimate relative productivity dispersion in the Indian auto-component industry.

Table 5.5
Estimation of Cobb-Douglas Production Function: All Auto-component Firms

Dependent Variable: LN RGVA		
Independent Variables	Coefficients	
	Fixed Effect	Random Effect
Log L	0.6835624* (0.000)	0.7184277* (0.000)
Log K	0.2112268 * (0.000)	0.2342617* (0.000)
Constant	0.0826888 (0.619)	-0.2853843* (0.032)
F-value	602.65	
Prob>F	0.00000	
Wald Chi2 (2)		2314.1
Prob>Chi2		0.00000
R-squared	0.8971	0.8973
Observations	836	836
Fixed vs. Random Effects (Hausman)	12.82	12.82
Number of Groups	84	84

* Significant at 5% level of significance, Note: Figures in the parenthesis are p values.

After obtaining relative productivity dispersion, the final equation 2.3 has been estimated using the panel regression techniques (Table 5.6). The fixed effect model is better than random effect model in a sample of 'All Auto-component Firms' as evident from a high

value of Hausman test. Further the fixed effect equation is statistically significant by F-test. The explanatory power of the estimated equation is approximately 10 percent.

Table 5.6
Estimation of Relative Productivity Dispersion's Relation with Spillover Variables: All Auto-component Firms

Dependent Variable: Relative Productivity Dispersion (P_{it})		
Independent Variables	Coefficients (All Firms)	
	Fixed Effects	Random Effects
K/L_{it}	0.0000	0.0000
$R\&D_{it}$	-0.0612	-0.0379
$SIZE_{it}$	-0.1960	-0.1107
$EXPINT_{it}$	-0.0063*	-0.0035*
KGM_{it}	0.0003	0.0002
$Spill\_1_t$	-0.0244*	-0.0293*
$Spill\_2_{it}$	-0.0465	-0.1269*
$Spill\_1_t$*$R\&D_{it}$	0.0017	0.0011
$Spill\_2_{it}$*$R\&D_{it}$	0.0023	0.0100
$Spill\_1_t$*$Size_{it}$	-0.0011	-0.0009
$Spill\_2_{it}$*$Size_{it}$	0.0647*	0.0840*
Constant	2.4374*	2.5402*
F -value	9.18	
Prob>F	0.0000	
Wald Chi2 (2)		90.7
Prob>Chi2		0.000
R-squared	0.0976	0.12
Observations	836	836
Fixed vs. Random Effects (Hausman)	49.75	49.75
Number of Groups	84	84

* Significant at 5% level of significance, ** significant at 10% level of significance

As the estimation of fixed effect model shows, the results of the auto-component segment are completely different from that of the automobile segment. Of the various firm specific variables controlled for in the model, only export intensity emerged significant in explaining relative productivity dispersion in the auto-component industry. However, it has negative and expected coefficient in this case suggesting that the export intensity is associated with improved productivity in the Indian auto-component industry and hence reduces dispersion in the industry. This is probably because the export intensive firms

have better access to information about foreign markets and they can enjoy the economies of scale by expanding the market for their products through international trade. Further they operate in intense international competition which forces them to be constantly productive. Illustratively, the Indian auto-component firms are increasingly becoming part of the global supply chain of auto-components due to their increasing maturity in terms of quality, productivity and design and engineering.

With respect to spillovers, the results show strong productivity spillovers from the presence of foreign firms in the Indian auto-component industry also, however, they are positive in this case unlike the automobile segment where they were negative. Thus, foreign presence in the auto-component segment leads to reduced productivity dispersion in the segment. The coefficient of disembodied technology import variable is insignificant for the auto-component firms, however, it also suggests positive productivity spillovers. These are very important results implying that the opening up of the Indian auto-component industry to foreign firms and foreign competition by the government has positively impacted the productivity of auto-component firms and thereby has contributed to reduced productivity dispersion in the industry.

An interesting observation is that the coefficient of interaction variable - Spill_2* Size is positive and significant. This implies that while the disembodied technology import and size variables are insignificant alone, together they create significant negative productivity spillovers. The size variable with foreign presence variable (Spill_1 * Size) generates positive spillovers, however, spillovers are insignificant. This implies that large firms benefit more from the presence of foreign firms. None of the remaining interaction variables emerged significant.

The aforementioned results are for all auto-component firms (84 in our study consisting of 59 domestic and 25 foreign firms). However, considering the possibility that these results may have been dominated by effects on foreign firms, separate estimation has been done for domestic auto-component firms.

'Domestic Auto-component Firms' Results

The Cobb Douglas production function given in the equation 2.1 has been estimated for 59 domestic auto-component firms using the panel estimation techniques (Table 5.7). The high value of Hausman test suggests the use of fixed effect model than the random effect model. Further the fixed effect model is robust by F-test. Thus the estimated elasticity of output with respect to labor and capital are 0.66 and 0.22 respectively. These elasticities have been used to estimate residuals - a measure of firm specific productivity in present study. The productivity so obtained has been used to estimate relative productivity dispersion from the equation 2.2.

After obtaining relative productivity dispersion, the final equation 2.3 has been estimated using the panel estimation techniques (Table 5.8). The appropriateness of fixed effect model over the random effect model is suggested by the Hausman test and the significance of fixed effect model is evident from the F-test. The explanatory power of the estimated equation is approximately 11 percent.

Table 5.7
Estimation of Cobb-Douglas Production Function: Domestic Auto-component Firms

Dependent Variable: LN RGVA		
Independent Variables	Coefficients	
	Fixed Effect	Random Effect
Log L	0.6617608* (0.000)	0.6970495* (0.000)
Log K	0.2214314* (0.000)	0.2393125* (0.000)
Constant	0.1014528 (0.593)	-0.2290811 (0.152)
F-value	414.76	
Prob>F	0.00000	
Wald Chi2 (2)		1439.19
Prob>Chi2		0.00000
R-squared	0.8766	0.8767
Observations	586	586
Fixed vs. Random Effects (Hausman)	8.55	8.55
Number of Groups	59	59

* Significant at 5% level of significance, Note: Figures in the parenthesis are p values.

Table 5.8
Estimation of Relative Productivity Dispersion's Relation with Spillover Variables: Domestic Auto-component Firms

Dependent Variable: Relative Productivity Dispersion (P_{it})		
Independent Variables	Coefficients (Domestic Firms)	
	Fixed Effects	Random Effects
K/L_{it}	0.0000	0.0000
$R\&D_{it}$	0.7023	0.6818
$SIZE_{it}$	0.1522	0.2687
$EXPINT_{it}$	-0.0065*	-0.0040*
KGM_{it}	0.0025	0.0026
$Spill\_1_t$	-0.0026	-0.0054
$Spill\_2_{it}$	-0.0542	-0.1399
$Spill\_1_t$*$R\&D_{it}$	-0.0141	-0.0138
$Spill\_2_{it}$*$R\&D_{it}$	-0.0160	0.0125
$Spill\_1_t$*$Size_{it}$	-0.0101	-0.0104
$Spill\_2_{it}$*$Size_{it}$	0.0692	0.0902
Constant	1.4871	1.5022
F -value	5.90	
Prob>F	0.0000	
Wald Chi2 (2)		65.34
Prob>Chi2		0.0000
R-squared	0.1146	0.1283
Observations	586	586
Fixed vs. Random Effects (Hausman)	42.58	42.58
Number of Groups	59	59

* Significant at 5% level of significance.

The results from the fixed effect model for domestic auto-component firms do not confirm the aforementioned results of all auto-component firms. There are no significant productivity spillovers for the domestic auto-component firms from the presence of foreign firms. This implies that the domestic auto-component firms have not benefited via any of the channels of spillover. Similarly, there are no significant productivity spillovers from the import of disembodied technology. However the coefficients of these spillover variables are as expected and suggest positive productivity spillovers for the domestic auto-component firms.

Similarly, none of the interaction variable is significant though they have expected signs. Illustratively, size and R&D variables are important determinants of positive productivity spillovers for the domestic auto-component firms however they are insignificant. Of the various firm specific variables controlled for in the study, only export intensity is significant in reducing the dispersion of productivity amongst the domestic auto-component firms.

To conclude, the econometric exercise carried out in the chapter shows that the impact of foreign presence and disembodied technology import on the productivity of domestic firms in the Indian automotive industry vary between the two segments. While, the presence of foreign firms negatively impacts the productivity of domestic automobile firms, no significant spillovers have been observed for the domestic auto-component firms from their presence. However, the coefficient of foreign presence variable for the domestic auto-component firms is negative suggesting insignificant positive spillovers. The disembodied technology import variable is insignificant in both the segments of industry with negative sign implying insignificant positive spillovers for domestic firms. Among the determinants of spillovers, size and R&D are weak determinants of positive spillovers from foreign presence in both the segments of the industry.

Chapter 6

Summary and Conclusion

FDI has become an important component of the development strategy of developing countries in the last two decades or so. In these countries, FDI is now considered as an important source of international capital, advanced technology and improved managerial practices and efforts are now being made towards stimulating FDI inflows. India has also encouraged FDI inflows into the country after the economic reforms of 1991. However, the country's foreign investment policy was highly restrictive prior to 1991. While the foreign investment was permitted in designated industries it was subject to varying conditions on setting up joint ventures with domestic partners, local content clauses, export obligations, promotion of local R&D and so on. FDI was primarily seen as a source of acquiring industrial technology and FDI proposals with an element of technology transfer were given clear preference. However, following the severe balance of payment crisis in 1991, the Government of India initiated a process of wide ranging economic reforms which aimed at substantial integration of the Indian economy with the global economy. FDI promotion was taken up as one of the key objectives of the reforms and the FDI policy regime was liberalized. As a result the FDI in India increased considerably.

The growing FDI has widely acknowledged direct benefits (boost in domestic investment and its multiplier effect on income, employment, exports etc., at the country level and access to better technology, management skills, and capital at the firm-level). However, the emphasis is now shifting to indirect benefits of FDI (spillovers) in developing countries. While the presence of foreign firms creates competition for the domestic firms through advanced technology and better organizational skills, some of these advantages of foreign firms may not be totally internalized and a part of it may spillover to domestic firms. The spillovers can be in the form of improvement in productivity, exports or managerial practices of domestic firms. Thus the presence of foreign firms can affect the domestic firms either way. It is therefore important to examine empirically that whether the entry of foreign firms in India, after the economic reforms of 1991, has been

beneficial or detrimental for the performance of domestic firms (Sasidharan and Ramanathan 2007). This study has examined this for the Indian automotive industry.

The Indian automotive industry was operating in a highly regulated economic environment over the period 1950 to 1985. There were restrictions and controls with respect to licensing (product specific and capacity licensing), foreign collaborations, import of capital goods, local content requirement, etc. This restrictive environment provided little/no incentive to the automotive firms to undertake technological upgradation and they were suffering from inefficiencies in production. However, the industry has undergone substantial policy changes over the last two and a half decades. The policy changes took place in two phases namely partial de-regulation in 1985 and broad based policy changes in 1991. These changes have transformed the landscape of the Indian automotive industry. Particularly, the removal of licensing restrictions, abolishment of local content requirement and opening up of the industry to foreign competition, investment and technology in 1991 and in subsequent years, have majorly impacted the Indian automotive industry.

A large number of foreign firms have entered into the industry to reap the vast market opportunities that exist in the form of low cost and untapped demand. As a result India is now home to almost all major global firms. The drive to entry in the Indian automotive industry has been well supported by the favorable economic conditions of the Indian economy particularly in the financial sector which has played a big role in fueling demand and growth in the industry. Foreign firms foray into the Indian market is also explained by the near stagnation in auto markets of USA, EU and Japan. In the early years of 1990s, most of these foreign firms like Ford Mahindra, Hindustan GM, and Daimler Tata etc. were joint ventures with India partners, however, most of them became wholly owned subsidiaries in the later years of the decade (Chenoy 2007).

These foreign firms have brought with them new technologies and efficient processes and have led to intense competition in the industry. The resulting intense competition in the domestic market and growing acceptance of India made products in the international markets have encouraged domestic firms to expand their production capacities and upgrade their technological competence. The technology is being upgraded either through

in-house R&D efforts or through technology acquisition. These efforts in turn have pushed up the technical efficiency of the sector.

The competition has also shifted the focus of the firms towards cost cutting and introduction of innovative products to suit the customer requirements. The efforts towards cost reduction have led to a complete change in the procurement and manufacturing strategy of the firms. While, each OEM used to deal directly with various auto-component manufactures earlier involving huge handling and management costs, the steps towards cost reduction have led to the tierisation of the Indian auto-component industry. The industry has started working as a total value chain instead of having a fragmented activity like earlier (Piplai 2001). Furthermore, to maintain their market shares, the manufactures have started reorienting their strategy to differentiation to lure customers. The differentiation is in terms of offering products which are customer specific, by providing better services to customers and product excellence.

Thus the removal of restrictions in 1991 has helped the industry to restructure itself, absorb newer technologies, align to global developments and realize its potential (Burange and Yamini, 2008). Consequently, the market which was earlier a supplier driven market has transformed to a buyer driven market. This has benefited an average Indian consumer who has now a wide variety of vehicle models to choose from.

Coincidently, the restructuring of the Indian automotive industry coincided with the strong performance of the Indian economy. Given that the automotive spending is the second leading discretionary purchase by a consumer after housing, the general growth of the Indian economy has also contributed to the growth of industry in the last two decades (GOI 2012). Further, the rising income levels, bulging middle class, growing urbanization, new products launches, easy availability of cheap financing option etc. have also contributed to a booming automotive industry in India.

As the industry is growing domestically, it has started exploring overseas markets for their products. Many Indian OEMs are expanding their global outreach which is clearly evident from growing exports of the industry. Several foreign manufacturers are also using India as their manufacturing base to meet the market requirement of some of their

products in global market. Illustratively, Hyundai has made India as its manufacturing base for the export of small cars to the world.

Considering the deep forward and backward linkages of the automotive industry with other sectors of the economy, the Government of India has also recognized the importance of automotive industry for the overall industrial growth, employment generation, exports, and government's finances (tax kitty). This is why the government has taken various initiatives to facilitate and encourage growth in the industry. These include measures such as launch of NATRiP for developing world class common automotive testing and R&D infrastructure in the country, continuous emphasis on improving rail, road and port infrastructure to facilitate last mile connectivity between ports and automotive hubs, complete alignment to Euro-III emission norms', and to Euro-IV in around 12 cities etc. The government has also opened up the automotive industry to 100 percent FDI under the automatic route. Quantitative restrictions have also been abolished since 2001. As a result of these efforts the Indian automotive industry has grown exponentially during the last two decades and India has become the 6^{th} largest vehicle manufacturer in the world.

Thus given the tremendous growth and restructuring of the Indian automotive industry during the last two decades, an important question that arises is how have the domestic automobile and auto-component firms been impacted by the presence of foreign firms in the industry? Ideally the presence of foreign firms is expected to have positive impact on the productivity of domestic firms via channels of competition, labor mobility, and demonstration (discussed in Chapter 1 in detail). Also, considering the fact that the entry of foreign firms in the Indian automotive industry induced intense competition in the industry and encouraged domestic firms to cut cost and upgrade/ adopt new technologies, it is expected that the productivity of domestic firms would have improved by the presence of foreign firms. This study tested this hypothesis for the automobile and auto-component segments separately.

The study uses secondary data from the Prowess database of the Centre for Monitoring Indian Economy. The initial sample of automobile firms consisted of 50 firms, but most of them were dropped due to the discontinuity of data for several years. Nevertheless, the

final sample of automobile firms (20 automobile firms of which 7 are foreign firms and 13 are domestic firms), comprises major firms of each segment. Similarly, in case of auto-component firms' initial sample consisted of 434 firms and after dropping the firms for which continuous data was not available, the study left with a final sample of 84 firms (25 foreign firms and 59 domestic firms). The study covers a ten year time period from 2001 to 2010 and the choice of the time period is guided by twin considerations of (a) opening up of the automotive industry to 100 percent FDI during the aforesaid period (b) non availability of firm level time series data for a large number of firms for prior 2001 period.

Since the spillovers from FDI can only be estimated indirectly, the study has used relative productivity dispersion in the automotive industry as a proxy to estimate spillovers from the presence of foreign firms. The firm specific productivity is estimated using the Cobb Douglas production. Then to estimate relative productivity dispersion, the firm with highest productivity is considered as the most efficient firm while the other firms are considered as the laggard firms. The gap between the two, measures the productivity dispersion. Finally, to examine spillovers from foreign presence on relative productivity dispersion, the study has used the standard panel estimation techniques of random and fixed effects.

The results of the econometric exercise show that spillovers from foreign presence and disembodied technology import vary between automobile and auto-component segments of the automotive industry. While, the presence of foreign firms negatively impacts the productivity of domestic automobile firms, no significant spillovers have been observed for the domestic auto-component firms from their presence. However, the coefficient of foreign presence variable for the domestic auto-component firms is negative suggesting insignificant positive spillovers. The disembodied technology import variable is insignificant in both the segments of industry. This confirms Pant and Mondal's (2010) argument that spillovers are more likely to occur from the presence of foreign firms than from the import of disembodied technology. With regard to the determinants of spillovers, both size and R&D variables considered in the study emerged insignificant. However, their interaction coefficients with foreign presence variable are negative

suggesting positive spillovers for large sized and R&D intensive domestic firms from foreign presence in both the segments of the industry.

These results are contrary to the hypothesis and suggest that the domestic firms in Indian automotive industry have not benefitted from any of the channels of spillover. While there is no study of this kind for the automotive industry, the results of the study are in conformity with literature on the subject for the Indian manufacturing sector.

To conclude, the results of the study are against the considerations of the government towards opening up of the automotive industry to foreign competition and technology i.e. to make domestic firms competitive and productive. However, in order to facilitate and ensure that domestic firms benefit from foreign firms presence, the government needs to continue and strengthen its policy efforts towards incentivizing R&D expenditure in the industry as the R&D intensive firms are better placed to reap the benefits of foreign firms' presence. Also the government should help the firms to grow in size because the spillovers are likely to work more for large sized firms than the small firms.

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Appendix A

List of Automobile Firms Included in the Sample

Company Name	Classification of firm based on foreign equity participation (10% or more = foreign firm, else domestic firm)
Ashok Leyland Ltd.	Foreign Firm
Atul Auto Ltd.	Domestic Firm
Eicher Motors Ltd.	Domestic Firm
Force Motors Ltd.	Domestic Firm
General Motors India Pvt. Ltd.	Foreign Firm
Hero Motocorp Ltd.	Foreign Firm
Hindustan Motors Ltd.	Domestic Firm
Honda Siel Cars India Ltd.	Foreign Firm
Hyundai Motor India Ltd.	Foreign Firm
Kinetic Motor Co. Ltd.	Domestic Firm
Kranti Automobiles Ltd.	Domestic Firm
L M L Ltd.	Domestic Firm
Maharashtra Scooters Ltd.	Domestic Firm
M&M Ltd.	Domestic Firm
Maruti Suzuki India Ltd.	Foreign Firm
S M L Isuzu Ltd.	Foreign Firm
Scooters India Ltd.	Domestic Firm
Sooraj Automobiles Ltd.	Domestic Firm
T V S Motor Co. Ltd.	Domestic Firm
Tata Motors Ltd.	Domestic Firm

Source: CMIE, Prowess.

Appendix B

List of Auto-Component Firms Included in the Sample

Company Name	Classification of firm based on foreign equity participation (10% or more = foreign firm, else domestic firm)
A N G Industries Ltd.	Domestic Firm
Amtek Auto Ltd.	Domestic Firm
Auto Pins (India) Ltd.	Domestic Firm
Autolite (India) Ltd.	Domestic Firm
Automobile Corpn. Of Goa Ltd.	Domestic Firm
Automotive Axles Ltd.	Foreign Firm
Automotive Stampings and Assemblies Ltd.	Foreign Firm
Banco Products (India) Ltd.	Foreign Firm
Bharat Forge Ltd.	Domestic Firm
Bharat Gears Ltd.	Domestic Firm
Bharat Seats Ltd.	Foreign Firm
Bimetal Bearings Ltd.	Domestic Firm
Bosch Chassis Systems India Ltd.	Foreign Firm
Bosch Ltd.	Foreign Firm
Clutch Auto Ltd.	Domestic Firm
Denso India Ltd.	Foreign Firm
Dynamatic Technologies Ltd.	Domestic Firm
Exedy India Ltd.	Domestic Firm
Federal-Mogul Goetze (India) Ltd.	Foreign Firm
Fiem Industries Ltd.	Domestic Firm
Frontier Springs Ltd.	Domestic Firm
G K N Driveline (India) Ltd.	Foreign Firm
Gabriel India Ltd.	Domestic Firm
Gujarat Automotive Gears Ltd.	Domestic Firm
Halonix Ltd.	Foreign Firm
Hella India Lighting Ltd.	Foreign Firm

Hi-Tech Gears Ltd.	Domestic Firm
Hindustan Hardy Spicer Ltd.	Foreign Firm
I P Rings Ltd.	Domestic Firm
India Forge and Drop Stampings Ltd.	Domestic Firm
India Nippon Electricals Ltd.	Foreign Firm
J B M Auto Ltd.	Domestic Firm
J M T Auto Ltd.	Domestic Firm
Jagan Lamps Ltd.	Domestic Firm
Jainex Aamcol Ltd.	Domestic Firm
Jamna Auto Inds. Ltd.	Domestic Firm
Jay Bharat Maruti Ltd.	Domestic Firm
Jay Ushin Ltd.	Foreign Firm
K A R Mobiles Ltd.	Domestic Firm
K E W Industries Ltd.	Domestic Firm
Kalyani Forge Ltd.	Domestic Firm
Kinetic Engineering Ltd.	Domestic Firm
Krishna Engineering Works Ltd.	Domestic Firm
Lumax Industries Ltd.	Foreign Firm
Majestic Auto Ltd.	Domestic Firm
Menon Bearings Ltd.	Domestic Firm
Menon Pistons Ltd.	Domestic Firm
Micro Forge (India) Ltd.	Domestic Firm
Minda Industries Ltd.	Domestic Firm
Motherson Sumi Systems Ltd.	Foreign Firm
Munjal Auto Inds. Ltd.	Domestic Firm
Munjal Showa Ltd.	Foreign Firm
Omax Autos Ltd.	Domestic Firm
Perfect Circle India Ltd.	Domestic Firm
Pradeep Metals Ltd.	Domestic Firm
Precision Pipes and Profiles Co. Ltd.	Domestic Firm
Pricol Ltd.	Domestic Firm
Ramkrishna Forgings Ltd.	Domestic Firm
Rasandik Engineering Inds. India Ltd.	Domestic Firm
Raunaq Automotive Components Ltd.	Domestic Firm
Reil Electricals India Ltd.	Foreign Firm

Remsons Industries Ltd.	Domestic Firm
Rico Auto Inds. Ltd.	Domestic Firm
Roto Pumps Ltd.	Domestic Firm
Samkrg Pistons and Rings Ltd.	Domestic Firm
Schrader Duncan Ltd.	Foreign Firm
Setco Automotive Ltd.	Domestic Firm
Sibar Auto Parts Ltd.	Domestic Firm
Simmonds Marshall Ltd.	Domestic Firm
Sona Koyo Steering Systems Ltd.	Foreign Firm
Steel Strips Wheels Ltd.	Domestic Firm
Subros Ltd.	Domestic Firm
Sundaram Brake Linings Ltd.	Domestic Firm
Sundaram-Clayton Ltd.	Foreign Firm
Sundram Fasteners Ltd.	Domestic Firm
Suprajit Engineering Ltd.	Domestic Firm
Talbros Automotive Components Ltd.	Domestic Firm
Triton Valves Ltd.	Domestic Firm
Ucal Fuel Systems Ltd.	Foreign Firm
Veljan Denison Ltd.	Domestic Firm
Vybra Automet Ltd.	Domestic Firm
Wheels India Ltd.	Foreign Firm
Yuken India Ltd.	Foreign Firm
Z F Steering Gear (India) Ltd.	Foreign Firm

Source: CMIE, Prowess.