

An Economic Study on Technological Competition and Liberalization Of Indian Automobile Industry In India

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Abstract

The main purposes of this study, the automobile industry would include the following categories: cars and other four wheeled drives [CAR], light commercial vehicles [LCV] and medium and heavy commercial vehicles [HCV]. In 1991, substantial changes were made to the economic policy of India. Because the liberalisation concerning foreign investment encouraged several global players to enter into the Indian market establishing JVs with domestic players. While FDI upto 51% was allowed on an automatic basis, the same for more than 51% required governmental clearances which were approved on a case-to-case basis depending upon the projected exports, sophistication of technology brought in, etc. Another important policy decision was the relaxations on imports of capital goods and technology.

Keywords: Automobile Sector, Economic Growth, Labour

1.1. Introduction

The automobile industry, one of the core sectors, that has undergone change with the advent of new business and manufacturing practises in the light of liberalisation and globalisation. As the automotive industry moves into the 21st century, its road map continues to change. Today, innovation and competition are among the driving forces as automotive related businesses try to keep pace in the new global market place. Indian automobile industry is all set to play the same role in Indian economy. In general, liberalisation and the accompanying entry of foreign firms have raised the technological competence level of India's automotive

industry. It assigned central role to the market forces for organising economic activities and also adopted a more liberal stance towards foreign trade and investment. These policy changes, collectively known as 'liberalisation of the Indian economy', had far reaching implications. Accordingly, the functioning of the automotive industry also got liberalised, which significantly altered its development trajectory. This policy brought about significant changes in the Indian automobile industry with respect to quality standards, degree of competition, and degree of product differentiation as a result of relaxed trade restrictions. The important policy decisions of the liberalisation package were delicensing, 51% FDI via automatic route, relaxations for critical imports and suspension of local content requirements. The impact of these policy decisions over the developmental aspects of the industry was visible by the mid-1990s. The policy decisions led to a second wave of restructuring of the industry and resulted in a fiercely competitive domestic market, both in terms of price and quality (Singh 2004). The policy decisions also altered the behaviour of the established firms with respect to technology acquisition and performance (Narayanan 2001).

The tariff structure for auto-related imports also underwent changes with the peak tariff rate reduced in 1995 (Kathuria 1996). By mid-1990s, several foreign players had entered into the Indian passenger car market by mainly setting up JVs with the local firms. In 1997, the Ministry of Industry in its policy for automotive industry placed import of capital goods and auto-components under Open General License (OGL), but regulated the import of automotive vehicles in CBU form or in SKD/CKD condition. For instance, in Jan. 2000 the requirement of foreign exchange neutrality was done away with for the new investors. Since April 2001, the SKD/CKD and even CBU imports were put on the OGL list, thereby eliminating the need for obtaining license under MoU with DGFT for the new investors. The quantitative restrictions on imports were therefore effectively removed. The export commitments for the already-existing foreign investors were abolished in August 2002. It highlights the key policy decisions and events in the liberalisation phase. The key policy decisions highlighted during 1991 to 2001 are grouped together as 'liberalisation policy' and the ones on right as 'Auto Policy 2002'.

1.2. Structure of the Indian Automobile Industry

For the purposes of this study, the automobile industry would include the following categories: cars and other four wheeled drives [CAR], light commercial vehicles [LCV] and medium and heavy commercial vehicles [HCV]. In 1991, substantial changes were made to

the economic policy of India. Under the delicensing policy, the firms were free to enter, expand, diversify and relocate based on their commercial judgements. The delicensing of entry and diversification, combined with automatic approval upto 51% FDI led to a spate of entries by the foreign players, establishing JVs with the domestic players. GOI (2002) notes that after delicensing of cars in 1993, 17 new ventures had come up out of which 16 were for manufacture of cars. This transformed the previously oligopolistic car segment into one of the most competitive sector in the industry. Auto Policy 2002 comprises several policy decisions that aim at making the Indian automotive industry globally competitive and for raising its contribution to the economy. Discontinuation of foreign exchange neutrality requirement and approval of 100% FDI via automatic route are the policy decisions aimed at creating a more conducive environment for the foreign investors. Higher foreign competition was introduced in the industry. However, the induction was not sudden and allowed the indigenous firms to adjust. Efforts are being made to move beyond the factor-driven advantages by encouraging R&D efforts within the industry. This resulted in technological upgradation and introduction of various new models of motor vehicles in collaboration with Japanese and Western auto manufacturers, leading to a transformation of the structure that existed in this industry. Automobile production in India increased substantially during this period. Domestic manufacturers acting as a global hub for exports is also gaining acceptance. Though exports are not necessarily lucrative, it will enable domestic players to increase exposure and maintain capacity utilisation at a healthy level. Growth trends of key variables of the industry are explained below in table 1.2.1

Table 1.2.1**Growth Trends of Key Variables of the Industry****('000 Numbers)**

Year	Production		Domestic Sales		Export	
	Number	Growth (%)	Number	Growth (%)	Number	Growth (%)
2009	4223		4259		159	
2010	4859	15.06	4900	15.05	139	-12.59
2011	4744	-2.35	4812	-1.81	168	20.76
2012	5372	13.23	5237	8.83	185	9.97
2013	6280	16.91	4942	13.46	307	66.11
2014	7244	15.33	6811	14.63	480	56.16
2015	8468	16.90	7898	15.96	630	31.17
2016	9744	15.06	8906	12.77	806	28.06

2017	11088	13.79	10123	13.67	1011	25.46
2018	10854	-2.11	9654	-4.63	1238	22.42
2019	11175	2.96	9723	0.71	1530	23.61

Source: SIAM, Society of Indian Automobile Manufacturers, 2019

The Table 1.2.1 shows the recent growth trends of key variables in the industry from 2009 onwards. While the production of automobile industry increased from 4223 thousands in 2009 to 4859 thousands in 2010 and its growth rate is 15.06 percentages, the domestic sales increased from 4259 thousands to 4900 thousands along with its growth rate is 15.05 percentage. The export of this industry is declining from 159 thousands to 139 thousands and its growth rate is -12.59 percentages during this same period. After that the export of this industry increased from 139 thousands in 2009 to 1530 in 2011 along with its positive growth rate.

While the production of automobile industry decreased from 4859 thousands in 2009 to 4744 thousands in 2015 and its growth rate is negative, then it started to increase up to 2017. But the domestic sales of automobile decreased from 4900 thousands in 2009 to 4812 thousands 2010 along with negative growth rate and it started to increase up to 2019. Again the automobile production decreased from 11088 in 2015 to 10854 thousands 2017 onwards along with its negative growth rate and also the domestic sales of automobiles decreased from 10123 thousands in 2014 to 9654 thousands in 2016 onwards along with its negative growth rate. After that it started to increase in 2017. This is due to the slowdown in the Indian economy. Reduced availability of credit and high cost of finance remain the main reasons for the current scenario in the commercial vehicle market, while falling industrial growth rate added to its woes. The economic scenario has to improve and banks have to start lending.” Mr Mathur said one was not so sure about an immediate upturn in the industry, but may be the worst was behind now. Things will remain difficult for the next few quarters because the essential solution is an economic recovery.

1.3. Policy Regimes, Growth of Production of Automobiles

In 1991, substantial changes were made to the economic policy of India. The government did away with most of the controls and regulations. It assigned central role to the market forces for organising economic activities and also adopted a more liberal stance towards foreign

trade and investment. These policy changes, collectively known as ‘liberalisation of the Indian economy’, had far reaching implications. Accordingly, the functioning of the automotive industry also got liberalised, which significantly altered its development trajectory. It highlights the key policy decisions and events in the liberalisation phase. The key policy decisions highlighted during 1991 to 2001 are grouped together as ‘liberalisation policy’ and the ones on right as ‘Auto Policy 2002’.

The industry currently contributes about 5% of the GDP and it is targeted to grow five fold by 2016 and account for over 10% of India’s GDP. The Indian CV industry is currently going through demand correction following one of the longest up cycles in its history. Although growth of these segments has shown similar trend, volume growth in the M/HCV segment has been more volatile. The commercial vehicle industry has high degree of correlation with the GDP and IIP (Index of Industrial production) of the country. The past few years have witnessed a rapid change in all the segments of the Indian Passenger vehicle industry. International competition, increase in the number of participants, and the need to counter pressure on margins have made it a buyer’s market rather than a seller’s one. Today customers have wide model choices and the rising income levels, especially with the low equal monthly installments (IMIs) have made vehicle purchase affordable. The average annual growth rate of Indian automobile sectors during the two periods, namely liberal economic policy regimes, since 1991 with delicensing and a separate auto policy by the Ministry of Industry are presented in table 1.3.1

Table 1.3.1

Annual Average growth of production of automobiles in two periods (%)

Sectors	1991-92 to 2000-2001	2001-02 to 2008-2009	1991-92 to 2008-2009
M/HCVS	4.87	16.94	9.95
LCVS	4.03	20.83	11.11
ALL CVS	3.74	15.08	8.52
Passenger Cars	11.62	15.74	13.24
MUVS	13.64	10.55	12.34
ALL PVS	11.51	14.40	12.73
TOTAL	8.99	14.57	11.34

Source: ACMA, Statistical Profile, SIAM and Indian Transport Motor statistics of Govt. of India. CVS: Commercial Vehicles, PVS: Passenger Vehicles, M/HCVS: Medium and Heavy Commercial Vehicles, LCVS: Light Commercial Vehicles, MUVS: Multi Utility Vehicles,

On the whole, Indian automobile sector grew at a much faster rate in the post 2001 era [14.57% per annum] when compared to [8.99% per annum] the period of 1991-2001. Medium and Heavy commercial vehicles sector also registered a growth rate of about 16.94% in the post 2001 era over the growth rate of 4.87% per annum in the previous period, 1991-2001. In the passenger vehicles sector MUV [other utility vehicles] experienced the decrease in growth [from about 13.64 % per annum to 10.55 % per annum] between the two periods. The Car sector also had an increase of about 13.24 percent in its growth rate over the two periods. This was the only sector which had highest growth rate over the two periods.

1.4. India's Position in World Motor Vehicles Production

The automobile industry is increasingly a global industry. Indian auto industry is likely to see a growth of 10-12 percentage in sales in 2010, according to a report by the global rating firm, Fitch. According to its report, Indian Auto Sector Outlook, competition in the country's auto sector is likely to increase due to increasing penetration of global original equipment manufacturers (OEM). It is well developed, globally competitive auto ancillary industry. India is among one of the lowest cost producers steel in the world. It has established automobile testing and R&D centres. It is fifth largest manufacturer of commercial vehicles, fourth largest manufacturer of passenger car market in Asia, 11th largest passenger car market in the world and expected to be the seventh largest auto industry by 2016.

The Automobile industry in India is the seventh largest in the world with an annual production of over 2.6 million units in 2009. In 2009, India emerged as Asia's fourth largest exporter of automobiles, behind Japan, South Korea and Thailand. By 2050, the country is expected to top the world in car volumes with approximately 611 million vehicles on the nation's roads. It operates via sophisticated intra-firm and intra-industry linkages and no part of the industry can be viewed in isolation. For example, The Ford Motor Company has manufacturing facilities in 30 countries on six continents. The auto industry is often thought of as one of the most global of all industries. Its products have spread around the world, and it is dominated by a small number of companies with worldwide recognition. However, in certain respects the industry is more regional than global, in spite of the globalizing trends evident in the 1990s.

The automotive industry in India has been witnessing an impressive growth since the country's economic liberalization in the early 1990s. In contrast to the 1.5 million units produced in the year 1993-94, the production of vehicles in the country crossed a historic land mark of 10 million units in the year 2006-2007. India is also home to the world's largest 2-wheeler manufacturer and 11th largest commercial vehicle manufacturer (Her Honda 2008 and OICA 2008b). India is currently the world's second largest market for 2-wheelers (IBEF 2008) and is considered to be one of the fastest growing passenger car markets (GOI 2006a). In the year 2007, India ranked 8th in the production of commercial vehicles and 9th in the production of passenger cars worldwide, moving up from a rank of 13th and 15th respectively in the year 2000 (OICA, 2008a). The worldwide production of cars and commercial vehicles in India is explained below in table 1.4.1

Table 1.4.1

Worldwide production of cars and commercial vehicles in India ('000 units)

Year	Cars	CVS	Total	%Change
2008	533	285	818	
2009	518	283	801	-2.1
2010	655	160	815	1.7
2011	704	191	895	9.8
2012	908	254	1162	29.8
2013	1178	333	1511	30.1
2014	1264	363	1627	7.7
2015	1473	547	2020	24.2
2016	1714	540	2254	11.6
2017	1830	485	2315	2.7

Source: OICA Statistics, International Organization of Motor Vehicle Manufacturers

The India's production of passenger cars and commercial vehicles have reached a new record of 29.8 percent in 2008, 30.1 percent in 2009 and 24 percent in 2012. This section considers the global spread of vehicle sales and production. Rising demand owing to the strong growth of Indian economy post liberalization and the changing landscape in the global automotive industry have fuelled such a growth. The production growth of passenger cars and commercial vehicles has reduced to 2.7 percent in 2017. The automobile industry has been

severely affected by the economic downturn. The downturn in the automobile industry in late 2017 was deep and highly synchronised. Market structure (including market share has an important role to play in understanding innovation. Market structure affects innovation. The relationship between market share and profitability is most studied single phenomenon in business policy.

1.6. Data Sources and Methodology

The analysis explained in this chapter is based mainly on the secondary data. The basic data are available in different units and for different time-span. Here, adjustments for the data are essential for the estimation purposes. The main sources of data are Centre for Monitoring of Indian Economy (CMIE). It provides information on all firms in the industry under study with regard to production, installed capacity, capacity utilization, equity shares, rates of dividend, balance sheets, profit and loss account, financial ratios and the capital structure. The data set contains firm level data for 10 automobile manufacturing companies for the period 1991–1992 to 2008–2009. The data relate to firms assembling or producing cars and other four wheeled drives, light commercial vehicles, and the heavy commercial vehicles. The nature of the markets is different for these products. For example, while the cars and four wheeled drives are meant for personal use, light, medium and heavy commercial vehicles are all meant for commercial purposes. The study analyses the competitiveness in both the segments of the automobile industry in India. For the empirical analysis, the observations for 18 years namely 1991–1992 to 2008–2009 were pooled. Government of India took major decision to liberalise the economy and de-license the whole Indian automobile industry in 1993. The liberalisation concerning foreign investment encouraged several global players to enter into the Indian market establishing JVs with domestic players. By mid-1990s, several foreign players had entered into the Indian passenger car market by mainly setting up JVs with the local firms.

There are year-to-year changes in the sample set due to the entry and exit of firms. There are large fluctuations in the growth rates of automobile firms particularly from 1998–1999 to 2000–2001. In 2002, the Indian government formulated an auto policy that aimed at promoting integrated, phased, enduring and self-sustained growth of the Indian automotive industry. Fiscal incentives as well as institutional support have been provided for encouraging industry R&D efforts. This paper has attempted to analyse the effects of liberalisation policy, on R&D activities and competitiveness [defined in terms of market share changes] in the

Indian automobile industry. In particular, the paper analyses the determinants of inter-firm differences in market share changes. In doing so it explicitly introduces R&D activities as one of the main determinants. The study examines the impact of Auto policy-2002 with the help of slope dummy variables. Slope dummy was used because, with Auto Policy, the thrust for automotive R&D continued in this policy, but with renewed vigour. On the technology front, the liberalisation concerning foreign technology agreements and foreign collaborations infused world-class technology into the industry. The government has encouraged efforts for latest foreign technology assimilation and indigenised design and development. The intercept dummy, on the contrary, would capture the overall differences, if any, between these two time periods. The empirical specification of the testable model being:

$$\text{RMS} = f(\text{SIZE}, \text{VI}, \text{ADI}, \text{RDI}, \text{LRI FE}, \text{MKI}, \text{MCI}, \text{SKILL}, \text{AGE}, \text{FER}, \text{LRR}, \text{MKR})$$

Where RMS is the rate of change in market share defined as

where MS—market share defined in terms of the annual sales turnover of a firm to that of the total sectoral sales; SIZE—size of the firm measured by the log value of annual sales turnover; VI—degree of vertical integration defined by value added as a proportion of annual sales turnover; ADI—advertisement intensity defined by expenditure on advertisement and sales promotion as a proportion of sales; RDI—R&D intensity measured by research and development expenditure as a proportion of sales; LRI—disembodied technology imports measured by lump sum and royalty payments as a proportion of sales; FE—degree of foreign ownership represented by proportion of value of equity shares held by foreign firms to the total paid up capital of the firm; MKI—embodied technology imports measured by value of imports of capital goods as a proportion of sales; MCI—imports of components measured by the value of imports of components as a proportion of sales; SKILL—skill content of the work-force defined by the wages and salaries paid to the highly paid staff as a proportion of the total wage bill of the firm; AGE—age of the firm measured by depreciation as a ratio of gross block.

Variables ending with 'D' are Slope dummy variables obtained by multiplying the dummy factor [0 for all observations prior to Liberalisation policy (1991-2001) and 1 for the Auto policy 2002 (2001-2009) by the respective variables. The study uses fixed effect estimation to analyse the determinants of inter-firm differences in the dependent variable, namely, the rate of change in market share.

1.7. Empirical Results of this Market Shares Analysis

The results of the empirical analysis are presented in table 1.6.1. The coefficients and the t values are presented in columns for this equation. All the results presented in the table deal with the determinants of inter-firm differences in rate of change in market share in the motor vehicles industry, that is the two sectors defined earlier, taken together.

Table 1.6.1

Fixed Effect Estimation of Determinants of Change in Market Shares

Dependent variable: RMS

Variables	Coefficient	Std. Error	t ratio
Constant	120.7186	57.20295	2.110356
Firm size (S)	-23.40342	9.951152	2.351830
Vertical Integration (VI)	-0.645581	0.675277	0.956025
R&D intensity (RDI)	-7.216484	3.236065	2.230018
Embodied Technology imports (MKI)	0.552513	0.841225	0.656795
Imports of components (MCI)	-0.237266	0.521762	0.454740
Age of the firm (AGE)	1.840069	1.027913	1.790103
MKR (MKI& RDI)	-0.231373	0.661202	0.349928
D02 (Auto policy 2002)	-187.6280	63.21552	2.968069
DSIZE (Firm size)	5.271336	4.751673	1.109364
DVI (Vertical Integration)	2.391443	0.763807	3.130953
DRDI (R&D intensity)	1.120706	2.666159	0.420345
DMKI (Embodied Technology imports)	1.309590	2.216037	0.590960
DMCI (Imports of components)	1.625416	0.652282	2.491894
DAGE (Age of the firm)	-3.281554	1.303045	2.518374
DMKR (MKI& RDI)	-0.604217	0.778482	0.776148
R ²	.4367		
Adjusted R ²	.2689		
F	2.07		

RMS: rate of change in market share [in terms of sales]. Coefficients printed in bold are significant at 0.05 or higher. Variables which end with 'D' are the slope dummies for the auto policy-2002 period.

The t values for slope dummy variables relate to significance of difference in the coefficient. The sign and coefficient of variables with significant t values in both the periods are presented separately in Table 1.6.2. The coefficient values and signs for post auto policy period are corrected by adding the coefficient values of variables with that of the slope

dummies. This table facilitates comparison of results for pre and post auto policy period. The findings of the study are discussed below.

Table: 1.6.2

Estimated signs and coefficient values in pre and post auto policy-2002 period

Variables	Pre auto policy-2002 (Liberalisation policy period)	Post autopolicy-2002 (Auto Policy)
VI	-0.645581	1.745862
RDI	-7.216484	-6.09578
MKI	0.552513	1.862103
MCI	-0.237266	1.38815
AGE	1.840069	-1.44149
MKR	-0.231373	-0.83559

These coefficient values are taken from the estimated equation presented in table 6.5.2.1. The actual value for the post auto policy period was obtained by adding the estimated coefficients of slope dummies with that of the variables.

In this equation, major variables capturing technological paradigm and trajectory shifts emerged very important in the determination of inter-firm differences in competitiveness. On the technology front, the liberalisation concerning foreign technology agreements and foreign collaborations infused world-class technology into the industry. The government has encouraged efforts for latest foreign technology assimilation and indigenised design and development. Fiscal incentives as well as institutional support have been provided for encouraging industry R&D efforts. Over years, many domestic as well as foreign firms have set up R&D facilities in the country. Efforts are being made to move beyond the factor-driven advantages by encouraging R&D efforts within the industry. Further, incentives for R&D efforts planned by the government have incentivised car manufacturers. India has been making efforts towards the harmonisation of auto standards world-wide and therefore integrating its auto industry into the global automotive industry.

As hypothesised, the difference in the role played by technology variables between the two policy regimes is also well highlighted by the results. Further, more than the technology acquisition from abroad, the interaction between imported technology and in house R&D effort seems to be the most important determinant of competitiveness. Whereas the in-house

R&D intensity, though also had a negative sign, turned out statistically significant. This result reiterates the strong complementarity between R&D and technology imports and the need for efficient adaptation requirements of the imported technology to suit the local resource conditions. The important policy decisions of the liberalisation package were delicensing, 51% FDI via automatic route, relaxations for critical imports and suspension of local content requirements. Another important policy decision was the relaxations on imports of capital goods and technology. The relaxations were in the form of simplification of bureaucratic procedures and rationalisation of tariff duties, a trend which has continued till today.

Therefore, imports of technology alone cannot facilitate technological trajectory shifts. In-house R&D turned out insignificant because it, on its own, would also be inadequate to bring about trajectory shifts. It is the interaction between technology imports and in-house efforts that alone can accomplish trajectory shifts. Successful adaptation of the imported technology through in-house efforts and establishment of trajectory advantages were being used by the firms to build up competitive capabilities.

However, as it is clear from the slope factors, all the technology variables capturing paradigm shifts emerged very important in the post auto policy period with a positive and are not highly significant coefficient except MCI. This result supports the contention that in a more liberal regime firms would prefer to import technologies to accomplish paradigm shifts. Large Indian firms like TELCO used in-house R&D to facilitate paradigm shifts in the post reform period. In-house R&D is also now directed by many firms to locate their technology imports. This could be the reason why RDI emerged with a positive coefficient. This in turn would imply that, during the period immediately after liberalisation, the relationship between imports of technology and in-house R&D efforts which has for long been turned out to be one of substitution. Further, one of the interaction variable emerged with a negative sign. This result also reiterates the competitive nature of technology imports and in-house efforts in facilitating paradigm shifts in a more liberal regime. These firms which went in for intra-firm transfer of technology could also benefit from the successes of the technological efforts of the collaborators. This would imply that firms which brought about technology paradigm shifts through acquisition from abroad or relied on their in-house efforts for it were more competitive in the auto policy period.

Product improvements through imports of components turned out to be a very important factor in the determination of RMS in the post auto policy-2002). This is because imports of

components were relatively not uncommon in this sector in India and firms used this as an alternative to indigenous technological development. Further, the cost-effective and quality auto-components produced in India are increasingly gaining acceptance in international markets. There is an increasing trend in the number of Indian auto-component firms getting integrated into the global supply chains of automobile and auto-component majors worldwide. On the other side, the automobiles produced in India are increasingly making their way to the foreign markets through either direct or indirect exports. Along with reductions in the overall tariff level to open up India for international trade, the government has also progressively rationalised its domestic taxation structure to provide a fair competition ground for its domestic manufacturers against the international competition. For instance, the excise duty on passenger cars has been brought down from its peak rate of 66% in 1991-92 to 24% in 2008-09. With regard to the import tariffs in the year 2008-09, the custom duty on WTO-bound segments (CVs and auto-components) has been reduced to 10%, whereas that for the WTO-unbound segments (passenger cars, MUVs and 2-/3-wheelers) has been 10% for CKD units and 60% for SKD/CBU form (SIAM 2008g). This is perhaps the reason, MCI turned out significant with a positive coefficient value implying an increased role during the post de-regulation (auto policy) period.

Firm size comes up with a negatively significant for the pre auto policy period. There seems to be an inverse relationship between size of the firm and RMS. A possible explanation to this could be that smaller firms are as dynamic as their larger counterparts in building technological trajectory advantages. With delicensing, the importance of firm size in determining the growth of market share seems to have reduced size turns out significant, though it has a negative sign. The liberalisation concerning foreign investment encouraged several global players to enter into the Indian market establishing JVs with domestic players. The relationship between firm size and competitiveness is a complex one. The literature using the Marris model of growth either did not find size to be important (Buckley et al., 1978) or reported an inverse relationship between size and growth (Siddharthan and Lall, 1982). However, in most of these studies size was a catchall variable (Siddharthan et al. 1994), after introducing technology and other related factors along with the size variable, found firm size to be unimportant in explaining growth of large Indian firms. Since competitiveness is measured in terms of rate of growth in market share, the result corresponds to that of the growth literature.

Vertical integration emerged positively significant in the determination of RMS during the auto policy period and negatively related in the determination of RMS during the pre auto policy period. The negative sign for the first period could be due to the decline in the transaction cost advantage of vertical integration. The decline in the transaction cost is due to the increase in the number of suppliers of components and parts. This is in line with the findings of earlier studies which point towards the emergence of sub-contracting. With deregulation, however, foreign firms with an objective of capturing the market with technologically superior and guaranteed quality vehicles would choose to produce most of the components in-house. This could be because of the tacidity involved in the transfer of technology and innovation results.

1.8. Major Findings

Automotive industry in India has been witnessing an impressive growth since the country's economic liberalisation. While the production of automobile industry decreased from 2003 to 2004 and its growth rate is negative, the domestic sales and exports of automobile industry decreased along with negative growth rate during this same period. There are large fluctuations in the growth rates of automobile firms particularly from 2009 to 2013. Again the automobile production decreased from 2014 to 2016 onwards along with its negative growth rate and also the domestic sales of automobiles decreased along with its negative growth rate. This is due to the slowdown in the Indian economy. Reduced availability of credit and high cost of finance remain the main reasons for the current scenario in the vehicle market, while falling industrial growth rate added to its woes. On the whole, the commercial vehicle and passenger vehicle sector grew at a much faster rate in the post auto policy era. The Car sector also had an increase of about in its growth rate over the two periods. This was the only sector which had highest growth rate over the two periods.

Worldwide productions of cars and commercial vehicles in India have reached a new record of 29.8 percent in 2003, 30.1 percent in 2009 and 24 percent in 2011. The production growth of passenger cars and commercial vehicles has reduced to 2.7 percent in 2018. The automobile industry has been severely affected by the economic downturn. The downturn in the automobile industry in late 2018 was deep and highly synchronised.

The market concentration of commercial vehicle firms is increasing over the period that leads less competitive the behaviour of firms. Less competitive behaviour results more market power (i.e., lower social efficiency). Overall, the commercial vehicle sector is highly

oligopoly, where although there is a product differentiation, competition, both price and non price is considerable. The firms like Tata motor Ltd. and Ashok Leyland Ltd. are the dominant firms in Indian Commercial vehicle firms. The market concentration of passenger vehicle sector is declined over the period of time that leads more competitive the behaviour of firms. More competitive behaviour results less market power (i.e., higher social efficiency). By mid-1990s, several foreign players had entered into the Indian passenger car market by mainly setting up JVs with the local firms. In PVs sector the firms like Hindustan motors, Mahindra and Mahindra and Maruti Suzuki India are the leading firms in Indian Passenger vehicle firms.

The key policy decisions highlighted during 1991 to 2001 are grouped together as 'liberalisation policy' and the ones on right as 'Auto Policy 2002'. As hypothesised, the difference in the role played by technology variables between the two policy regimes is also well highlighted by the results. This paper has attempted to analyse the effects of auto policy, introduced in India during the 2002, on R&D activities and competitiveness [defined in terms of market share changes] in the Indian automobile industry.

Competitiveness in a liberalisation policy along with delicensing regime would, however, depends upon the size of the firm, import of capital goods and its ability to bring about technological paradigm shifts. Because the liberalisation concerning foreign investment encouraged several global players to enter into the Indian market establishing JVs with domestic players. While FDI upto 51% was allowed on an automatic basis, the same for more than 51% required governmental clearances which were approved on a case-to-case basis depending upon the projected exports, sophistication of technology brought in, etc. Another important policy decision was the relaxations on imports of capital goods and technology. This is especially because of entry of new firms and the introduction of new models of vehicles involving technological upgradation. Different forms of technology transfers brought with it the know-how of the successes of technology suppliers. These transfers enabled the firms to bring about technological paradigm shifts.

Further, in an auto policy regime, advantages of vertical integration over sub-contracting also appear to be important in the determination of competitiveness. Product improvements through imports of components turned out to be a very important factor in the determination of RMS in the post auto policy-2002). This is clearly evident from the results that inter-firm differences in competitiveness depend crucially on shifts in technology paradigm and

trajectories along with the degree of vertical integration, and levels of product quality improvements, which were made possible by the auto policy in the motor vehicles sector of the Indian automobile industry. The benefits from the foreign investment were reaped with the imposition of export obligations and localisation commitments. Efforts are being made to move beyond the factor-driven advantages by encouraging R&D efforts within the industry. The thrust for automotive R&D continued in this policy, but with renewed vigour. Suitable fiscal and financial incentives were planned for promoting industry R&D efforts. On the technology front, the liberalisation concerning foreign technology agreements and foreign collaborations infused world-class technology into the industry. The government has encouraged efforts for latest foreign technology assimilation and indigenised design and development. Fiscal incentives as well as institutional support have been provided for encouraging industry R&D efforts. The domestic R&D efforts came to fruition with the launch of India's first indigenously developed car 'Indica' by Tata Motors in 1999. Over years, many domestic as well as foreign firms have set up R&D facilities in the country.

1.9. References

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