

AUTOMOBILE INNOVATION TECHNOLOGY IN EMERGING NATIONS WITH A SPECIAL REFERENCE TO INDIA AND SOUTH AFRICA

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ABSTRACT

World Bank Report (2014) draws attention to the fact that globalization has narrowed technological divides between two directions that is north and south, thereby making level of playing field for developing countries. Precisely, it opens a superior question of technological advancement of developing countries, to which this paper intends to dwell on. Technologies playing a vital role in the sustainability of high rates of economic growth in countries like India that has witnessed rapid expansion of market in recent decades, similar to South Africa. Thus, it attempts to make a comparative study between these two countries, namely India and South Africa, on the basis of technological advancement that are either commercialized or initiated. It is equally important, that the paper identifies the deployment of different institutional mechanism that is supposed to deliver the desired goal by taking the case study of auto Industry. At the end the paper attentively underscores the challenges as well as prospects of the countries witnessing in the era of globalization.

Keywords: Globalization, Institution, Technology, Economic growth and Automobile innovation of South Africa & India

INTRODUCTION

The growth of India in terms of economic development since 1990s has attracted significant scholarly attention over causes as well as consequences that range from political to economic consideration (Kohali, 2009, Bhagwati, 2002 among many others). For instance, in the debate of 'opening of economy' is the focal consideration and scholars like (Bhagwati, 2002) is to take this success as a result of trade and globalization with the resonance of easing cross-border barriers such as, tariffs and so on. Matter of fact is that the term 'globalization' is used to describe the increasing interconnectedness that exists between countries as "states and societies become increasingly enmeshed in worldwide systems and networks of interaction" (Held & McGrew, 2003). Globalization encompasses the fields of economics, politics, technology and culture (Haynes, 2008) and although all fields are significant to industrialization, the focus of this essay is on economic globalization. Harris (cited in Loots, 2001) defines economic globalization as 'the increasing internationalization of

manufacture, circulation and promotion of goods and services'¹. Economic globalization is driven by the reduction of transport and communication costs, fewer policy barriers to trade and investment and increased access to transmission speed of information and technology (Loots, 2001). As a result, firms increasingly plan 'their production on a worldwide basis' (Roberts & Thoburn, 2004). The impact of globalization on industrial output, in terms of the types of goods which are made significantly, however, the greatest impact is on globalization of production process as it has transformed the way in which the industries are organized (Kaplinsky, 2005).

Hence, one might be tempted to conclude that the trajectory of economic growth in India, which was fluctuated around 3 % in Gross Domestic Product (GDP) from the independence to the 1980's, Suddenly jumped to more than 5 % per annum. However, it would be the partial reflection which hides the institutional revitalization and its reorientation, so that the emerging market opportunity could be tapped. As many scholars have argued that the developing nations following a set line of research and discovering the global sources of development such as learning via transferring or exporting and foreign direct investment effects (Barba Navaretti and Venables, 2004), the international value series quality has exposed how the global connection play an important role in opening the automobile technological knowledge and improving its quality and learning innovations (Giuliani et al., 2005; Gereffi, 1994; 1999; Pietrobelli and Rabellotti, 2007; Kaplinsky, 2000; Altenburg, 2006; Humphrey & Schmitz, 2002a, b; Gereffi & Kaplinsky, 2001; A. Morrison et al. 2008). However, such understandings heavily rely on the free trade in which any kind of national interfaces is considered to be counteract of innovation, but scholars like (Stieglitz and Greenwald, 2014), effectively proposed the case of intervention to make some industries more innovative, which does not excessively hinges on 'term of trade' as "learning by doing" in some circumstances demand especially if it is about developing countries.

Similarly, South Africa represents developmental trajectory of which pre 1990s economy was almost stagnated and held back by apartheid, which has many implications for industrialization. The term 'industrialization' is used to describe the development of industry. However, the term 'globalization', is multifaceted, because, as (Hewitt et. Al., 1992), explains, industry can be defined in a number of ways. Firstly, it can be defined as the production of material goods, excluding agriculture. Secondly, it can be defined as mining, energy and manufacturing sectors. This classification of industry is 'defined in terms of the kind of output, but it doesn't depend on how the goods are made' (Hewitt et al, 1992). The third definition they offer is, concerned about how the goods are made and focuses on the production process and "sees industry as a particular way of organizing production" (Hewitt, et. al, 1992). Therefore, considering these definitions, the process of industrialization is not simply about moving away from agriculture to the production of other goods, nor is it just about the production of particular goods, it includes the process by which these goods are made that, sine qua none, demand exploration of not only the policies paradigm but institutional settings as well.

This paper is arranged in the following way: firstly, it presents the case of South Africa as well as India in the context of auto industry with identification of peculiar institutional arrangement amid of diverse actors. It is expounded by possibilities as well as challenges that are confronting global economy.

1 See more details Globalization, trade and income Richard G. Harris Simon Fraser University <http://www.jstor.org/stable/135819> accessed on 09/10/2014

GLOBALIZATION AND SOUTH AFRICA AUTOMOBILE INDUSTRY

South African automobile segment

The Ford Company of USA started trading cars in South Africa from the 1905 onwards, and proposed the first global program in South Africa. There was no important tariff benefit gained from the assembly, and the capacity of imports had a good reason to setup the plant which meant decreasing the low cost of the transport. Ford recognized the importance of the South African market and imported 10,000 vehicle in the 1920 out of which 69,000 motorcars were manufactured for foreign countries. Historically, the legacy of apartheid policies and its consequences by sanctioning was devastating Department of Trade and Industry (DTI, 2007a) as these policies had been designed to benefit just 25% of the population that had created an inefficient industrial structure (Chang, 1997). This was consistent with Protectionists policies, and the subsequent international sanctions, isolated South African firms from the global market and therefore the manufacturing sector relied on producing goods for the domestic market (Barnes & Kaplinsky, 2000; Roberts & Thoburn, 2004). Thus, there were enough ground to keep industries at margin of development which was accompanied by low level of education among masses that have been established, thereby making it essential for bringing economic growth.

South Africa's integration into the global economy took place during a time of political instability and therefore, the country did not benefit significantly from increased levels in foreign direct investments (FDI) (Loots, 2001). Yet, the subsequent development of auto industries in South Africa demonstrates gain from the trade and improving potentiality of manufacturer. So in terms of exports, the export of manufactured goods "increased by an annual average of 6.7% between 1990 and 2005, up from 2.9% in the preceding two decades" (Manuel, 2007: 12). Further, it has reached the 7% of total GDP contribution and growing up to 25 % per annum (see table 1).

Table 1: Key Macro Indicators – 2012: South Africa²

GDP	R3 251,4
Automotive industry's contribution to GDP	7%
GDP Growth rate	25%
GDP per capita (current prices)	R60 505
CPI (annual average)	5,6%
PPI – manufacturing (annual average)	4,9%
Total South African export value	R717,9 billion
Main export destinations	China, USA, Japan, Germany and India
Total South African import value	R835,6 billion
Main countries of origin : imports	China, Germany, Saudi Arabia, USA and Japan
Automotive exports as % of total SA exports	12,1%

² This information is the based on http://www.aiec.co.za/Reports/AutomotiveExportManual2013_LowRes.pdf accessed on 16/11/2014

Automotive imports as % of total SA imports	16,3%
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Source: AIEC, South African Reserve Bank, South African Revenue Service (SARS)/ automotive export manual South Africa, 2013

A series of case studies are now presented to illustrate the impact of globalization on three manufacturing industries. Trade liberalization did not lead to its demise, in fact, in the year of 2005 the sector accounted for 7.4% of South Africa's GDP (DTI, 2007c). Vehicle exports increased from 20,000 in 1997 to 285,000 in 2008 (Black, 2001; Kaplinsky, 2005; SA info, 2008). Also, its contribution at the global level has increased significantly, as reveal. Thus, the success is attributed by effective policies and institutional mechanism that enabled the industry to respond to globalization and become a significant exporter (see the table 2.)

Table 2: South Africa's share of Global Production

	2005	2006	2007	2008	2009	2010	2011	2012	%Change 2012/2011
Global Vehicle Production million	66.55	69.33	73.18	70.52	61.70	77.62	79.88	84.14	+5.3%
SA Vehicle Production million	0.525	0.588	0.535	0.563	0.374	0.472	0.533	0.539	+1.3%
SA Share of Global Production	0.79%	0.85%	0.73%	0.80%	0.61%	0.61%	0.67%	0.64%	-

Source: http://www.naamsa.co.za/papers/2014_3rdquarter/index.html accessed on 08/11/2014

THE AUTOMOTIVE INDUSTRY OF SOUTH AFRICA

In the early 1990s, South Africa's automotive and its component sectors were a stagnated market as it was a general case of with other industries too. As it is noticed earlier in the case of auto industry which witnessed remarkable growth in a short span of time, similar thing can be noted in the case of component industries. As the matter of fact, the component industries between 1990 and 1999, South Africa's share in EU imports of catalytic convertors rose from 2.9% to 72.7% (Kojima & Kaplinsky, 2004). The relationship SME component producers built with TNCs enabled them to learn efficient manufacturing practices (Kojima & Kaplinsky, 2004) and made it possible for some to access the after-market (Barnes & Kaplinsky, 2000).

In fact investment in South Africa auto industries are coming into fore wave of investments. Toyota SA would be investing approximately \$33.2 million in parts distribution warehouse and a new assembly line in the eastern coastal city of Durban. German auto component group Friedrich Boysen GmbH has invested \$16.4 million in a new 10,000 sq. meter plant. Also, BMW will be introduced in third shift as its plant, Mercedes Benz SA has started recruiting for 600 new positions in readiness for the production of its C-class brand in the country. Beijing Automotive Works wants to stake \$17.9 million in an assembly plant that will service the whole of sub-Saharan Africa, and another Chinese company is planning to build a truck plant in the Coega Industrial Development Zone in the Eastern

Cape³. Thus, the local manufacturer developed their competitiveness as auto industry has expanded over time.

However, globalization wasn't good for all component manufactures and many SMEs required investment to upgrade and having lower level of investment with high risk in growing competitiveness (Black, 2001). To add perplexity, TNCs increasingly expected component manufacturers to be involved in the designing of components, a function that few South African firms had the capacity to achieve and lack of quality remained a persistent problem (Barnes & Kaplinsky, 2000). Therefore, along with the easing of import restrictions, all this meant that proximity to an automotive TNC was no guarantee of inclusion in their supply chain United Nations Office of the Special Adviser in Africa (UNOSAA, 2008). Herein lie the policies and programme that are meant to strike a balance so that maximum benefit in terms of the size of manufacture could be sustained and the linkage can work and help in scaling up to a level of production.

Policy changes

In fact, the Motor Industry Development Programme (henceforth MIDP) was introduced in 1995 (Black, 2001) to encourage manufacturers to focus on producing certain components while enabling them to import others duty-free, thereby promoting the specialization in order to make the industry more productive (Black, 2001). The programme also encouraged exports, as firms were not allowed to import more than they exported (Kaplinsky, 2005). The main goals of DTI's policy towards the auto industry are to build stronger linkages between OEMs and local suppliers, to decrease the trade deficit, to reach a higher diversification degree of component manufacturers and to increase the employment level in the industry (Barnes and Black, 2003). In a sense, these policies are meant to keep South Africa at competitive environment in which private players and their role has to be widened significantly. These favorable conditions provided the incentives needed for foreign firms such as Ford and Toyota to reinvest in South Africa (Barnes & Kaplinsky, 2000). This resulted in the import of up-to-date technology and processes and helped local firms, including component SMEs to connect to the global motor industry (Kojima & Kaplinsky, 2004). The MIDP was significant in enabling the assembly industry to become more productive. however, the sector also benefited from cheap electricity (SA info, 2008) and access to aluminum (Kojima & Kaplinsky, 2004). The end result was an increasingly competitive assembly industry, and its potential in enabling the sector to compete in the global market.

In nutshell, the MIDP's aim geared towards increasing the volumes and employment opportunities by improving its competitiveness and strengthening in global market. One of the major plan's instrument was an incentive scheme, called 'Import Rebate Credit Certificate' (a duty rebate given to exporters and importers of assembled vehicles and auto parts). Consequently, it proved to be successful. For example, total annual production increased up to 532,545 units in 2011 from 388,442 units in 1995, while the number of exported units surged from 15, 764 in 1995 to 272,457 units in 2011. On the sales of importation, it increased from 25,339 in 1995 to 362,390 in 2011 which represents around 66% of total cars, as South Africa Automotive Industry Report for 2012. Thus, the raising gulf between export and import is apparently recognized, and Department of Trade and

³ http://www.uneca.org/sites/default/files/uploaded-documents/COM/com2014/Documents/era_2014_feature_story_sa_en.pdf

Industry South Africa (DTI) plans to help upgrading whole activities of the sector by the identification of weakness and effectively propose diagnosis (DTI 2002a).

INDIAN AUTOMOTIVE INDUSTRY

The auto industries of India expended its operation as well as quality of production in the beginning of 1990s (table 1, and table 2). Automotive industry in India is one of the key sectors of the economy. Deep forward and backward linkages with several key segment of the economy, automotive industry has a strong multiplier effect and acts as one of the key drivers of economic growth. The well-developed Indian automotive industry produces a wide variety of vehicles such as passenger cars, light commercial vehicles, medium, heavy commercial vehicles, multi utility vehicles such as jeeps, scooters, motors-cycles, mopeds, three wheelers and tractors and other agricultural equipment's etc. this sector has high potential for providing employment. This will also increase the level of employment in manufacturing sectors which is quite low i.e. 12% as compared to the countries like Malaysia (50%), Korea (62%) and China (31%).

Table 3: Automobile production in Numbers⁴

Years	2001-02	2002-03	2003-04	2004-05	2005-06
Category					
Passenger Cars	564,052	608,851	842,437	960,505	1,045,881
Multi Utility Vehicles	105,667	114,479	146,103	249,149	263,032
Commercials Vehicles	162,508	203,697	275,224	350,033	391,078
Two wheelers	4,271,327	5,076,221	5,624,950	6,526,547	7,600,801
Three wheelers	212,748	276,719	340,729	374,414	434,424
Total	5,316,302	6,279,967	7,229,443	8,460,648	9,735,216
Percentage growth	11.70%	18.60	15.12	16.80	15.06

Source: Society of Indian Automobile Manufacturing 2005-06

Table 4: Automobile Export in Numbers

Years	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
Category						
Passenger Cars	22,990	50,088	70,828	126,249	160,677	170,193
Multi Utility Vehicles	4,122	3,077	1,177	3,067	5,736	5,579
Commercials Vehicles	13,770	11,870	12,255	17,227	29,949	40,581
Two wheelers	111,138	104,183	179,862	264,669	366,724	513,256

⁴ See the more details <http://www.siamindia.com/> accessed on 20/11/2014

Three wheelers	16,263	15,462	43,366	68,138	66,801	76,885
Total	168,283	184,680	307,308	479,350	629,887	806,494
Percentage growth		09.74	66,40	55.98	31.40	28.03

Source: Society of Indian Automobile Manufacturing 2005-06

INDIAN AUTOMOTIVE COMPONENT

Not only the auto sector but also the component sector has witnessed a steady increase in its production as well as in strong diversified activities. In 1990s global OEMs and Tier 1 suppliers started operations in India. This paved the way for a large numbers of new joint ventures in the component industry with European and American component manufactures and gave the Indian component industry all-around expertise to manufacture the components for applications in Japanese, European as well as American vehicles. After the Phased Manufacturing Programme (PMP) came to an end in 1991, government introduced a Memorandum of Understanding (MoU) system that continued to place emphasis on the aspects of localization of components and with the support of this policy, the component industry developed further capability to manufacture the new breed of auto components required for the new generation vehicles (Automotive Mission Plan 2006-2016⁵).

Infrastructure support

Indeed, the auto and component industries growth is not only the matter of policy prescription, but it is the matter of changing the direction of economy by infrastructure development. To achieve such goal, government is intended to support and implement in time bound by setting up a Government which will center of excellence NATRIP in the following areas, and the second phase to be completed by 2011 (see more details Automotive Mission Plan 2006-2016).

- Noise, Vibration & Harshness (NVH) center at Manesar
- Auto component at Manesar
- Engine including power train at The Automotive Research Associations of India (ARAI), Pune
- Fatigue testing at ARAI Pune
- Material testing at ARAI Pune
- Automotive infotronics at Chennai
- Crash testing at Chennai
- Testing track at Indore
- Vehicles dynamics at Indore

Institution and R&D

Needless to mention, major drive of auto and its component industries has been its constant innovation and harnessing the academics, knowledge and capacity, thereby improvement of products is achieved. In this sense, government intends to encourage collaborations of industry with research and academic institutions, e.g. Council of Scientific and Industrial Research (CSIR), Indian Institute of Technology (IIT) and machine tool industry for the development of appropriate technology. Also, the creations of Intellectual Property Right (IPR) to meet more stringent regulatory

⁵ This information is the based on http://dhi.nic.in/Final_AMP_Report.pdf accessed on 02/10/2014

mechanisms so as to develop relevant machine tools and equipment which would eventually improve manufacturing processes and quality of the vehicles.

Number of institutions are involved in the promotions of research in the automobile sectors including CSIR, IIT and Index of Industrial production (IIP) which are also pursuing research in this area. There is a need of initiatives in order to optimize output. The initiatives are as follows⁶ (see more details Automotive Mission Plan 2006-2016).

- Support to the development and acquisition of technology to have alternate fuel and hybrid engines, use of advance materials, design and styling. The creation of centre for automotive manufacturing excellence in IITs.
- Encourage innovations for alternative cost effective materials and processes.
- Support IT integrations in manufacturing and development of automotive infotonics; provide support infrastructure to facilitate development of automotive infotonics
- Creation of Advanced Research Center as identified by CAR, Center for Automotive design and a Technical organization to handle harmonization and internalization of Indian regulations.
- Creation of technology modernization fund with special emphasis on SNEs

For encouraging R&D, it is suggested that lab facilities in IITs could be developed and modernized. Also, a focused/ modular programme in IITs and Indian Institute of Management (IIM) could also be initiated.

CONCLUSION

The automotive and component industry accounts of both countries has improved significantly over a period of time as institutional deployment backed by the policies reorientation put into place. In the sense, globalization has benefitted and brought out employment. On the frontier of innovation and its spillover effect, the institution of learning are interacting with industries to some extent, which has benefited both the countries. However, the emerging challenges are related with component and small industries in terms of credit accessibility and sometimes lack of networking with big firms as well as the quality of product.

Furthermore, the automobile industry plays a vital role in national economies of both countries developed and developing. Multinational companies (MNC) grew up the economies, firms profited through MNCs. MNCs have limited connection with MNCs for instance, competition in market. Formerly various authors grip the direct interaction classically branded companies connections will enable to the spillovers.

However, South African automobile industry has attain the cost benefits of economies scale, it is important for productions became the globally competitive advantage so they have increased the successful riding of the export opportunity. The long runs of incomes in national market which should be increased in the volume, economies development and superior share of people are able to fund for luxury goods.

⁶ This information is the based on http://dhi.nic.in/Final_AMP_Report.pdf accessed on 02/10/2014

Finally, India and South Africa which are both developing countries need to improve the infrastructure and collaborations with the institutions and universities. They require new technology in the automobile manufacturing productions, so that the Automotive and automobile industries can be able to compete globally. Both the countries need to create policies and have to focus on innovation, the area of science technology and innovation policy and the expanded R&D expenditure, making the skills development, knowledge development, technology transfer from one country to another country thereby improving the manufacturing production and focusing on the quality, cost effectiveness and also safety.

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