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Growth of Manufacturing Sector in India: Pre and Post Reform Periods- A Case Study of Indian Engineering Goods Industry

ASHEREF ILLIYAN
Associate Professor
Department of Economics, Jamia Millia Islamia (A Central University)
New Delhi (India)

ABSTRACT

Followed by a serious Macro Economic Crisis of Balance of Payments and mounting fiscal deficit in 1990-91 India switched over to an outward oriented and private sector oriented policy since July 1991. The major part of this Structural Adjustment Policy (SAP) or New Economic Policy was industrial liberalization, Financial liberalization, trade liberalization and so forth. The new economic policy of 1991 was thus a paradigm shift in the economic policy of the country. The prime aims of new economic policy were to increase industrial efficiency, to intensify economic growth and to promote an international oriented market Hence, it is imperative to understand to what extent Economic Reforms have been successful in achieving faster growth of Indian Industry. Taking output growth as a proxy for industrial growth this paper tries to analyze growth of Indian industry (manufacturing sector) and presents a comparison of pre and post reform periods. Engineering Goods Industry is used as a case study. The basic objective of this paper is to analyze the trend and growth of Indian Engineering goods industry[1] *vis-a vis* Manufacturing sector[2] in the pre and post reform periods. The paper applies methods such as annual average growth rate, semi log trend equation and Chow Test for analysis. The major finding of the paper is that growth of Engineering Goods Industry has been higher during post-reform period as compared to pre-reform period. However, one has to ponder over whether this growth has been accompanied by productivity growth or simply input growth, If it is accompanied by productivity growth such a growth is sustainable. However, various empirical studies on productivity in the post- reform period does not lend support to such an argument.

Key Words : Economic Reforms, Growth, Engineering Goods Industry, Manufacturing Sector, Chow Test

INTRODUCTION

The Mahalanobis Capital Goods Strategy which was adopted since 2nd plan onwards was a major watershed in the history of India's economic development. This strategy emphasized priority to capital goods sector for the long run development and dominance public sector in this area. The import substitution strategy was also corollary to this strategy.

Undoubtedly, this strategy had led to many benefits such as setting up of indigenous industrial

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base in India, faster industrial development, balanced regional industrial development and so forth. However, over time this strategy had led to many problems such as inefficiency, corruption, rent seeking behavior, low profitability, low productivity, under utilization of capacity (Bhagawati and Desai, 1971). Further, "The import-licensing regime was so arbitrary and so-non transparent that it became almost impossible to import anything apart from distorting effective rate of protection across sectors" (Debroy, 1998). According to Srivastava (1986) the stagnant industrial development in the country from mid 1960s to late 1970s led to some rethinking leading to some process of liberalization from mid 1970s but accelerated during 1980s.

Although India embarked on a partial liberalization measures since early eighties, followed by a serious Macro Economic Crisis of Balance of Payments and mounting fiscal deficit in 1990-9I India switched over to an outward oriented and private sector oriented policy. The major part of this Structural Adjustment Policy (SAP) or New Economic Policy was industrial liberalization, financial liberalization, trade liberalization and so forth.

The newly adopted industrial and trade policies relaxed production and investment decisions constraints of the firms and made access to imported inputs, technology and other capital goods quite easy. The policy further enhanced the exposure of the firms into the international competitive world. As the prime goals of the newly adopted policy or economic reforms were to increase industrial efficiency, to achieve faster economic growth and to promote an international orientation among the Indian firms, it is imperative to understand, at what extent these goals have been successful (Aggarwal and Goldar, 1999). Hence, the focus of this paper is to understand to what extent Economic Reforms have been successful in achieving faster growth of Indian Industry (Manufacturing sector).

The present study focuses on Engineering goods industry as "Engineering goods industry enjoys 30.5% weight in the index of industrial production, 29.9% share of total investment in all industries, 33.5% share in the value of output of all industry, 37.1% share in value added by all industry 30.6% share in employment of all industry, and 62.8% share in number of foreign collaborations" (EEPC). According to available data for the year 2017-18 Engineering industry has emerged as the single largest item of total Indian export (25.10% share of total Indian export).

Above all, according to Ministry of Commerce, GOI , Engineering Industry is the largest of the industrial sectors in India. India has a comparative advantage in some of the Engineering sub sectors in terms of Manufacturing costs, market knowledge, technology and creativity. The Engineering industry has been de-licensed and enjoys 100 per cent foreign direct investment.

These facts further elaborate the important role played by Engineering goods industry in Indian economy. Thus, Engineering industry has played a significant role in industrial resurgence of India ever since independence of the country, particularly after the adoption of the Mahalanobis Capital Goods oriented strategy from the second five year plan onwards.

In this context the present study has estimated growth of Real Output, which are considered to be the important variable for measuring the growth of an Industry. Engineering industry is compared with aggregate manufacturing sector for the period 1973-74 to 2014-15 at two digit level of the National Industrial Classification (NIC), 2004. We are aware that growth of an industry can be measured through output growth, investment growth employment growth export growth etc. and we have taken output growth as a proxy for industrial growth.

Review of Literature :

Various studies on the impact of Economic Reform on Indian Manufacturing has come out

with contradicting results. While some argue the reforms has been highly beneficial others claim that the reforms has not been beneficial to the growth and productivity of Indian Manufacturing sector.

Balasubramanyam and Mahambre (2001) concluded that in spite of declining productivity, the industrial sector has benefited from the reforms by expanding its capacity.

A positive picture was shown by Panagariya (2004), who had argued that growth in the 1990s was more robust than that of the 1980s and that it was achieved through important policy changes.

A research study by Siggel (2007) on "Economic Reforms and their Impact on the Manufacturing Sector: Lessons from the Indian Experience " had found that the outcome of the reforms was more beneficial to the industries, their exports and employment.

Siggel and Agrawal (2009) based on the perception study of manufacturing firms the authors conclude that most of the firms felt that the reforms were helpful by increasing access to foreign technology and making imports of capital and intermediate goods cheaper.

Goldar (2015) finds that industrial growth rate in 2000s was higher than that of 1980s as well than that of 1990s. The author opine that accelerated growth in Manufacturing sector in India in 2000s was accompanied by accelerated growth in exports and imports of Manufactured products.

Nambiar *et al.* (1999) provides a pessimistic view of the impact of economic reforms. The authors concluded that trade has over the years shrunk India's manufacturing base, both in terms of value addition and employment.

Chauduri (2002) concluded that value added growth in the 1990s was inferior to that in the 1980s, that the industrial base had become shallower, that employment growth in the 1990s was negative in five out of nine years and that the labour productivity stagnated after 1995/96, after having increased in the early 1990s.

Various studies on impact of economic reforms on total factor productivity has shown negative impact of the reforms on total factor productivity While two studies (Unel, 2003; TSL, 2003) had found an acceleration of productivity growth in Indian industries in 1990s, the studies like Goldar and Kumari (2003), Trivedi *et al.* (2000), Unni *et al.* (2001) Balakrishanan *et al.* (2000), Das (2003) etc. show decline in productivity performance after the reform in the decade of 1990s. However, the later studies like Deb (2014), Goldar (2015) extends study period in 2000s have pointed out the higher and positive Total Factor Productivity growth in 2000s.

Objectives of the Study:

The present study has set the following objectives

1. To analyse the trends in the real output of Engineering industry *vis-a-vis* Manufacturing Sector
2. To analyse the growth in the real output of Engineering industry *vis-à-vis* Manufacturing Sector in the pre and post reform periods

Hypotheses :

1) ***Null Hypothesis***: there is no significant difference in the growth rate of real output of Engineering Industry in the pre and post reform periods.

Alternative Hypothesis: there is significant difference in the growth rate or real output of Engineering Industry in the pre and post reform periods.

2) ***Null Hypothesis***: there is no significant difference in the growth rate of real output of Manufacturing Sector in the pre and post reform periods.

***Alternative Hypothesis*:** there is significant difference in the growth rate or real output of Manufacturing Sector in the pre and post reform period.

METHODOLOGY

The study has used following statistical and econometric tools for the purpose of analysis. The p main source of data for the study is Annual Survey of Industry (ASI) published by Central Statistical Organisation (CSO) under the Ministry of Statistics and Programme implementation, Government of India. ASI has different classification of industries from time to time. The present study has used concorded series of ASI provided by Economic and Political Weekly Research Foundation (EPWRF) for the period 1973-74 to 2014-15. The data of value of output is deflated by using WPI (Wholesale Price Index) of respective commodity and hence, the output data is real output.

Annual Average Growth Rate :

Annual average growth rate are estimated by the equation

$\mathbf{G_t = Y_t - Y_{t-1} / Y_{t-1}}$

where, $Y_{t,}$ is the current year value and Y_{t-1} is the previous year value.

Semi Log Trend Equation :

For checking the statistical significance of growth we also estimate a semi log trend equation as $Y_{t,} = ab^t$

In log form $\mathbf{Ln\ Y_t = \beta_1 + \beta_2 T + U_t}$

where t is the time 1, 2… and Y is the dependent variable. U is the error term.

Chow Test :

Chow test is generally used to check whether there is any structural break in the data or not. The null hypothesis (H_0) tested under the Chow test is that there is no break point (*i.e.* that the data set can be represented with a single regression line). The alternative hypothesis is (H_1) is that there is break point (*i.e.* that the data set cannot be represented with a single regression line).

The formula is:

$$CHOW = \frac{(RSS_p - (RSS_1 + RSS_2)) / k}{(RSS_1 + RSS_2) / (N_1 + N_2 - 2K)}$$

where:

RSS_p = pooled (combined) regression line.

RSS_1 = regression line before break.

RSS_2 = regression line after break.

If calculated F-value falls into the rejection region (*i.e.* if the calculated F-value is greater than the F-critical value) then we may reject the null hypothesis of no structural break and accept the alternative hypothesis of structural break in the data (Statisticshowto.com).

RESULTS AND DISCUSSION

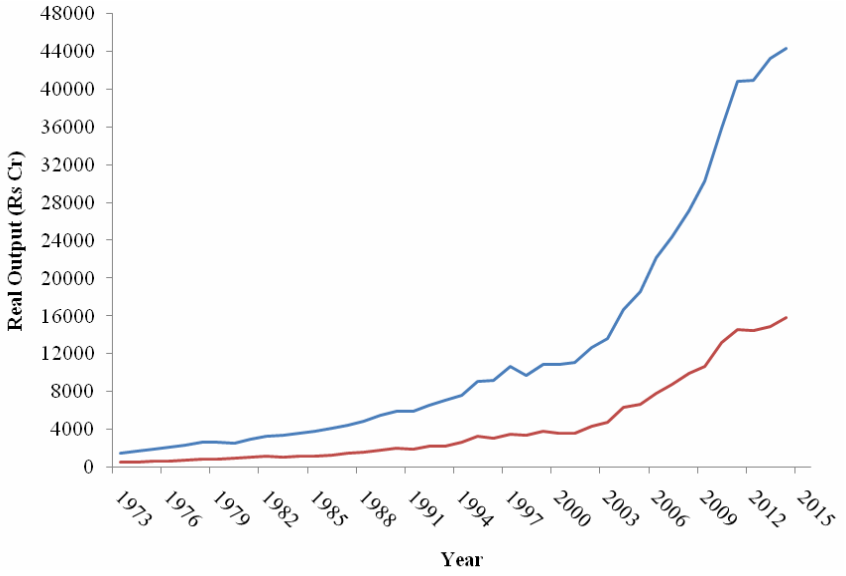
Trends in Real Output :

The analysis of trends in real output of Engineering industry *vis-à-vis* Aggregate Manufacturing

sector as well as various Engineering sub-group industries are discussed in this section:

Engineering *vis-a-vis* Aggregate Manufacturing Sector :

The trends in real output of Engineering Industry and Manufacturing sector (See Fig. 1) shows an increasing trend over time 1973-2015. However, this trend growth can be broadly divided into 4 distinct phases. Firstly from 1973-1985, pre-reform period, there was a slow growth rate of real output which improved in the period 1986-91, moderate reform period. In the post-reform period we can observe higher growth rate of real output in Engineering Industry which reached a peak in 1996. It has been because of the liberal economic environment brought about by new economic policy of 1991. This period is called as period of investment boom by Uchikawa (2001). After 1996 till 2002 we can observe stagnating trend in real output because of tight monetary policy by RBI since 1996-97, South East Asian Crisis, Uncertain Central Government and Demand decline and host of other problems. The most golden period for real output growth has been 2002 to 2012. But Real output again started slowing down or stagnating from 2013 onwards due to demand decline, Chinese slowdown, Euro crisis and policy paralysis at Central Government (as some experts allege).

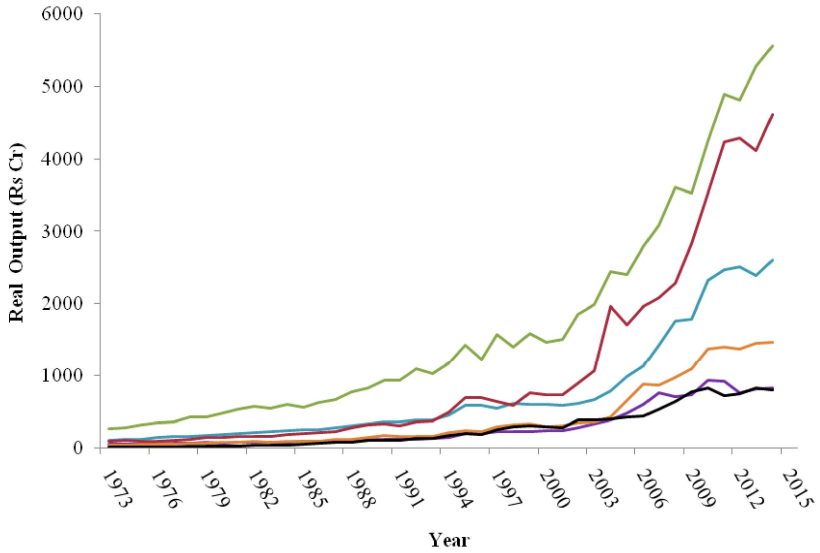


Note : the first figure from the top represents Manufacturing Sector and second figure Engineering Industry

Fig. 1 : Trends in Real Output-Engineering *vis-a-vis* Aggregate Manufacturing Sector

Trends in Real Output of Engineering Groups :

All the constituents of Engineering industry- BM (Basic Metals), MP (Metal Products), NEM (Non Electrical Machinery), EM (Electrical Machinery), MCE (Medical Communications Equipments) and MVTE (Motor Vehicles and Transport Equipment) are also showing more or less same trend albeit some showing more fluctuation than other (See Fig. 2). We can infer that broadly the period 1996-2002 was a period of stagnation and 2002 onwards till 2012 faster growth is visible up to 2012. Growth slowdown starts from 2012 onwards. BM is showing more fluctuating trend than others.



Note : the first figure from the top represents BM, second figure- MVTE, third figure-NEM fourth figure-EM, fifth figure-MP and last figure MCE

Fig. 2 : Trend in Real Output - Engineering Groups

Real Output Growth Analysis (Pre and Post Reform Periods) :

The analysis of real output growth of Engineering industry *vis-à-vis* aggregate Manufacturing sector as well as various Engineering subgroup industries are discussed in the following section:

Engineering *vis-a-vis* Aggregate Manufacturing Sector :

We can infer from Table 1 that Engineering industry as a group has shown improved performance during the post-reform period (1991-2015) as compared to pre-reform period (1973-91) in terms of real output growth. It is vivid from the table that annual average growth of real output increased from 7.72% during pre-reform period (1973-91) to 9.42% during post-reform

Table 1 : Real Output Growth of Engineering Industry *vis-a-vis* Manufacturing Sector-Pre and Post-Reform Periods

Period	Engineering	Aggregate manufacturing
Pre-moderate Reform (1973 – 1986)	6.66	8.26
Moderate Reform (1986-1991)	10.26	8.95
Pre-Reform (1973 – 1991)	7.72	8.46
Post- reform – stage 1 level 1 (1991 – 1996)	11.14	9.04
Post- reform – stage 1 level 2 (1996 – 2002)	1.70	3.58
Post- reform – stage 1 (1991 – 2002)	5.99	6.06
Post- reform – stage 2 level 1(2002-2009)	15.76	13.77
Post- reform – stage 2 level 2 (2009-2015)	8.32	8.70
Post- reform – stage 2 (2002-2015)	12.33	11.43
Post- reform (1991 – 2015)	9.42	8.97
Overall (1973 – 2015)	8.71	8.76

Source: Computed by the Author from ASI data

period (1991-2015). Annual average growth of real output during the entire period (1973-2015) has been 8.71%.

As compared to Engineering Industry manufacturing sector as a whole has recorded slightly lower performance during the post-reform period. Annual average growth of real output of Manufacturing increased slowly from 8.46% during pre-reform period (1973-91) to 8.9% during the post-reform period (1991-20015). Annual average growth of real output of Manufacturing sector during the entire period has been 8.76%.

When we further divide the pre-reform into i) pre-moderate (1973-1986) and ii) moderate reform (1986-91) and post-reform into i) post-reform-stage 1 (1991-2002) and ii) post- reform-stage 2 (2002-2015) interesting picture emerges. As far as Engineering is concerned moderate reform period has recorded growth rate of real output of 10.26 % as compared to real output growth rate of 6.66% during pre- moderate period. In the post-reform period stage 1 real output growth has been 5.99% which more than doubled to 12.33% during post- reform stage 2. If we further fathom into post- reform period we reach at some more interesting facts. We have divided post-reform stage 1 and stage 2 further into level 1 and level 2. In level 1 stage 1 Engineering goods industry has recorded 11.14% growth rate where as in level 2 growth of real output has decelerated to 1.71% which has pulled down the growth rate of real output in stage 1 post- reform period.

But since 2002 there has been revival in the growth of economy and growth rate of real output started shooting up. The highest growth rate of real output has been recorded in the post- reform stage 2 level 1 (15.76%). However, in the stage 2 level 2 real output growth declined sharply to 8.32% showing a deceleration in the industrial activity due to Global financial crisis of 2008, Euro Zone Crisis, Chinese economy slowdown, and policy paralysis that happened since 2012 of UPA 2 Government etc. (as some experts alleges). During this period, what is visible is a cyclical trend throughout the study period particularly during post-reform period.

In the case of Manufacturing sector real output growth increased slightly from 8.26% during pre-moderate reform period to 8.95% during moderate reform period. In the post-reform period stage 1 level 1 real output growth of Manufacturing has been increased to 9.04 % but there has been sharp deceleration in the growth to 3.58 % during stage 1 level 2 in the post- reform period. Similarly, real output growth recorded highest growth of 13.77 % during stage 2 level 1 but again at stage 2 level 2 growth rate sharply declined to 8.70%. Annual average growth of real output of Manufacturing sector during the entire period has been 8.76%.

These findings are corroborating the findings of Ahluwalia (1991) and Uchickava (2001). Ahluwalia (1991) points out that there was industrial stagnation in India in 1970s and turnaround during 1980s. Uchikawa (2001) highlights that there was an investment boom in Indian industries during 1991-96 but demand did not rise consummate with investment and hence under utilization of capacity happened in Indian Economy. The Industrial sector also witnessed great uncertainty and stagnation during 1996-2001 due to unstable Central Government, South East Asian Crisis 1997 and host of other factors.

Testing of Hypothesis :

The following section depicts the regression analysis and chow test conducted on the growth rate of real output of both Engineering industry and Manufacturing sector for testing of our hypotheses.

Regression Analysis - Engineering Industry :

The formulated null and alternative hypotheses on the growth rate of real output of Engineering

industry are:

NuIl Hypothesis:

There is no significant difference in the growth rate of real output of Engineering Industry in the pre and post reform periods.

Alternative Hypothesis:

There is significant difference in the growth rate or real output of Engineering Industry in the pre and post reform periods.

For testing these hypotheses a Regression has been done by keeping log output as dependent variable and time as independent variable. Time variable is represented by 1 for first year and the like.

It can be seen from Tables 3 and 4 that growth rate of real output of engineering industry during 1973-91 (pre reform period) has been 6.98 per annum and statistically significant. While post- reform growth rate has been 9.50% during 1991-2015, which is higher than pre reform period. Hence we reject the null hypothesis of no significance difference in real output growth of engineering in the pre and post reform periods.

Table 2 : Trend Growth of Real Output-Engineering Industry (Entire Period)

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Growth Rate
C	6.159639	0.040292	152.8739	0.0000	
T	0.081386	0.001633	49.8534	0.0000	8.1386
R-squared	0.984161				
Dependent Variable: LROUTENG (Log of Real Output of Engineering Industry)					
Method : Least Square					

*Source: Computed by the author from ASI data using Eviews software

Table 3 : Trend Growth of Real Output-Engineering Industry (Pre Reform Period)

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Growth Rate
C	6.295749	0.02263	278.2096	0.0000	
T	0.069885	0.002091	33.42805	0.0000	6.9885
R-squared	0.985884				
Dependent Variable: LROUTENG (Log of Real Output of Engineering Industry)					
Method : Least Square					

*Source: Computed by the author from ASI data using Eviews software

Table 4 : Trend Growth of Real Output-Engineering Industry (Post Reform Period)

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Growth Rate
C	5.722513	0.111604	51.27493	.0.0000	
T	0.095057	0.003568	26.63858	.0.0000	9.5057
R-squared	0.96993				
Dependent Variable: LROUTENG (Log of Real Output of Engineering Industry)					
Method : Least Square					

*Source: Computed by the author from ASI data using Eviews software

Regression Analysis - Manufacturing Sector :

The formulated null and alternative hypotheses on the growth rate of real output of Manufacturing sector are:

Null Hypothesis:

There is no significant difference in the growth rate of real output of Manufacturing Sector in the pre and post reform periods.

Alternative Hypothesis:

There is significant difference in the growth rate or real output of Manufacturing Sector in the pre and post reform periods.

For testing these hypotheses Regression has been done by keeping log output of Manufacturing Sector as dependent variable and time as independent variable. Time variable is represented by 1 for first year and the like.

It can be seen from Tables 6 and 7 that growth rate of real output of Manufacturing sector during 1973-91 (pre reform period) has been 7.39% per annum and statistically significant. While post reform growth rate during 1991 -2015 has been 9.17% which is higher than pre reform period. Hence we reject the null hypothesis of no significance difference in real output of manufacturing in the pre and post reform periods.

Table 5 : Trend Growth of Real Output - Manufacturing Sector (Entire Period)

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Growth Rate
C	7.25029	0.035466	204.4267	0.0000	
T	0.08017	0.001437	55.791	0.0000	8.017
R-squared	0.987312				
Dependent Variable: LROUTMAN (Log of Real Output of Manufacturing Sector)					
Method : Least Square					

*Source: Computed by the author from ASI data using Eviews software

Table 6 : Trend Growth of Real Output - Manufacturing Sector (Pre Reform Period)

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Growth Rate
C	7.336721	0.025112	292.1638	0.0000	
T	0.073931	0.00232	31.86775	0.0000	7.3931
R-squared	0.984489				
Dependent Variable: LROUTMAN (Log of Real output of Manufacturing Sector)					
Method : Least Square					

*Source: Computed by the author from ASI data using Eviews software

Table 7 : Trend Growth of Real Output - Manufacturing Sector (Post Reform Period)

Variable	Coefficient	Std. Error	t-Statistic	Prob.	Growth Rate
C	6.877507	0.102607	67.02749	0.0000	
T	0.091725	0.003281	27.95863	0.0000	9.1725
R-squared	0.972626				
Dependent Variable: LROUTMAN (Log of Real output of Manufacturing Sector)					
Method : Least Square					

*Source: Computed by the author from ASI data using Eviews software

Chow Test – Engineering Industry :

The chow test result also confirms our results of significant difference in the pre and post reform period in Engineering. The p values are 0.000 implying a highly significant result and hence, it is proved that there is a structural break since 1991.

Table 8 : Chow Test – Real Output Growth of Engineering Industry	
Chow Breakpoint Test: 1991	
Null Hypothesis: No breaks at specified breakpoints	
F-statistic	16.10279
Prob. F(2,38)	0.0000

*Source: Computed by the author from ASI data using Eviews software

Chow Test – Manufacturing Sector :

The chow test result also confirms our results of significant difference in the pre and post reform period. The p values are 0.000 implying a highly significant result and hence, it is proved that there is a structural break since 1991 in Manufacturing sector.

Table 9 : Chow Test – Real Output Growth Manufacturing Sector	
Chow Breakpoint Test: 1991	
Null Hypothesis: No breaks at specified breakpoints	
F-statistic	11.8361
Prob. F(2,38)	0.0001

*Source: Computed by the author from ASI data using Eviews software

Conclusion :

Thus, it can be concluded that growth of real output achieved during post reform period by both Engineering Industry and Manufacturing sector are much higher than that of pre reform period. This shows positive impact reforms on real output growth. However, once must read these results with a caution. Because output growth can happen in two ways-a) through input growth, b) thorough productivity growth. If the higher growth has been because of input growth but not due to productivity growth then such growth are not sustainable. Many studies have pointed that total factor productivity has declined in Indian Manufacturing sector in post- reform period in 1990s. Hence, if the output growth is not due to productivity growth such growth cannot be sustainable. Uchikawas (2001) had also pointed out that there was an investment boom indian Manufacturing sector in early 1990s but demand did not consumerate with the increase in investment and hence under utilization of capacity occurred in second half of 1990s. Therefore, efforts must be made for improving effective utilization of resources so that total productivity will improve. Further, output growth also depends on demand conditions in the economy, investment climate and infrastructural facilities and Government policy. A conducive environment must be provided so that Engineering and Manufacturing sector can have a holistic growth.

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Appendices :

(1) Engineering Industry -Definition :

As per ISIC Rev 3.1 of UN (2004) which is same as National Industrial Classification of India 2004, Engineering Goods Industry constitutes the following items:

1) Manufacture of Basic Metals (27)
2) Manufacture of Fabricated Metal Products, except Machinery and Equipment (28)
3) Manufacture of Machinery and Equipment n.e.c. (29)
4) Manufacture of Office, Accounting and Computing Machinery (30)
5) Manufacture of Electrical Machinery and Apparatus n.e.c. (31)
6) Manufacture of Radio, Television and Communication Equipment and Apparatus (32)
7) Manufacture of Medical, Precision and Optical Instruments, Watches and Clocks (33)
8) Manufacture of Motor Vehicles, Trailers and Semi-Trailers (34)
9) Manufacture of other Transport Equipment (35)

Figures in parenthesis shows NIC Classfication 2004.

(2) Manufacturing Sector-Definition :

Engineering industry is a constituent of manufacturing sector constituting more than 1/3 of share of output, employment, investment and export of manufacturing sector. Besides Engineering Goods industry manufacturing sector consists of Food products industry, Chemical industry, Rubber industry and so forth.

(3) Following Das (2003) the present study have divided the time period of the study into pre moderate reform (197-86), moderate reform 1986-1991), post reform stage 1 level 1 (1991-1996), post- reform stage 1 level 2 (1996-1992), ,post -reform stage 2 level 1 (2002-2009) and post-reform stage 1 level 2 (2009-15)

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