An analysis of the Indian economy: why India did not undergo an industrial revolution

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ABSTRACT: The current scenario of the manufacturing sector is that it constitutes 16% of the total Gross Domestic Product for India and this percentage has not changed since past couple of decades. We have analysed the various reasons why the industrial sector of India has been lagging behind and also found out the opportunities that India can grab to improve this sector. Descriptive design has been used and analysis is done on the basis of tools like regression, correlation and descriptive statistics. The regression equation tells us how any change in any of the four components (mining and quarrying, manufacturing, electricity water and gas, other utility services) of the industry will impact the industry and there are various recommendations regarding the government policies, productivity, employment, infrastructure and other factors that will help in improving the industrial sector.
Keywords: Economy, GDP, India, Manufacturing industry

I. INTRODUCTION:

Industrial revolution refers to the transition to new manufacturing processes which results to be a major turning point in an economy. Over the years, we have seen that the industrial sector in India has contributed very little to the growth as compared to agricultural and service sector. This research is carried out to study the situation of manufacturing sector, how this sector in India has shown a very minimal amount of growth and to find out the reasons and drawbacks that held India back. We will also find opportunities that India can grab to foster the growth in industrial sector. We will use various statistical tools like regression, correlation and descriptive statistics to find the relation between different components of the industrial sector including oil, gas, water, mining, quarrying and many others.

Manufacturing sector in India accounts to only about 16% of the GDP which has largely remained the same in the previous couple of decades. The performance of manufacturing sector is determined by many factors but productivity is the major factor. The productivity of the manufacturing sector of India is very less if we compare it with the productivity of other countries. The manufacturing sector has created very few and low quality employment for the country even though large amount of labour is available at a very low cost. The industrial sector declined initially during the British government because the British preferred goods of their own production more than the ones produced in India. There have been three industrial revolutions but all of them eluded the country.

MSME is a noteworthy development driver in India, with it adding to the tune of 8% to GDP. Exports part in India comprises about 40% of commitment from MSME alone. Taking a contribution at the sort of commitment of MSME to assembling, fares and business, different divisions are additionally profiting by MSME. MNCs today are purchasing semi-completed and auxiliary items from little endeavours, for instance, purchasing of

grasps and brakes by automobile organizations. It makes a linkage among MSME and enormous companies. Even after the execution of the GST 40%. MSME division likewise connected GST Registration which incremented the administration income by 11%.

We have talked about various employment opportunities available in the industrial sector, technological up gradation required for growth of industries, monetary policies that the RBI needs to form and fiscal policies that the government needs to implement to facilitate capital requirements for the manufacturers. We have analysed the current situations of various aspects of the industrial sector and provided recommendations to solve the problems accordingly.

II. LITERATURE REVIEW:
RESEARCHPAPER[1]
Author-Joumard, I., U. Sila and H. Morgavi (2015)

The Research Problem was that the manufacturing sector has contributed very little to employment, income and export growth. Objective of the study was to find the opportunities for India and make it a leader in manufacturing sector by increasing exports and making the sector well efficient. The methodology used was line and bar graphs to analyse various factors affecting manufacturing and industrial growth of the country. Major findings from the study are that the production is shifting away from agriculture, but mostly into services rather than the manufacturing sector. Despite various important market reforms of 1990's manufacturing sector has created very few and low quality employment for the country that too most of it is concentric to small firms. Even though there is masses of labour available at low cost, this industry is not booming because it is highly capital and skill intensive. Improving the literacy level is very necessary in order to make the labours familiar with the skills required for manufacturing. (Morgavi, 2015)

RESEARCH PAPER [2]
Author-Mehta, Yash &Rajan, John. (2017)

This research was conducted in order to study the current manufacturing practices and strategies implied by India for the growth of

manufacturing sector in the country. Focuses on how road networks are catering togrowth of manufacturing sector. The paper used tools like line graphs and bar graphs to analyse state wise contribution to GDP to conclude which states lack industrial growth. Major findings of the research were good infrastructure is very necessary for any manufacturing sector to grow. Underdeveloped states like UP and Bihar have not experienced Industrial growth as they lack basic infrastructure like paved roads, trained and literate personnel, and electricity. India plans to be a leader in the manufacturing sector in the world, and is trying to achieve this with the 'Make in India' campaign.(Mehta, 2017)

THREE REASONS WHY INDUSTRIAL POLICIES FAIL[3]
Author: Shanta Devarajan

- **Existing distortions-** Most of these models believe that market failure in the only distortion in the economy which is preventing industrialisation and that providing government subsidy can solve it all. However in the real world there are number of problems which need government's attention otherwise.
- **Political capture-** A very common problem is that the industrial policies are easily captured by politically powerful groups who use it for their own benefits and to make profits out of them rather than structural transformation.
- **Firms not sectors-**Industrial policies have typically targeted sectors. But research should be done on the characteristics of those firms which are highly successful in the sector which will result in more effectiveness of industrial policies.(Devarajan, 2016)

FULFILLING THE PROMISE OF INDIA'S MANUFACTURING SECTOR[4]
Author: Rajat Dhawan and Gautam Swaroop
India's manufacturing sector has a golden opportunity to emerge from shadow of country's service sector and tap the global markets. Increasing demand along with MNCs want to set up production in other countries in low cost could help the sector to grow tremendously. India has the potential to be competitive in various industries as it has a massive workforce, access to natural resources needed for production, and an emerging supply base. India lags behind in terms of skills,

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[1]"Challenges and Opportunities of India's Manufacturing Sector", OECD Economics Department Working Papers, No. 1183, OECD Publishing, Paris.
[2]Manufacturing Sectors in India: Outlook and Challenges. Procedia Engineering.

[3]Three Reasons Why Industrial Policies Fail, January 14th 2016.
[4]Fullfilling The Promise Of India's Manufacturing Sector, March 2012.

labour productivity and capital productivity. Improving these three areas will result in growth of manufacturing sector in India.(Swaroop, 2012)

Challenges Faced By The Manufacturing Industry[5]
Author: Yash Mehta and John Rajan

The technologies used are not well updated and the employees do not possess the skills which can improve the efficiency of production. We need skilled workforce then only the companies can grow and compete in the global market. Post GST, various tax policies are changed and many people don't have any idea about the working of these tax system and don't understand why it is like this. So nobody tries to expand very much and is playing safe by following the earlier rule so that they are not on the wrong side of the government.(Rao, 2017)

India Needs To Improve Manufacturing Sector Performance To Return To High-Growth Path, Says World Bank[6]
Author: Roy Nandita (October 7, 2014)

There are many external and internal factors domestically and internationally that could affect growth. Manufacturing sector in India accounts to only about 16% of GDP which has largely remained the same in previous couple of decades. Absence of delays due to tolls, road blocks and other stoppages could have reduced freight. This can help in boosting the competitiveness with other countries manufacturing sectors by 3-4% of net sale(roy, 2014).

THE FOURTH INDUSTRIAL REVOLUTION WILL BRING A MASSIVE PRODUCTIVITY BOOM[7]
Author: Suri Rajeev (January 15, 2018)

Now, before fourth Industrial Revolution, it has become clear that there are four physical infrastructure technologies that provide the foundation for growth: transportation, energy, communication, health and sanitation. But two other factors were important for growth including adoption of technologies and network effect such that technologies could increase growth. The 5G networks is a major catalyst for development of technology.(suri, 2018)

Opportunities And Challenges In The Indian Manufacturing Industry[8]
Author: Ghonge Dhanesh (2015)

The productivity of our manufacturing sector is very less compared to the other international markets. There are various opportunities in this sector which includes high availability of labour at cheaper rates, high demand due to huge population, better quality compared to China and the 'Make in India' campaign will be able to increase the supply. There are also a lot of challenges faced by them which includes unavailability of power for 24 hours of the day, the low levels of productivity of labours and high cost of logistics.(ghonge, 2015)

RESEARCH PAPER [9]
Author: Sahoo Pravakar and BhuniaAbhirup (2014)

The research was done to know why China's manufacturing sector boomed but India's couldn't and a comparative study is done. All the aspects of Chinese economic policies that led to its success of manufacturing sector are compared it to the Indian policies. China's manufacturing sector was developed because of increased FDI. Policies undertaken by China to improve manufacturing sector includes the transfer of rural labour surplus to the urban enterprises which helped in overall growth. They brought in a SEZ policy favourable to foreign investors and intentionally built it near the ports for exports. The huge labour potential was used. In the contrary, India performed below par in all of the aspects stated above (Pravakar Sahoo, 2014)

RESEARCH PAPER [10]
Author: AnchanVeerendra, Narula Japleen (January, 2019)

The research was done to know the contribution of primary, secondary and tertiary sector to the GDP. The author has used various statistical tools. The correlation of GDP from all sectors and population is very strong so if the population increases then the GDP should also increase. A relationship between the GDP at factor cost and at market price was established to know how much profits are generated by the manufacturing sector in India. It was found that the secondary sector was the most volatile one and did not contribute much to the GDP when compared to

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[5]Challenges Faced By The Manufacturing Industries, December 2017.
[6]India Needs to Improve Manufacturing Sector Performance to Return to High-growth Path, says World Bank, October 2014
[7]The Fourth Industrial Revolution will bring a massive productivity boom, January 2018

[8]Opportunities and Challenges in the Indian Manufacturing Industry, 2015
[9]China's Manufacturing Success:Lessons for India
[10]An Analysis of the Components of the Gross Domestic Product ofIndia; IJESI- the journal

certain benchmarks of different countries(Veerendra Anchan, 2019).

RESEARCH PAPER [11]
Author: Singh Ajit (2008)

In the ancient times, industry meant mere production but at the onset of modernisation, India stepped into the time zone of planned and developed industrial sector. India needs a new industrial policy after the Nehru-Mahala Nobis era. Laying stress on the neo-liberal interpretations, the research states that the epitome of growth lies unexplored while the past decade has shown constant magnitude of development. There also exists strong correlation between industrial boom and the growth of the IT sector as a whole. (Singh, 2008)

RESEARCH PAPER [12]
Author: Sree

The study reveals that once upon a time, small scale industries boomed in the country. However, the advent of the British changed the scenario drastically. British rule paved way for the rise of the largescale industries aiming for cost effective and mass production. The traditional industries of our country gradually declined because the British preferred goods of their own production more than the ones produced in India. Despite arguments about favouring the harmony between large- and small-scale industries, the new policies agreed upon even after Independence were large scale biased (Sree)

TALENT IN THE FOURTH INDUSTRIAL REVOLUTION [13]
Author: Benson Holly

Infosys conducted a survey on the young minds of the country to find out their approach towards learning and a faster movement so that they gain practical knowledge and required education at the fundamental time. It was found that 1,000 16-25year-olds, youngsters are reasonable about their training and aptitudes and have demonstrated their adaptability. When the generation that is going to start the boom in the country has the adequate skill set, the output hence

generated will be rapidly directed towards the end goal i.e. industrial revolution (holly, 2010)

INDIA'S ROLE IN THE INDUSTRIAL REVOLUTION [14]
Author: Dheeraj P.R.

For the Industrial Revolution to occur, three things were required:
- Capital – to manufacture the machines and production lines
- Crude materials – to create the products in the industrial facilities
- Market – to move the made products

The East India Company began gathering income from this district and sending it to Britain. This gave the capital. It brought the produced materials from Britain into India – with no obligations or duties – and sold them here. This was their free market. Therefore, the Industrial Revolution was based on the grave of the Indian economy. The Industrial Revolution was made in Britain, yet it was financed by India (without wanting to).(P.R., 2010)

Industrial Revolution: Turning Point In History [15]
Author: Resendez Luis, Alvarado Roberto, Powers Patrick

The Industrial Revolution had a noteworthy and enduring effect on our reality. We the general population have profited from it from various perspectives. The Industrial insurgency has formed the manner in which we live today in a lot more routes than you can envision, yet it happened such a long time ago. We required fewer demanding approaches to transport materials, and we additionally had a requirement for less expensive and quicker generation. (Luis Resendez, 2012)

III. RESEARCH METHODOLOGY
Research Problem: Despite abundance of resources and the means to achieve a boom in the manufacturing industry, India fails to identify one period of advancement that can be quoted as a period of Indian Industrialisation. The study aims to establish the facts and figures that identify the reasons for the slow growth of the industrial

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[11]The past, present and future of Industrial policy in India: adapting to the changing domestic and International environment; Centre for Business Research, University of Cambridge (working paper no.376)

[12]A historical account of Industrialisation in India and in Kerala; Shodh Ganga, Kerala

[13]Talent in the Fourth Industrial Revolution; 2010

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[14]India's role in the Industrial revolution; 21st November 2010

[15]Industrial revolution: turning point in history; December 2012

component and find distinct solutions to the problems hence identified.

Research Design: Quantitative and qualitative research design to derive the optimum results and arrive at the most feasible solutions to the problem stated

Variables identified:

1)Quantitative:
a.   Net state value added by mining and quarrying sector
b.   Net state value added by manufacturing sector
c.   Net state value added by electricity, gas, water supply and other utility services
d.   Net state value added by construction sector
e.   Employment in the organised sector
f.   GDP, NDP, GVA, Output generated in the country
g.   Export and import of oil and non- oil
h.   Foreign trade of principle commodities of the secondary sector
i.   Foreign trade with various groups of countries
j.   Production and import of crude oil and petroleum products

2)Independent
a.   Employment in the organised sector
b.   Components of GVA at basic prices

3) Dependent
a.   Gross value added by industrial sector
b.   GDP of the country and contribution by industrial output
c.   Foreign trade with various groups of countries (depends upon the current policies of the country)

4)Discrete
a.   employment in the organised sector
b.   Export and import of oil and non- oil.
c.   Foreign trade of principle commodities of the secondary sector.
d.   Foreign trade with various groups of countries.
e.   Production and import of crude oil and petroleum products.
f.   Employment in India

5)Moderator
a.   Employment in the organised sector

6)Extraneous
a.   Government policy
b.   birth rate and death rate
c.   inflation rate
d.   foreign relations and exchange rate
e.   Foreign trade with various groups of countries
    .

7) Intervening
a.   Oil and non-oil export and import

Primary Objective: To conduct a thorough study of the industry as a whole and the variables stated so as to evaluate the growth, drawbacks and strengths of the policies and suggest corrections and alterations if and when required.

Secondary Objectives:
1.   To analyse the contribution of the components of the sub-sectors of the industry sector towards the Gross Value Added (at basic prices) of the country
2.   To determine the inputs of the Net state value added from a pool of the manufacturing sectors
3.   To thoroughly study the employment pattern in the organised sector
4.   To analyse sector wise employment situation in India by broad groups of industry for several different periods
5.   To analyse the principal characteristics of the various industries in India through an annual survey
6.   To analyse year wise production and imports of crude oil and petroleum products
7.   To evaluate the change in foreign trade (export and import) of oil and non- oil in India as it is a raw material in the manufacturing sector.
8.   To know the amount of principle commodities exported and imported in the secondary sector over the years.
9.   To know the direction of foreign trade from/ to various group of countries over five the years

IV. DATA ANALYSIS
        The table below enlists the components of the Gross Value Added at constant prices by the Industry sector. The sub-sectors are mining and quarrying, manufacturing, electricity, gas, water supply and other utility services that are auxiliary to the sector.

        To conduct further analysis of the data, descriptive statistics has been used as a function of excel to calculate the measure of central tendency which entails the mean, median and other measures. The mode cannot be found out because the output in two distinct years of 60 years cannot be the exact same in the industry. The confidence level of 95% has been assumed and the maximum and minimum values have also been obtained

Industry		Mining & Quarrying		Manufacturing		Electricity, Gas, Water Supply & Other Utility Services	
Mean	22765.38829	Mean	3081.314153	Mean	17507.53271	Mean	2176.541
Standard Error	1402.986635	Standard Error	198.3312236	Standard Error	1101.60211	Standard Error	106.6131
Median	21866.70011	Median	2886.854562	Median	16839.37554	Median	2140.47
Mode	#N/A	Mode	#N/A	Mode	#N/A	Mode	#N/A
Standard Deviation	3711.95373	Standard Deviation	524.7350949	Standard Deviation	2914.565227	Standard Deviation	282.0718
Sample Variance	13778600.49	Sample Variance	275346.9198	Sample Variance	8494690.462	Sample Variance	79564.49
Kurtosis	-1.64713611	Kurtosis	-1.765782799	Kurtosis	-1.660187028	Kurtosis	-0.91393
Skewness	0.401979601	Skewness	0.585782809	Skewness	0.342370604	Skewness	0.597321
Range	9530.3906	Range	1209.29631	Range	7562.81429	Range	758.28
Minimum	18576.8894	Minimum	2610.35369	Minimum	14099.85571	Minimum	1866.68
Maximum	28107.28	Maximum	3819.65	Maximum	21662.67	Maximum	2624.96
Sum	159357.718	Sum	21569.19907	Sum	122552.729	Sum	15235.79
Count	7	Count	7	Count	7	Count	7
Largest (1)	28107.28	Largest (1)	3819.65	Largest (1)	21662.67	Largest (1)	2624.96
Smallest (1)	18576.8894	Smallest (1)	2610.35369	Smallest (1)	14099.85571	Smallest (1)	1866.68
Source: Central Statistics Office (CSO)							

The trend of growth of each sub-sector is distinct. The averages hold the same position and such a pattern can be observed in the graph below.
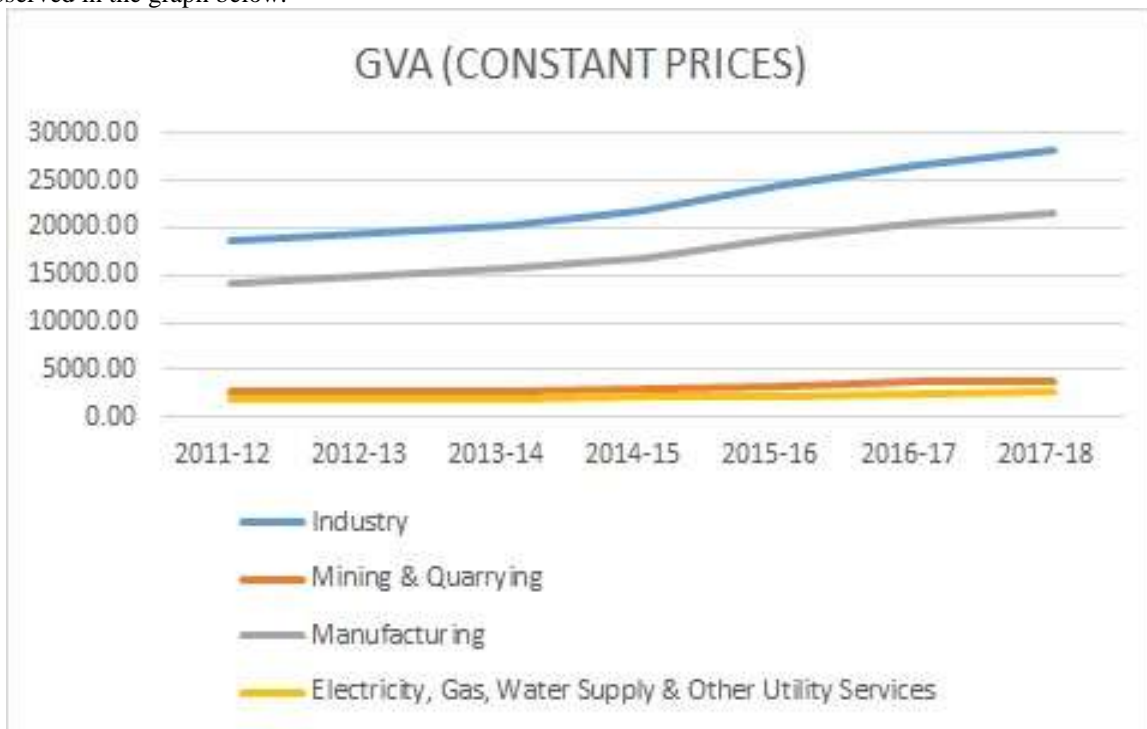
Graph1

In comparison to the industry as a whole, the several components of the gross value added follow a similar pattern of growth. Mining and quarrying, electricity, gas, water supply and other utility services are going at a slow but constant rate while manufacturing is almost parallel to the line of the industry trendline.

To evaluate the relationship between these factors of GVA, the correlations and regression tables have been calculated. It has been concluded that the three components are highly correlated amidst each other and also hold a strong pattern with the trend of the industry as a whole. All the figures are above 0.9 which indicates that they lie in the range of the highly positive correlation.

	Industry	Mining & Quarrying	Manufacturing	Electricity, Gas, Water Supply & Other Utility Services
Industry	1			
Mining & Quarrying	0.988850153	1		
Manufacturing	0.999599595	0.98467533	1	
Electricity, Gas, Water Supply & Other Utility Services	0.991489251	0.978227775	0.989849182	1
Source: Central Statistics Office (CSO)				

Using the regression analysis tables, the factors affecting GVA at constant prices of the industry have been analysed and an equation has been formulated.

$$Y = (1)X_1 + (0.9)X_2 + (1)X_3$$

Where X represents the variables taken which are the respective components of GVA at constant prices. Using this equation, the future predictions regarding the GVA components can be made assuming the inputs distributed over the factors. Due to the confidence level assumption of 95%, the analysis is highly reliable.

Regression Statistics								
Multiple R	1							
R Square	1							
Adjusted R Square	1							
Standard Error	5.3546E-09							
Observations	7							
ANOVA								
	df	SS	MS	F	Significance F			
Regression	3	82671602.94	27557201	9.61E+23	1.8017E-36			
Residual	3	8.60159E-17	2.87E-17					
Total	6	82671602.94						
	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-4.605E-09	3.06278E-08	-0.15035	0.890031	-1.0208E-07	9.2866E-08	-1.0208E-07	9.2866E-08
Mining & Quarrying	1	2.41361E-11	4.14E+10	3.1E-32	1	1	1	1
Manufacturing	1	6.34546E-12	1.58E+11	5.63E-34	1	1	1	1
Electricity, Gas, Water Supply & Other Utility Services	1	5.5097E-11	1.81E+10	3.69E-31	1	1	1	1
Source: Central Statistics Office (CSO)								

In further research, the data related to crude oil and petroleum products has been analysed because crude oil is an important manufacturing input in the industrial sector and its analysis will provide further insights into the effectiveness and efficiency of the system.

On understanding the correlation between the two, it is observed that they are positively correlated but not up to an extent so as to form a linear graph.

	PRODUCTION	IMPORTS
PRODUCTION	1	
IMPORTS	0.744065551	1

Source: Central Statistics Office (CSO)

Given below is the descriptive statistics table of the production and imports of crude oil. The factors vary largely on comparing the average and mode of the data. The maximum and minimum

figures are very distinct and it can be concluded that the production and import patterns must be altered so as to achieve optimization of balance of trade.

PRODUCTION		IMPORTS	
Mean	32.91666667	Mean	84.75
Standard Error	0.543905629	Standard Error	11.59046
Median	33	Median	66
Mode	33	Mode	15
Standard Deviation	3.263433774	Standard Deviation	69.54274
Sample Variance	10.65	Sample Variance	4836.193
Kurtosis	0.05707582	Kurtosis	-1.05117
Skewness	-0.412399895	Skewness	0.659954
Range	13	Range	206
Minimum	25	Minimum	14
Maximum	38	Maximum	220
Sum	1185	Sum	3051
Count	36	Count	36
Largest (1)	38	Largest (1)	220
Smallest (1)	25	Smallest (1)	14

Source: Central Statistics Office (CSO)
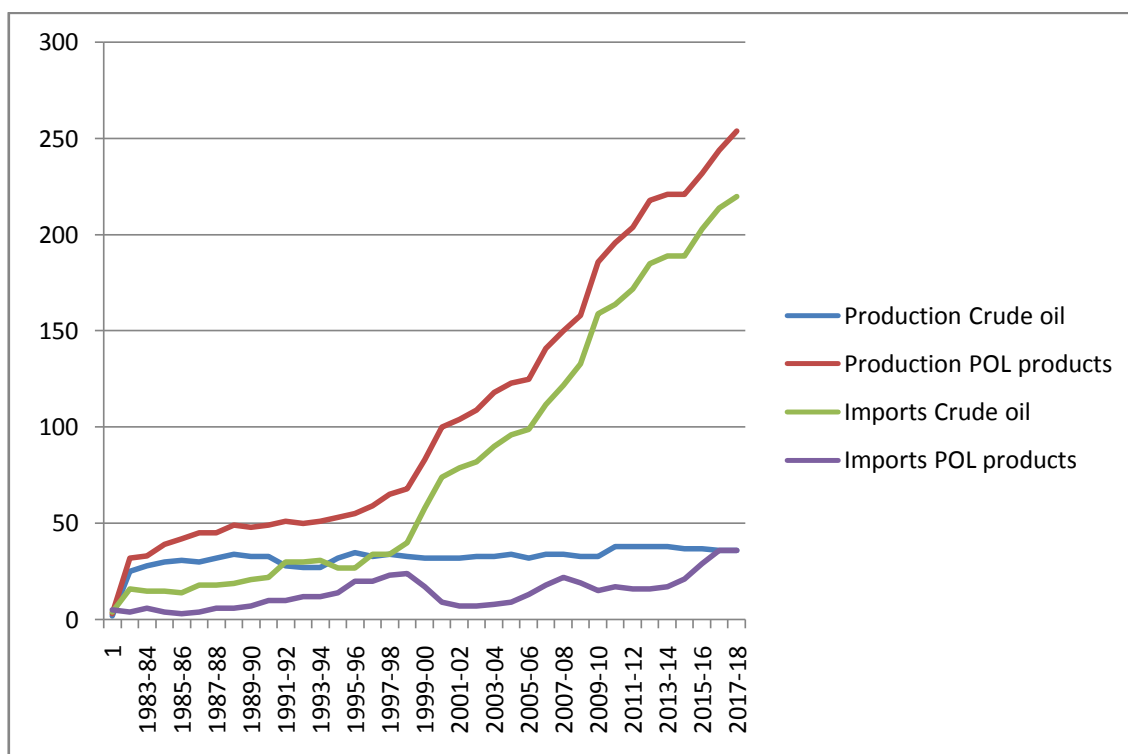
Graph2

It is a general observation that the products of which the home country has sufficient resources for production are not imported. In the graph, this observation stands justified. India imports high amounts of crude oil from abroad while production of crude oil has not increased

over the past two decades. In terms of other petroleum products, the imports of which are low and production rate is high, self sufficiency is an advantage that lies underused.

Furthermore, the overall exports and imports of crude oil and petroleum products have been taken into account. This broadens the perspective of this research on a macro-economic scale and brings in the figures of trade balance and support the system overall with the fiscal policy in place. The descriptive statistics of the data have been described below.

Exports		Imports		Total balance	
Mean	4961.092	Mean	7292.156	Mean	-2331.06
Standard Error	1065.183	Standard Error	1603.365	Standard Error	546.6103
Median	1397.531	Median	1783.319	Median	-273.018
Mode	#N/A	Mode	#N/A	Mode	#N/A
Standard Deviation	6652.067	Standard Deviation	10013.01	Standard Deviation	3413.58
Sample Variance	44249995	Sample Variance	1E+08	Sample Variance	11652530
Kurtosis	0.141623	Kurtosis	0.009823	Kurtosis	0.144576
Skewness	1.291308	Skewness	1.261305	Skewness	-1.28434
Range	19491.23	Range	29918.73	Range	10427.5
Minimum	64.184	Minimum	91.426	Minimum	-10454.7
Maximum	19555.41	Maximum	30010.16	Maximum	-27.242
Sum	193482.6	Sum	284394.1	Sum	-90911.5
Count	39	Count	39	Count	39
Largest (1)	19555.41	Largest (1)	30010.16	Largest (1)	-27.242
Smallest (1)	64.184	Smallest (1)	91.426	Smallest (1)	-10454.7

Source: Central Statistics Office (CSO)

The obvious phenomenon that exists here is that the imports and exports move in the opposite directions. They are, hence, negatively correlated to the total balance. The graph supports this observation.

	Exports	Imports	Total balance
Exports	1		
Imports	0.997323	1	
Total balance	-0.97673	-0.9898	1
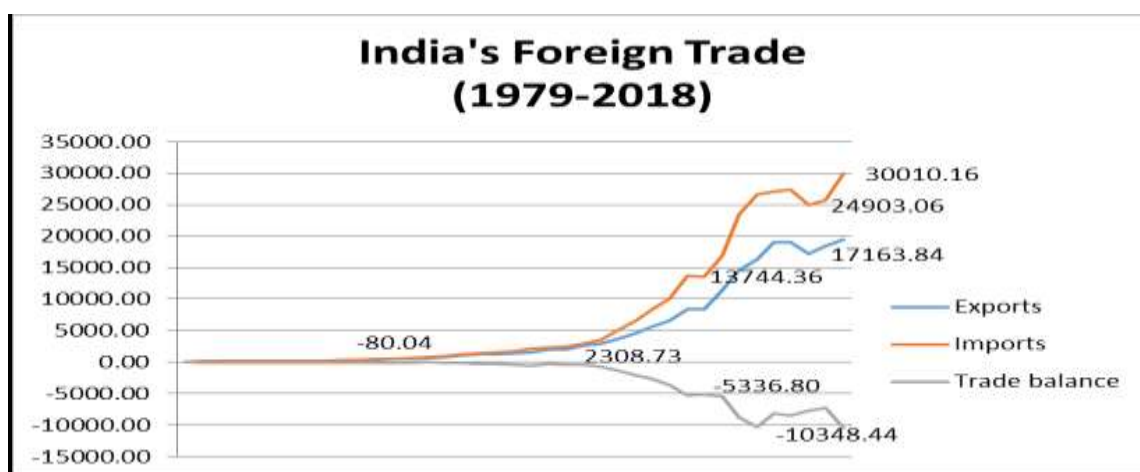
Graph3

The graph truly depicts the deficit balance of trade in the country prevailing over the past years from 1779 to 2018. The level of imports has been multiplying while the exports are increasing at

a declining rate. The reasons for such a scenario could be multiple and deep-rooted well within the system of trade.

The regression tables below depict the analysis of the exports, imports and trade balance.

Regression Statistics								
Multiple R	1							
R Square	1							
Adjusted R Square	1							
Standard Error	0.0004711							
Observations	39							
ANOVA								
	df	SS	MS	F	Significance F			
Regression	2	4427961312	2.21E+08	9.97587E+14	4.1095E-248			
Residual	36	7.98961E-06	2.22E-07					
Total	38	4427961312						
	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	5.822E-06	9.59303E-05	0.060691	0.951941363	-0.000188734	0.000200378	-0.000188734	0.000200378
Exports	1	1.57117E-07	6364664	1.5787E-218	0.999999648	1.000000285	0.999999648	1.000000285
Imports	-1	1.0438E-07	-9580397	6.374E-225	-1.00000019	-0.999999766	-1.00000019	-0.999999766

Source: Central Statistics Office (CSO)

The capital consideration in the industry is a huge factor for evaluating the industry sector and understanding the need for a revolution. The analysis of capital has been done using the tool of correlation. Descriptive statistics have also been used to highlight the details of the data.

There exists high correlation between the three types of capital in purview because of the influence of the general atmosphere of capital investment prevailing in the country. As a whole, invested capital and fixed capital are almost perfectly correlated.
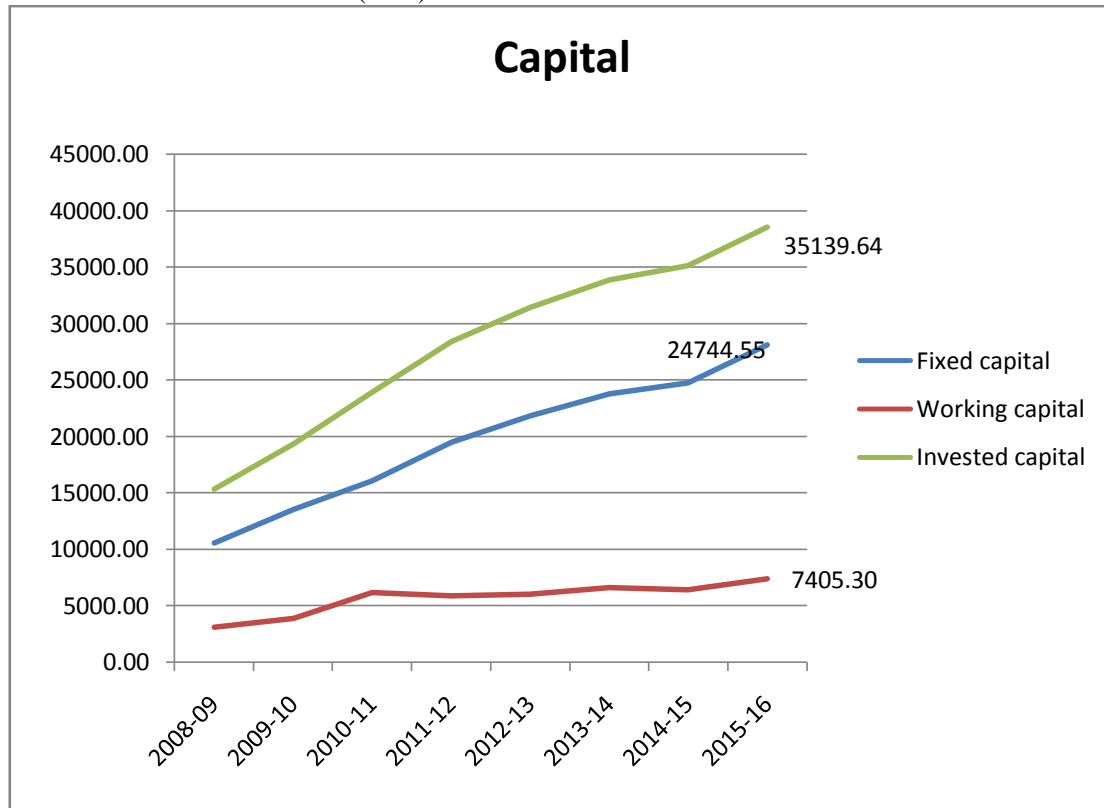
	Fixed capital	Working capital	Invested capital
Fixed capital	1		
Working capital	0.91075204	1	
Invested capital	0.997382923	0.927058741	1

Source: Central Statistics Office (CSO)

Fixed capital		Working capital		Invested capital	
Mean	19753.49	Mean	5697.359	Mean	28248.36
Standard Error	2119.547	Standard Error	512.2834	Standard Error	2863.623
Median	20649.06	Median	6118.87	Median	29926.3
Mode	#N/A	Mode	#N/A	Mode	#N/A
Standard Deviation	5994.984	Standard Deviation	1448.956	Standard Deviation	8099.548
Sample Variance	35939832	Sample Variance	2099475	Sample Variance	65602678
Kurtosis	-1.03212	Kurtosis	0.17277	Kurtosis	-1.00806
Skewness	-0.25835	Skewness	-1.06316	Skewness	-0.47033
Range	17536.81	Range	4292.97	Range	23179.22
Minimum	10559.66	Minimum	3112.33	Minimum	15351.78
Maximum	28096.47	Maximum	7405.3	Maximum	38531
Sum	158027.9	Sum	45578.87	Sum	225986.9
Count	8	Count	8	Count	8

| Largest(1) | 28096.47 | Largest(1) | 7405.3 | Largest(1) | 38531 |
| Smallest(1) | 10559.66 | Smallest(1) | 3112.33 | Smallest(1) | 15351.78 |

Source: Central Statistics Office (CSO)

Graph4

In the industrial sector, the requirement of working capital has been observed to be in the same range i.e. between 500 to 5000 crores. On the contrary, fixed capital and invested capital are at an all-time high growth stage with the current figures standing at 28,096 and 38,531.

Manpower is an important source of output in the industry. There are different labourers, employees and workers involved in the sector which have been evaluated below.

The number of workers and employees depict a highly positive relationship at the outset which shows that the employment pattern for both labour and managerial positions however some distinction still prevails. This difference could possibly be in the hiring pattern or in the terms of employment and rate of turnover.

	Number of factories	Number of workers	Number of employees	Total persons engaged
Number of factories	1			
Number of workers	0.94098175	1		
Number of employees	0.940662959	0.999009004	1	
Total persons engaged	0.941320183	0.999028823	0.999991018	1

Source: Central Statistics Office (CSO)
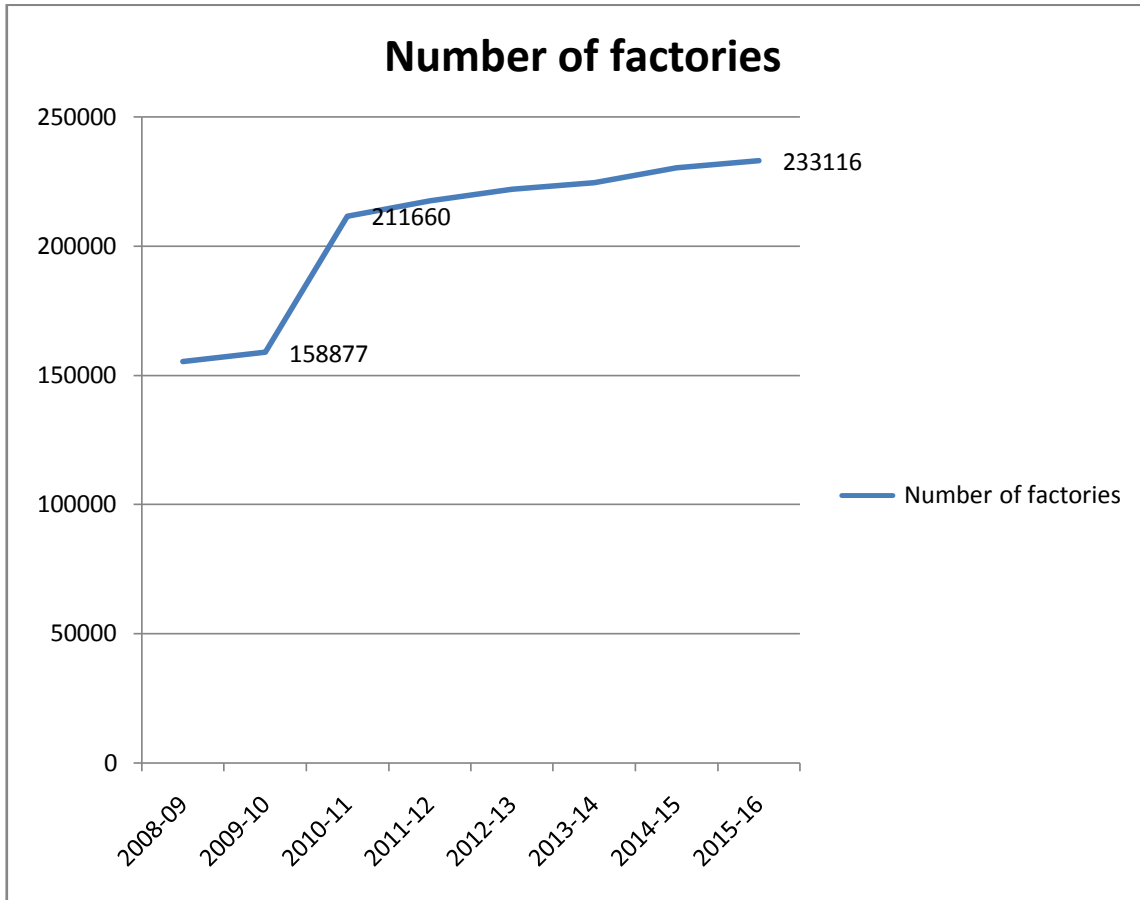
Graph5

Over the previous decade, the number of factories has risen from 155,321 to 233,116. The jump in the number was seen in the year 2011 after which the sector experienced constant growth in quantity.
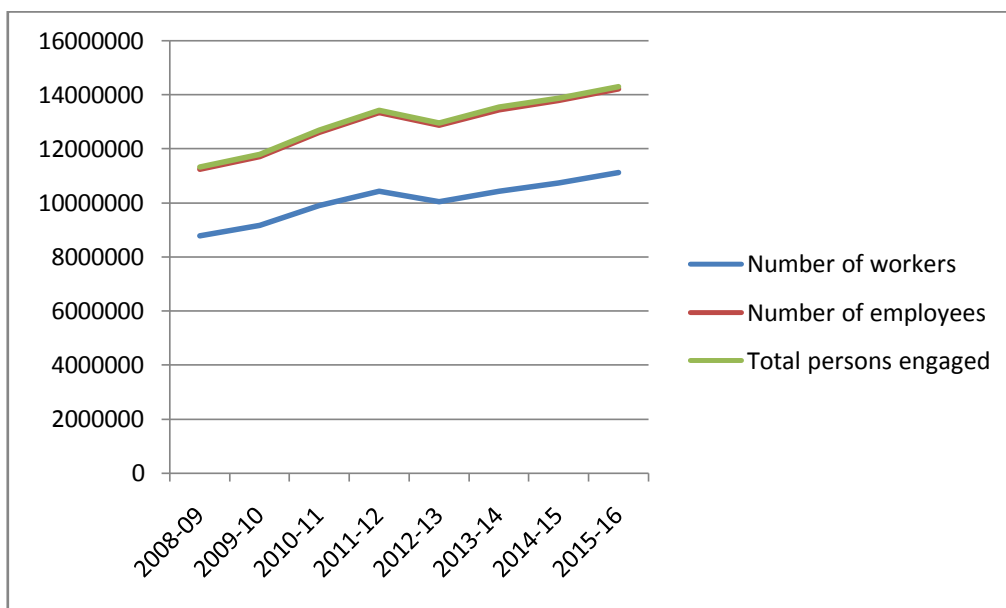
Graph6
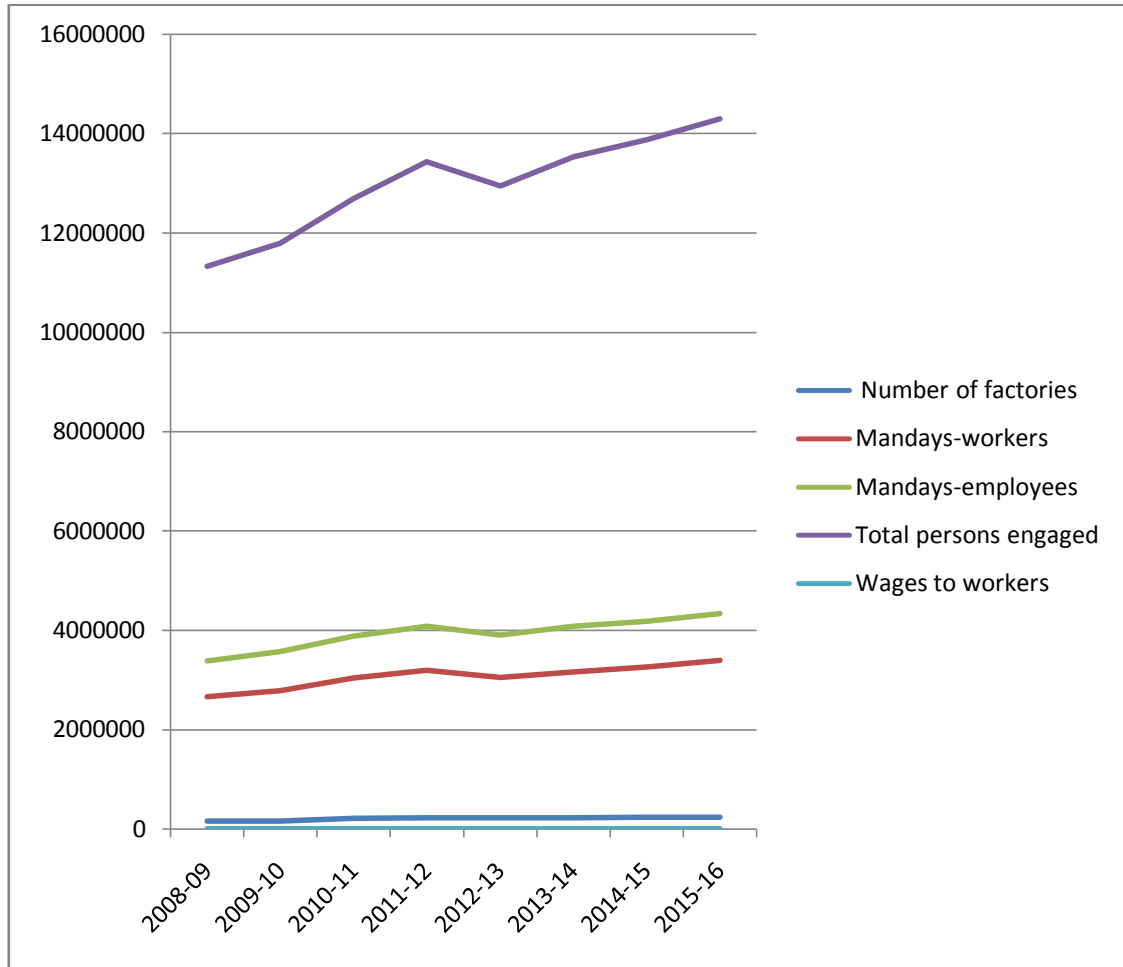
Graph7

The regression tables below depict the analysis of the various employees and the factories.

Regression Statistics	
Multiple R	0.99999306
R Square	0.99998612
Adjusted R Square	0.99997571
Standard Error	5030.32309
Observations	8

ANOVA

	df	SS	MS	F	Significance F
Regression	3	7.292E+12	2.4307E+12	96057.97 15	3.61242E-10
Residual	4	101216601	25304150.4		

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Total	7	7.292E+12						
Intercept	95910.8591	38627.907	2.48294216	0.0679964	-11337.4044	203159.1226	-11337.4044	203159.1226
Number of factories	0.18421966	0.17923 16	1.02783045	0.36211829	-0.313406944	0.681846268	-0.313406944	0.681846268
Number of workers	0.01408574	0.0539807	0.26094051	0.80702204	-0.135788621	0.163960108	-0.135788621	0.163960108
Number of employees	0.98446207	0.0419195	23.4846022	1.9489E-05	0.868074968	1.100849182	0.868074968	1.100849182

Source: Central Statistics Office (CSO)

Whether it is in terms of factories or in terms of man-hours or days put in by the employ for the work, the wages are less than highly correlated with the number of factories. The total persons engaged is observed to be correlated to a scale of 0.95 with the wages provided to the workers.

	Number of factories	Mandays-workers	Mandays-employees	Total persons engaged	Wages to workers
Number of factories	1				
Mandays-workers	0.940593897	1			
Mandays-employees	0.943582439	0.998892385	1		
Total persons engaged	0.941320183	0.995610918	0.996901766	1	
Wages to workers	0.878964481	0.932757318	0.93420958	0.954495126	1

Source: Central Statistics Office (CSO)

The regression tables below depict the analysis of the data related to the man-days and number of factories that employ labour in the industry sector.

Regression Statistics	
Multiple R	0.9797149
R Square	0.95984128
Adjusted R Square	0.90629633
Standard Error	104.089285
Observations	8

ANOVA

	df	SS	MS	F	Significance F

Regression	4	776878.1629	194219.541	17.9258959	0.019634379			
Residual	3	32503.73795	10834.5793					
Total	7	809381.9008						

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-3423.4014	810.8476056	-4.2220034	0.0242934	-6003.880334	-842.922401	-6003.880334	-842.9224013
Number of factories	-0.0004793	0.003818077	-0.1255326	0.90804196	-0.012630117	0.01167153	-0.012630117	0.01167153
Mandays-workers	0.0001244	0.003463352	0.0359193	0.9736031	-0.010897532	0.011146334	-0.010897532	0.011146334
Mandays-employees	-0.0030636	0.003210446	-0.9542661	0.41034863	-0.013280693	0.007153453	-0.013280693	0.007153453
Total persons engaged	0.00125069	0.00049077	2.54842889	0.08405811	-0.000311157	0.002812542	-0.000311157	0.002812542

Source: Central Statistics Office (CSO)
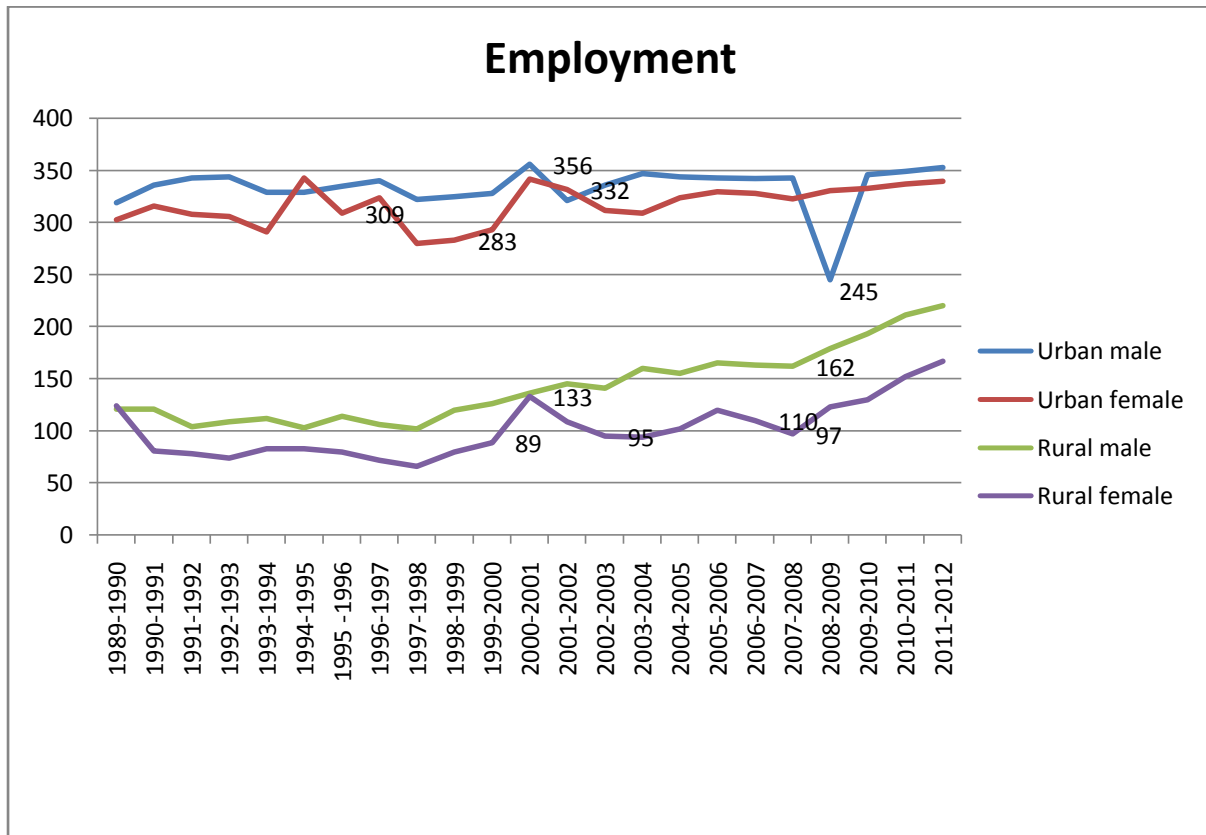
Graph8

The number of employees in the rural and urban sector lies in completely different range of numerical and fluctuates over time with changes in policies. Employment in the urban sector is highly greater than the rural sector. The difference of this is depicted in the graph. The gap exists because of modernisation and development.

In the rural area, males and females in 1997 were employed in a similar pattern which changed in the period of 2000-02 drastically, after which the rate of employment touched greater heights of growth being favourable for the industry as a whole till the year 2012.

In urban locations, employment stands at a peak rate which shows prospects of higher growth as compared to rural. Though there are fluctuations, but they aren't as much as the impact of economic conditions in other factors. Urban male employees show less growth whereas urban female employment rate has risen up drastically on comparing figures of 1990 and 2000s upto 2012.

V. RECOMMENDATIONS:
1. Robotics and automation:
The population of India is very huge and an over-reliance on automatic techniques will reduce the job creation which is not very useful for a country with such a huge population. There is a fear of job loss due to robotics and automation among the Indians. But coping up with new technology is very important for every country's manufacturing sector to grow and increase productivity, so India needs to train its population to work with the new technology so that we adopt automation and the job creation doesn't shrink.

2. Productivity:
Even though India as an economy has the highest manpower, the efficiency of the Indian workers are 4-5 times less productive than other countries due to which Indian manufacturers are not able to compete with global industries in terms of quality, production planning, supply chain management and maintenance. Hence, India has very low productivity. To overcome this, it is important to train the employees with the required skills and not only make them adapt to the changing technology but also to increase their productivity and efficiency.Also as we can see in graph number 8, the number of males and females employed in the urban region is much higher than in the rural regions of India even when India has a lot of its population living in the rural areas. India has a lot of rural population which should be utilized properly by training them so that they are able to work in industries to increase the productivity of industries and also increase employment in those areas to optimally utilize the human resource.

3. Fiscal policies:
There is a need to Modernise and up-grade technology in India of the existing industries. To make this possible, it is very important for the government to exercise rational fiscal policies. Government should decrease taxes or provide subsidies to manufacturing industries which will encourage more and more people to shift from agricultural sector to industrial sector.

4. Monetary policies:
The monetary policies of the RBI should be more liberal towards the manufacturing industries so that they can easily get loans at a nominal interest rate which will lead to large capital investments made in this sector which is a necessity for industrial growth.

5. Infrastructural bottlenecks:
There exist various infrastructural bottlenecks like power and coal which need to be removed effectively and in order to do so, manufacturers should invest more in such factors so that the production capacity and effectiveness increases followed by rapid industrial growth.

6. Investment climate:
There needs to be a favourable investment climate by the government to protect the interest of domestic producers from different countries resulting from globalisation. There needs to be more government policies like Made in India and Start-up India and more awareness should be spread about these policies to protect the Indian manufacturers from liberalization policies of 1991. As we can see in graph number 3, India has a negative trade balance which tells us that we import much more than the exports and that deficit has been increasing every year from 1982 to 2018 and has a negative balance of 10,45,400 crore rupees in the year 2017-18. There needs to be a favourable investment climate to protect the Indian producers so that exports can increase can India becomes self-sufficient.

7. Sick units of the government:
There exist a lot of sick businesses owned by the public sector which the government needs to privatize. This will benefit both public sector and private sector along with overall growth of this sector. It will also help in increasing the employment as we can see in graph number 6, that

the number of workers and employees in the industrial sector has been increasing over the years from 2008 to 2016 but the rate at which it is increasing is very nominal. India has an advantage of its unique demography i.e., it is home to world's youngest populations. This population needs to be utilized properly to increase the employment at a higher rate. More and more jobs need to be created and the existing sick units need to be privatized so that they become efficient and increase production which will also increase employment and benefit the economy as a whole.

8.   Optimization of production of crude oil:
As we can see in graph number 2, The crude oil imports have increased from 16 million tons to 220 million tons from 1982 to 2018 but the production of oil has been constant since the past two decades. Therefore self-sufficiency is an aspect in which India has been lagging behind. The modernization and up-gradation of technology should be done in such a way that the extraction and production of crude oil can increase which will also eventually lead to increasing growth of industries.

9.   Schemes related to MSMEs:
MSME is a significance sector and proper resources should be allocated to this division. Another step that should be taken is to create exceptional awareness about the various government policies and schemes that the government offers for the stipulation of growth in this sector. There are various schemes like the Prime Minister Employment Generation Programme (PMEGP) and Performance and Credit Rating Scheme for MSMEs which are implemented by the government to protect the interest of and promote MSMEs but awareness about these schemes need to spread around so that more people come to know about the scheme and they are motivated with the idea of MSME.

10. Infrastructural development:
From the graph number 5, we have observed that the number of factories has increased drastically from 2008 to 2011 but after that, they have increased at a very low slow rate till 2016. If the infrastructure of the manufacturing sector needs to be improved then the number of factories should be increased and various schemes should be implemented to promote people to open-up new factories like the ones implemented by the government to promote MSMEs and more awareness needs to be spread about these schemes.

11. Investment in research and development:
According to the findings of a research conducted by OECD in 2015, India's Gross Domestic Expenditure on Research and Development was only 0.85% of its GDP. When we compare it with other developed nations, theyspend 2-3% of their GDP on R&D. The more India invests in R&D, the more it will come to know about its weaknesses and the aspect that it needs to focus on to increase the productivity of manufacturing sector and the ways in which it can do overcome those weaknesses.

VI. CONCLUSION
We have carried out this study to see the impact of various components of Industry to the GDP i.e. Mining and Quarrying, Manufacturing, Electricity and Gas and other utility services are highly related to each other and have a very strong pattern with the trend of the industry. We have found out co relation between these factors which tells us that these factors are highly dependent on each other. Also, the conducted research tells us that the contribution of industrial sector to the GDP is very less but if the above recommendations are followed then it contribution percentage would definitely shoot up and also help in optimally utilizing the resources of the country.

VII.   LIMITATIONS
- The data and interpretations are subject to bias of the researchers.
- There exist chances of errors in the numerical data. Steps have been taken to minimise such errors.
- There is a possibility o using the data for derivation of more useful interpretations.
- The knowledge and experience of the researchers in this field is limited.

ANNEXURES:

TABLE 34 : PRODUCTION AND IMPORTS OF CRUDE OIL AND PETROLEUM PRODUCTS				
(Million tonnes)				
Year	Production		Imports	
	Crude oil	POL	Crude oil	POL

		products		products
1	2	3	4	5
1982-83	25	32	16	4
1983-84	28	33	15	6
1984-85	30	39	15	4
1985-86	31	42	14	3
1986-87	30	45	18	4
1987-88	32	45	18	6
1988-89	34	49	19	6
1989-90	33	48	21	7
1990-91	33	49	22	10
1991-92	28	51	30	10
1992-93	27	50	30	12
1993-94	27	51	31	12
1994-95	32	53	27	14
1995-96	35	55	27	20
1996-97	33	59	34	20
1997-98	34	65	34	23
1998-99	33	68	40	24
1999-00	32	83	58	17
2000-01	32	100	74	9
2001-02	32	104	79	7
2002-03	33	109	82	7
2003-04	33	118	90	8
2004-05	34	123	96	9
2005-06	32	125	99	13
2006-07	34	141	112	18
2007-08	34	150	122	22
2008-09	33	158	133	19
2009-10	33	186	159	15
2010-11	38	196	164	17
2011-12	38	204	172	16
2012-13	38	218	185	16
2013-14	38	221	189	17
2014-15	37	221	189	21
2015-16	37	232	203	29
2016-17	36	244	214	36
2017-18	36	254	220	36

POL : Petroleum, oil and lubricants.

Note :   Data for 2017-18 are Provisional. Crude oil production data for 2017-18 is target for the year.

Source :   Ministry of Petroleum and Natural Gas, Government of India, PPAC.

Secondary Sector Employment				
	Urban male	Urban female	Rural male	Rural female
1989-	319	303	121	124

Year				
1990				
1990-1991	336	316	121	81
1991-1992	343	308	104	78
1992-1993	344	306	109	74
1993-1994	329	291	112	83
1994-1995	329	343	103	83
1995-1996	335	309	114	80
1996-1997	340	324	106	72
1997-1998	322	280	102	66
1998-1999	325	283	120	80
1999-2000	328	293	126	89
2000-2001	356	342	136	133
2001-2002	321	332	145	109
2002-2003	336	312	141	95
2003-2004	347	309	160	94
2004-2005	344	324	155	102
2005-2006	343	330	165	120
2006-2007	342	328	163	110
2007-2008	343	323	162	97
2008-2009	245	331	179	123
2009-2010	346	333	193	130
2010-2011	349	337	211	152
2011-2012	353	340	220	167

Note :   Data on NSS rounds 38, 43, 50, 55, 61, 66 and 68 relate to quinquennial rounds.

Source :   National Sample Survey Organisation, Ministry of Statistics and Programme Implementation, Government of
India.

TABLE 121 : INDIA'S FOREIGN			

TRADE - RUPEES 'billions			
Year	Exports	Imports	Trade balance
1979-80	64.18	91.43	-27.24
1980-81	67.11	125.49	-58.38
1981-82	78.06	136.08	-58.02
1982-83	88.03	142.93	-54.89
1983-84	97.71	158.32	-60.61
1984-85	117.44	171.34	-53.91
1985-86	108.95	196.58	-87.63
1986-87	124.52	200.96	-76.44
1987-88	156.74	222.44	-65.70
1988-89	202.32	282.35	-80.04
1989-90	276.58	353.28	-76.70
1990-91	325.58	431.93	-106.35
1991-92	440.42	478.51	-38.09
1992-93	536.88	633.75	-96.86
1993-94	697.51	731.01	-33.50
1994-95	826.74	899.71	-72.97
1995-96	1063.53	1226.78	-163.25
1996-97	1188.17	1389.20	-201.03
1997-98	1301.01	1541.76	-240.76
1998-99	1397.53	1783.32	-385.79
1999-00	1595.61	2152.37	-556.75
2000-01	2035.71	2308.73	-273.02
2001-02	2090.18	2452.00	-361.82
2002-03	2551.37	2972.06	-420.69
2003-04	2933.67	3591.08	-657.41
2004-05	3753.40	5010.65	-1257.25
2005-06	4564.18	6604.09	-2039.91
2006-07	5717.79	8405.06	-2687.27
2007-08	6558.64	10123.12	-3564.48
2008-09	8407.55	13744.36	-5336.80
2009-10	8455.34	13637.36	-5182.02
2010-11	11429.22	16834.67	-5405.45
2011-12	14659.59	23454.63	-8795.04
2012-13	16343.18	26691.62	-10348.44
2013-14	19050.11	27154.34	-8104.23
2014-15	18964.45	27370.87	-8406.41
2015-16	17163.84	24903.06	-7739.21
2016-17	18494.34	25776.75	-7282.42
2017-18	19555.41	30010.16	-10454.75

Note   : Data for 2016-17 are revised and for 2017-18 are provisional.
Also see Notes on Tables.
Source : Directorate General of Commercial Intelligence and Statistics.

Items/Year	Industry	Mining & Quarrying	Manufacturing	Electricity, Gas, Water Supply & Other Utility Services
2011-12	18576.89	2610.35	14099.86	1866.68
2012-13	19411.17	2626.09	14868.73	1916.35
2013-14	20234.17	2631.07	15607.09	1996.01
2014-15	21866.70	2886.85	16839.38	2140.47
2015-16	24514.41	3284.53	18987.90	2241.98
2016-17	26647.10	3710.66	20487.11	2449.34
2017-18	28107.28	3819.65	21662.67	2624.96

Source: Central Statistics Office (CSO)

Industry Characteristics	Number of factories	Number of workers	Number of employees	Total persons engaged
2008-09	155321	8776745	11252793	11327485
2009-10	158877	9157802	11722631	11792055
2010-11	211660	9901970	12617691	12694853
2011-12	217554	10438156	13346243	13430483
2012-13	222120	10051626	12873853	12950025
2013-14	224576	10444404	13462061	13538114
2014-15	230435	10755288	13808327	13881386
2015-16	233116	11136133	14227645	14299710

Source: Central Statistics Office (CSO)

Industry Characteristics	Number of factories	Mandays-workers	Mandays-employees	Total persons engaged	Wages to workers
2008-09	155321	2660547	3386622	11327485	597.72
2009-10	158877	2783026	3574683	11792055	689.41
2010-11	211660	3035766	3884964	12694853	856.46
2011-12	217554	3190232	4087324	13430483	1000.19
2012-13	222120	3048628	3910879	12950025	1108.96
2013-14	224576	3163707	4085342	13538114	1264.96
2014-15	230435	3262545	4184357	13881386	1404.85
2015-16	233116	3391712	4337047	14299710	1560.01

Source: Central Statistics Office (CSO)

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