



Impact of Foreign Direct Investment on Sectoral Growth of Indian Economy

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ABSTRACT

At the backdrop of expanding economies and in the race of attracting higher investments and enhancing exports, it becomes important to analyze the relationship between Foreign Direct Investment (FDI) and growth in terms of output of the economy. A number of studies have been conducted for analyzing the relationship and impact of FDI on growth of the aggregate economy. This paper aims at assessing the impact and relationship of FDI and Growth with each other at the sectoral level. The impact is examined through Panel co-integration test followed by Random effects model. Granger causality test is also applied to assess the causation of each of these. The results indicate that growth has an impact on FDI but FDI doesn't have an impact on growth at the sectoral level.

Keywords: Foreign Direct Investment, Growth, Sectors

JEL Classifications: F21, O4, I25, I28, C33

1. INTRODUCTION

The attraction of foreign investment is one of the most important strategies prevalent in developing countries for enhancing capital formation, generating employment and thus facilitating growth and development. India is an emerging country and in recent years has attracted a significant share of foreign investment. Enhancement in foreign investment in the last three decades has been accompanied with continuous growth of gross domestic product (GDP) in India. The key issue of this paper revolves around the impact of Foreign Direct Investment (FDI) on the economic performance and development of various sectors of the Indian Economy.

FDI refers to an investment made by multi-national enterprises or by a non-resident in an enterprise of recipient (host) countries through which they earn returns and exercise control on. In India, FDI is considered as an equity capital but in 2002 Government of India through the IMF guidelines¹ (RBI, 2003) redefined FDI inflows and hence included reinvestments and venture capital also.

FDI flows to countries which have less bureaucratic structure, appropriate infrastructural facilities and conducive business environment. In 2014, China became the largest incipient of FDI with \$129 billion followed by Hong Kong and then USA². India featured in the top 10 destinations for FDI inflows in 2014 and witnessed a rise of 22% with \$34 billion of FDI inflows. Among the top 10 recipients of FDI majority are from developing countries including China, Hong Kong, Brazil, India and Singapore. Another characteristic which has been noteworthy at the sectoral front is that China succeeded in attracting FDI in the service sector much more than India in the year 2014. On examining the data in Chart 1, it is seen that the share of developed countries has eventually declined while that of developing countries increased.

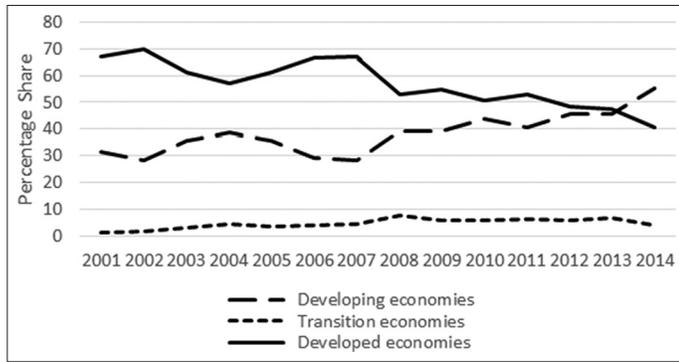
In Chart 2, it can be seen that India's share in world FDI inflows increased from 0.3% to around 3% from 2000 to 2014.

Despite such statistics, India is still not an attractive destination for FDI inflows as compared to China and other key emerging host

¹ IMF guideline has prescribed to include reinvestments and venture capital in the FDI flows.

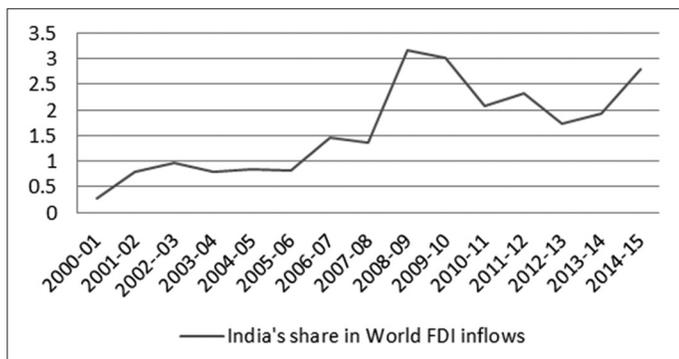
² UNCTAD Report 2014.

Chart 1: Percentage share of Developed, Developing and Transition Economies in World Foreign Direct Investment



Source: Extracted from World Investment Report, UNCTAD, 1980-2014

Chart 2: India's Share in World Foreign Direct Investment



Source: Extracted from World Investment Report, UNCTAD, 1980-2014

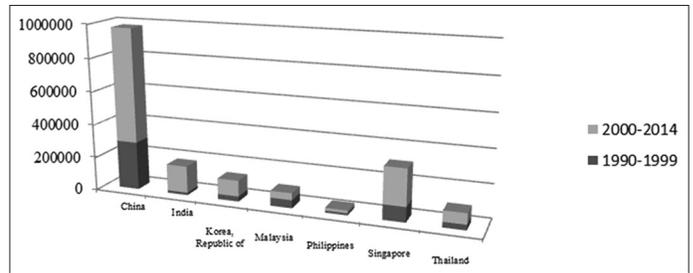
countries. It can be seen in Chart 3, how the major economies in Asia attracting FDI have performed in the period 2000-2014 as compared to the 1990s.

FDI inflows in India rose tremendously in the decade of 2000 as compared to China. The reason is can be mainly attributed to improvement in infrastructure, congenial business environment and government steadiness. It can be clearly seen that India has showed tremendous growth from 1990's to 2000's in the arena of attracting investments. India has become the third highest recipient of FDI in Asia after China and Singapore.

After the reforms, India has been receiving FDI from a number of countries and thus there has been a broadening of sources for India. As compared to 15 countries investing in India in 1991, in 2014 there were more than 120 countries. The major additions to the list of countries investing in India after 1991 have been Mauritius, South Korea, Malaysia and Cayman Islands. Traditionally, in both the pre and post reform period USA, United Kingdom, Germany, Japan, Italy and France have been major investors in India. Chart 4 depicts the share of top countries investing in India from 2000 to 2014.

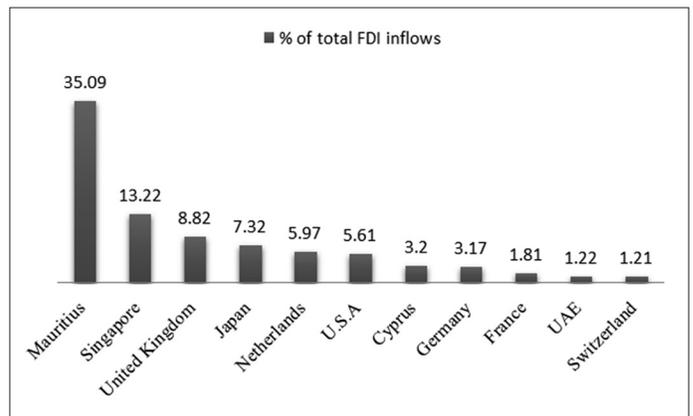
Mauritius emerged as the prime investor in India during 2001-2014. FDI inflows from Mauritius comprise of about 35.09% of

Chart 3: Foreign Direct Investment trend in Emerging Economies of Asia



Source: Extracted from World Investment Report, UNCTAD, 1980-2014

Chart 4: Top countries investing in India



Source: DIPP, SIA Bulletin, Ministry of Commerce, GOI, 2000-2014

the total FDI inflows in India and are at the number one position on India's FDI inflow list since 1995. Double Taxation Treaty i.e., double taxation avoidance agreement between India and Mauritius facilitates routing of investment through Mauritius into India. India and Singapore have also signed this type of taxation treaty. This can be the predominant reason for Singapore to be the second largest investing country in India.

Other countries which invest in India throughout FDI inflows are UK with a relative share of 8.82%. Other countries which follow suit are Japan, Netherlands, USA, Cyprus, Germany, France, UAE and Switzerland.

To analyze growth, it becomes important to assess the GDP trends of the Indian economy. It can be seen in Chart 5 that the absolute value of GDP has been continuously rising from 2000 to 2014 with an exception of 2009-2010.

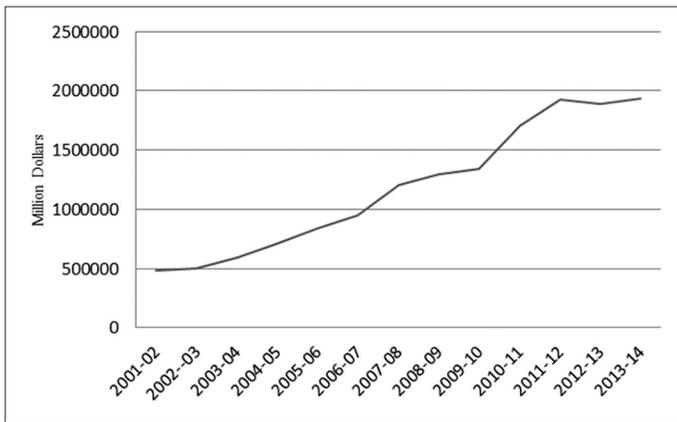
While in Chart 6, the percentage growth of GDP from 2001 to 2014 has been depicted indicating continuous growth with a fall in 2008-2009.

Thus, after assessing various parameters related to FDI inflows and growth in India, it becomes imperative to assess the impact at sectoral levels of FDI inflows on growth. The present study focuses on the objectives to analyse the impact of FDI on sectoral growth (gross output) of Indian Economy and vice versa.

2. SECTORAL DIMENSIONS OF FDI FLOWS IN INDIA

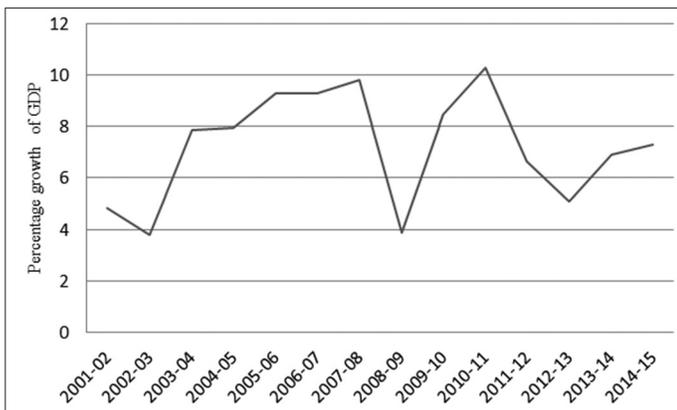
To fulfill the objective of the paper it is necessary to understand the sectoral dimensions of FDI inflows. Chart 7 clearly indicates the share of major sectors attracting FDI in India.

Chart 5: Gross domestic product trend in India



Source: Extracted from World Investment Report, UNCTAD, 1980-2014

Chart 6: Percentage growth of gross domestic product



Source: World Development Indicators, World Bank, 2000-2014

It is inferred from the above depiction that the top five sectors in total for FDI inflows comprise worth US \$112,923 million during 2000-2014 which explains for approximately 50% of total FDI inflows. Services, construction, telecommunication, computer hardware and software and drugs and pharmaceuticals account for approximately 40.8% of FDI inflows of the top five sectors.

To fulfill the objective of the paper, an appropriate selection of sectors is required. The sectors have been chosen based on the following factors:

- i. Percentage share of FDI inflows in each sector of total FDI inflows from the country.
- ii. Percentage share of gross output in each sector of total GDP from the country.
- iii. Percentage share of exports in each sector of total exports from the country.

The percentage share of each of the sectors are depicted in Chart 8.

The choice of sectors is based on the contribution of the above factors in enhancing it. The major sectors chosen have been depicted in Figure 1 which has the highest share in GDP, FDI and exports in India.

Figure 1: Sectors chosen for the research study

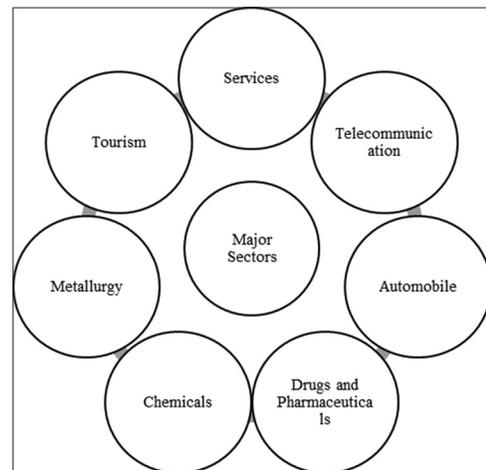
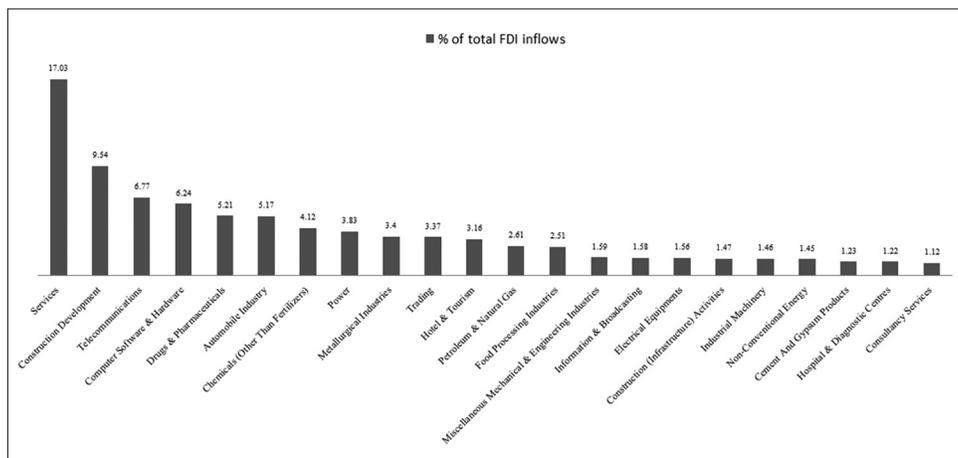


Chart 7: Percentage of sector wise Foreign Direct Investment to total Foreign Direct Investment inflows



Source: DIPP, SIA Bulletin, Ministry of Commerce, GOI, 2000-2014

3. DIMENSIONS OF FDI AND GROSS OUTPUT AT SECTORAL LEVEL

From Chart 9, each sector’s contribution to the total FDI inflows can be assessed while Chart 10 depicts the sectoral gross output contributing to the total GDP of the country. Service sector is the major driver of economic growth with the contribution of around 55% of the GDP. FDI inflows have been continuously rising since 2005 in this sector.

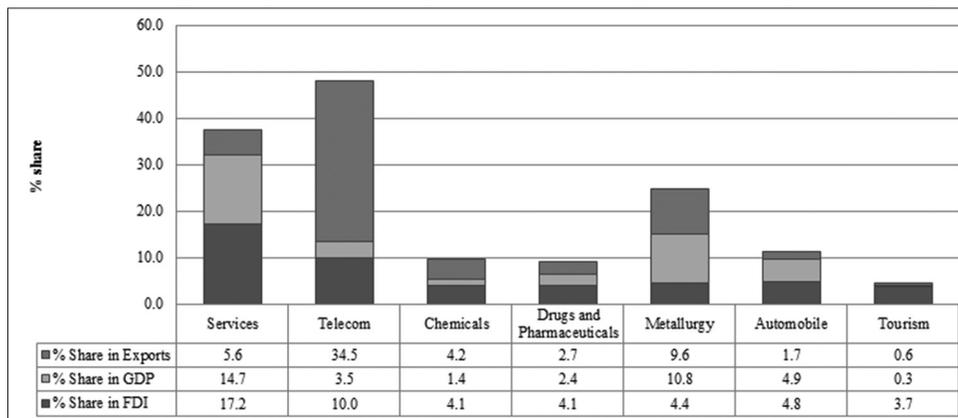
The contribution of service sector to the GDP of the country has been steadily rising over the years. Though there was a slight fall after 2009-2010 with the exception on 2012-2013.

India’s wireless network in telecommunication sector ranks second after China. Thus, telecommunication sector is growing at a fast rate. According to DIPP statistics, amount of FDI attracted by telecommunications sector during this period was US \$17.1 billion. It can be inferred from Chart 9, that FDI in telecom fell drastically from 2001 to 2002. From 2003 to 2010 FDI in telecom maintained a stagnant level but started rising after 2010. On the other hand, gross output as depicted in Chart 10 has been constantly rising in the telecom sector. The rise is constant and not drastic. Thus, showing gradual expansion of the telecom sector.

India’s chemical industry, one of the established traditional sectors of India, plays an important role in the economic development of the country. The chemical sector is a basic goods industry. It also provides input for industrial and agricultural development. For example, it is used as an input in textile, leather, plastics, paper, printing inks and food stuffs sectors etc. The growth in terms of gross output of the chemical sector was stagnant from 2001 to 2006. It is in 2006 that this sector witnessed a steep rise in the gross output. Since then the output of the chemical sector has been rising exponentially. The increased FDI in this sector has resulted in development, growth and expansion of the industry which in turn has resulted in improved quality of products from the industry. From the above graph a major difference between the FDI inflow before 2008 and after 2008 can be seen.

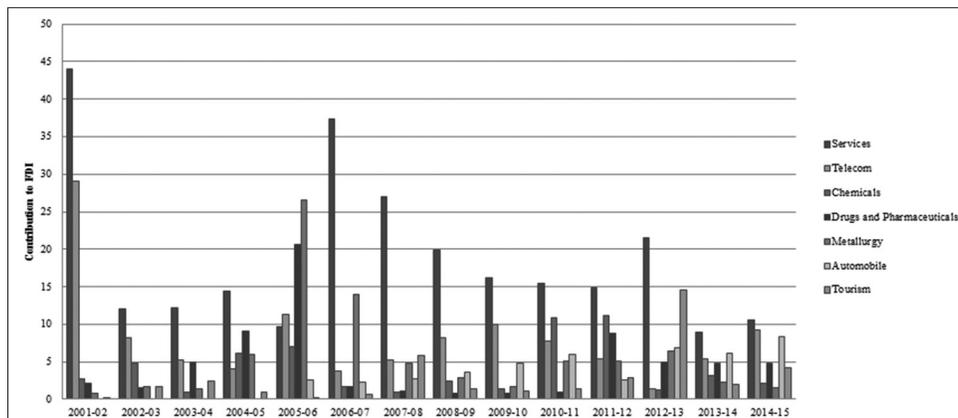
India has one of the largest metallurgical sector in the world. It boasts of presence of several iron and steel factories in the country. In the recent decades industry has shown impressive performance. Huge deposits of natural resources in form of minerals like copper, iron ore, bauxite, chromite’s, manganese, and gold in India has contributed to booming basic metals industry. The gross output in the metallurgical sector has been rising continuously since 2000. It remained unaffected by the global crisis and has been

Chart 8: Sectoral percentage share in Foreign Direct Investment, gross domestic product and exports

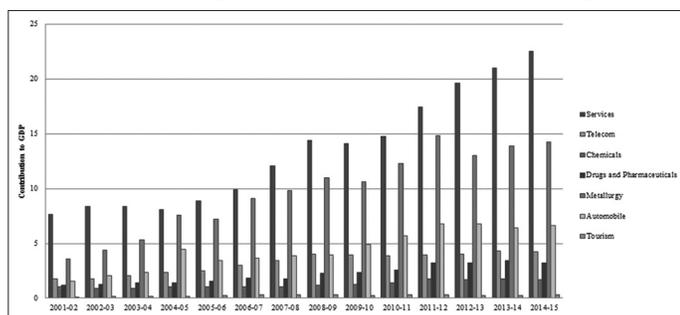


Source: Calculated from Annual Survey of Industries, Economic Survey of India, UN Comtrade and DIPP

Chart 9: Sector specific contribution to Foreign Direct Investment inflows



Source: DIPP, SIA Bulletin, Ministry of Commerce, GOI

Chart 10: Sector specific contribution to gross domestic product

Source: Annual Survey of Industries, CSO and Economic Survey of India

increasing. While FDI, has been quite uneven. Initially FDI was minimal and then rose from 2004 to 2007. After 2007 till 2009, the FDI inflows fell and then again started rising after 2009-2010 and fell again since 2014.

The drugs and pharmaceutical sector is positively contributing to the economy since it is highly knowledge based and is steadily growing. India is ranked third largest producer of pharmaceuticals in the world because of high growth in drugs and pharmaceutical industry. The cumulative drugs and pharmaceuticals sector has attracted FDI worth US \$13,140.16 million in the period 2000-2014³. The gross output of the pharmaceutical sector was stagnant till 2007. It was after 2007 that the gross output started rising tremendously.

In the tourism industry, a number of economic activities are included like travel, tour operating and transport agencies. These agencies provide these activities in connection with various sectors of the Indian economy like horticulture, handicrafts, construction and agriculture. This sector is the third-largest foreign exchange earner and contributes 6.2% to India's GDP. It also accounts for 8.8% of India's total employment⁴. The tourism sector also includes the hospitality sector, which has sub sectors like hotels, restaurants, medical and healthcare. The hospitality sector is sized at US \$23 billion and is expected to witness an inflow of US \$12.17 billion in investments over the next 2 years⁵. Cumulative FDI inflows into the tourism and hospitality sector had been estimated at US \$3.65 billion between April 2000 and July 2011. FDI in tourism was stagnant till 2006 but rose sharply till 2008. It fell in 2009 and then has been stagnant. The gross output in the tourism sector, rose gradually over the years from 2000 to 2014. This shows that the tourism sector has great potential and is continuously expanding over the years.

FDI inflows gained momentum and significance from the year 2006 in the automobile sector. Automobile sector accounts for a high share of exports as compared to FDI which has been rising at a slow pace from 2006 to 2007. The gross output from the automobile sector has been continuously rising over the 13 year period.

3 Department of Industrial Policy and Promotion.

4 Planning Commission 2010.

5 Technopak Advisors (a market research company).

The above sectors are a combination of free and restricted sectors as per the FDI policy of India. The Table 1 indicates the sectoral requirement for investing in India.

The sectors in which FDI is allowed automatically are automobiles, Tourism and Chemical sectors. Investments in telecom sector are regulated through FIPB. Other sectors like services, drugs and pharmaceuticals and metallurgy have mixed policy conditions.

4. LITERATURE REVIEW

FDI in the present decade has been considered as a vehicle for growth and development. Main theories for FDI were given by leading economists like Dunning and Vernon. It was after the Second World War that a larger number of theories were stated regarding FDI. The oldest theory of FDI given in 1960s was based on interest rates and was called the capital markets theory. Another theory known as the hysteresis effect states that the timing of FDI depends upon the changes in the macroeconomic environment. The gravity approach of FDI states that higher FDI flows will take place in case of countries which have closer geographical proximity. Vernon stated in 1966 that the product life cycle is an important determinant of FDI inflows. It was theoretically observed that FDI inflows take place at the maturity and decline phase of the product. Terumoto Ozawa in 1970s analyzed the relationship between FDI and growth based on the idea of Michael Porter. In case of underdeveloped countries, FDI inflows occur mainly due to unexplored and untapped potential of the host country like natural resources and low labour costs. In the second phase of growth, rising standards of living and growth of internal markets lead to attraction of FDI. The third phase of growth facilitates FDI inflows due to innovations. Similar to this is the theory proposed by Dunning. The OLI⁶ paradigm model given by Dunning states four types of FDI namely resource seeking FDI, market seeking FDI, efficiency seeking FDI and strategic asset seeking FDI.

On reviewing existing literature, it is found that empirical analysis to estimate the relationship between FDI and growth has been carried out in diverse scenarios. Impact of FDI on growth and vice versa on cross sections of developed and developing countries as well as for individual economies and also sectors has been assessed in these studies. Though very few studies have been carried out for sectoral analysis of FDI and growth.

Johnson (2006) examined the impact of FDI on growth for a panel of 90 countries and found the result to be positive and significant. While Motalleb (2007) assessed the impact of FDI on growth for 60 low and middle income countries and thus concluded that large GDP and GDP growth rate are instrumental in attracting FDI. Trade i.e., imports and exports are also an important parameter for assessing growth. Zhang (2001) finds that the FDI contributes to promote exports substantially in case of China. It is seen that FDI acts as a promoter of host countries' economic growth. Applying endogenous growth theory to a cross section of 46 developing countries, Balasubramanyam et al. (1996) show that FDI leads to growth in those countries which followed export promotion

6 Ownership, localization and internalization theory.

Table 1: Policy conditions for sector wise FDI

Sector	Sector specific limits of Foreign investment under automatic route		Sector specific limits of Foreign investment under FIPB route	
	Sector	FDI cap/equity	Sector	FDI cap/equity
Metallurgy	Mining covering exploration and mining of diamonds and precious stones; gold, silver and minerals	100%	Mining and mineral separation of titanium-bearing minerals and ores, its value addition and integrated activities	100%
Telecom			Telecom	Beyond 49%
Chemicals	Hazardous chemicals and isocyanates	100%	Pharmaceuticals - brownfield	100%
Drugs and pharmaceuticals	Drugs and Pharmaceuticals	100%		
Services	NBFCs: Underwriting, portfolio management services, investment advisory services, financial consultancy, stock broking, asset management, venture capital, custodian, factoring, leasing and finance, housing finance, forex broking, etc.	100%	Banking	Private sector (other than WOS/Branches) - beyond 49% and up to 74%, public sector - 20%
Tourism	Tourism	100%	Insurance	Beyond 26% and up to 49% earlier till 26%
Automobiles	Automobiles	100%		

Source: DIPP, RBI, FDI: Foreign Direct Investment

policies over import substitution policies. Srivastava (2006) also validates the argument that export-oriented FDI is considered as a way to strengthen country's export-competitiveness in developing countries specifically the service sector during the post liberalization period since 1991. In case of India, since 1991 export opportunities have tremendously increased in the service sector. Kamath (2008) also indicate that higher FDI has led to growth of the economy as well as exports. Sahoo and Mathiyazhagan (2003) find that there is a long run relationship between growth, FDI and export. It is seen that exports are more effective in leading to growth in the Indian economy rather than FDI. Thus, it is advisable for India to open up export oriented sectors in order to facilitate higher rate of growth of the economy.

Apart from trade and growth, FDI is also impacted by a number of variables. In literature a number of studies have been carried out to indicate the determinants of FDI. Borenzstein et al. (1998) introduced a new model showing the impact of FDI in economic growth based on human capital, GDP per capita, government consumption, foreign exchange and trade distortions. The result of the study showed that FDI leads to technology transfer and contributes more to economic growth than to domestic investment. Makki and Samwaru (2004) indicate that FDI and trade contribute significantly towards advancing economic growth in developing countries. In return FDI interacts positively with trade and encourages domestic investment. Other factors like stable macroeconomic policies, institutional quality, lowering inflation rate, tax rates, and government consumption are required to attract FDI and lead to growth. Dhakal et al. (2007) indicate that in India causality is bidirectional and flows from growth to FDI and from FDI to growth. It is also seen that there exist other variables which strengthen FDI to growth causality i.e., greater trade openness, more limited rule of law, lower receipts of bilateral aid, and lower income level in the host country.

Carkovic and Levine (2002) indicate that educational attainment of the labour force and the stage of economic and financial

development of the country as well as trade openness are also considered to assess the growth effect of FDI. It is found that FDI does not have a consistent and positive impact on economic growth. Low levels of human capital have a negative and insignificant impact on FDI as found by Borenzstein et al. (1998). Once human capital reaches a particular threshold, the impact on FDI is positive. This is the case with those countries where FDI leads to technological spillovers. Another major finding is that the level of financial development in the recipient country influences the growth-FDI relationship.

Chakraborty and Basu (2002) find a strong evidence of GDP Granger causing FDI flows to India while Jayachandran and Seilan (2010) shows unidirectional causality from exports to growth rate and FDI to growth rate but no causality between FDI to exports and FDI to growth rates. FDI and exports affect economic growth in India and not vice versa. Sector specific study in case of India was carried out by Chakraborty and Nunnenkamp (2008) indicated that in the long run there exists co integration between FDI stocks and output. On assessing the sector specific growth rates, it is found that the effect of growth on FDI is favorable for manufacturing sector with no causality between FDI and growth in the primary sector. In case of service sector, causality flows from growth to FDI and the impact is insignificant on each other. Thus, FDI doesn't lead to growth of the sector and vice versa. There is also an urgent need to relax the regulations and open up more industries to FDI inflows in India. Trade openness and development of the financial sector are also desired for attracting higher FDI in India. Mathiyazhagan (2005) examines the relationship between FDI, output, export and labour productivity for the Indian economy during the time period from 1990-1991 to 2000-2001 based on the model given by Sahoo et al. (2002) and Sahoo and Mathiyazhagan (2003). It is found that FDI has led to a rise in output, labour productivity and export in a few sectors which is not highly significant. It has also been suggested in the study to open up export oriented sectors in order to achieve higher growth of the economy through these sectors.

Thus, the theoretical and empirical review of literature is instrumental in concluding that FDI in case of India is market seeking and is required for growth. Similarly, growth depends on FDI and exports. In order to justify the above statements for sectors in the India economy, it becomes necessary to carry out empirical analysis.

5. DATA AND METHODOLOGY

The present study is an attempt towards examining the cause and impact relationship between FDI and growth in case of India at the sectoral level. Time series data for seven sectors over the period 2001-2014 has been taken into consideration. For this particular study, gross output of each sector is treated as an indicator of growth of the sector. The data has been extracted from Annual Survey of Industries, Central Statistics Organization and Economic Survey of India. FDI inflows into each sector have been extracted from Department of Industrial Policy and Promotion. In addition to the above variables, other important determinants of FDI which emerge from review of literature are exports, human capital, macroeconomic stability and institutional quality. The data for exports has been extracted from UN Comtrade and in case of tourism sector, foreign exchange earned within the country has been treated as synonymous with exports from the sector. While the data for other remaining indicators has been extracted from World Development Indicators published by the World Bank.

In the present study, availability of data is limited and it has been suggested by econometricians to use panel estimates in such cases. It is expected that panel estimates handle issues of measurement bias and limited degrees of freedom efficiently. The current data series consists of 91 cross sections spread over 13 years. Thus, panel estimation method is suitable in our case.

This paper is primarily based on the model that FDI leads to growth (Balasubramanyam et al., 1996). The model has been devised to assess the sectoral impact of FDI on growth (Alfaro 2003, Chakraborty & Nunnenkamp 2008)

This paper is primarily based on the model that FDI leads to growth (Balasubramanyam et al., 1991). This relation is further strengthened by other factors like new technologies, improving human capital, infrastructure, domestic investment, trade and institutions.

The model has been modified to suit the present scenario of the Indian Economy based on the literature review. The relationship between FDI and growth along with other variables for panel estimation is expressed as:

$$\ln GO_{it} = \beta_0 + \beta_1 \ln FDI_{it} + \beta_2 \ln EX_{it} + \beta_3 \ln INF_{it} + \beta_4 \ln INSQUAL_{it} + \beta_5 \ln HUMK_{it} + \varepsilon \quad (1)$$

for $i=1, 2, \dots, N$ and $t=1, 2, \dots, T$

Where GO is Gross output or growth at time t for i^{th} sector, FDI is FDI inflows, EX is Exports, MS is GDP deflator i.e., macroeconomic stability or inflation, INSQUAL is M2 to

GDP ratio i.e., financial stability, HUMK is gross enrolment in secondary education i.e., human capital and ε is a disturbance term. In order to examine the impact of growth on FDI, the following relationship is examined:

$$\ln FDI_{it} = \beta_0 + \beta_1 \ln GO_{it} + \beta_2 \ln EX_{it} + \beta_3 \ln INF_{it} + \beta_4 \ln INSQUAL_{it} + \beta_5 \ln HUMK_{it} + \varepsilon \quad (2)$$

for $i=1, 2, \dots, N$ and $t=1, 2, \dots, T$

All the variables have been transformed into natural logs in order to overcome the problem of heteroskedasticity.

Thus, to analyze the relationship, the methodology stated in Figure 2 has been applied (Ahmed and Ismail, 2015) .

It is important to understand that in case of a non-stationary series, the results and inferences from regression are spurious and hence meaningless. Thus, the data series are checked for stationarity through panel root tests. Four panel root tests⁷ have been applied to check the robustness. The details have been summarized in the section on empirical analysis.

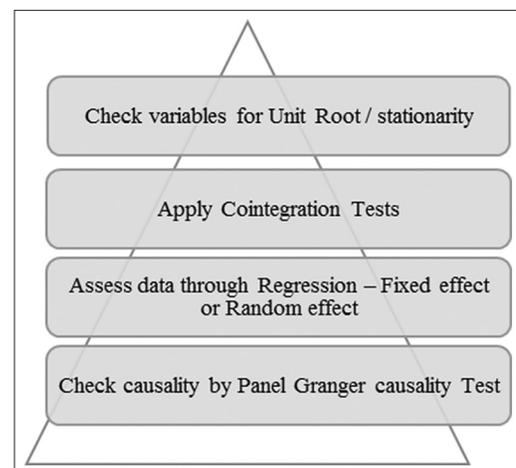
The Levin, Lin and Chu test is a panel based version of the ADF test. It is represented by equation 3 below

$$\Delta X_{it} = \alpha_i + \beta X_{i,t-1} + \sum_{j=1}^k \theta_{ij} \Delta X_{i,t-j} + \varepsilon_{i,t} \quad (3)$$

Where, Δ is the first difference operator, X_{it} is the variable being tested and ε_{it} is the white noise disturbance at time t in this test, β is identical across sectors and hence restrictive. It tests the null hypothesis $\beta=0$ and acceptance of null hypothesis implies non-stationarity (World Bank, 2010).

In case of Im, Pesaran and Shin test, β varies across all sectors relaxing the assumption of Levin, Li and Chu test of identical first-order autoregressive coefficients. This test is based on mean group approach and can be represented as equation 4 below

Figure 2: Methodology



7 Levin, Li and Chu t-test for common unit root, Im, Pearson and Shin W-test, ADF - Fisher Chi-square and PP-Fisher Chi-square.

$$\bar{Z} = \sqrt{N} [\bar{t} - E(\bar{t})] / \sqrt{\text{Var}(\bar{t})} \tag{4}$$

Where, $\bar{t} = \left(\frac{1}{N}\right) \sum_{i=1}^N t_{\beta i}$, $E(\bar{t})$ and $\sqrt{\text{Var}(\bar{t})}$ are the mean and variance of $t_{\beta i}$.

In this test, the null hypothesis which is tested is $\beta_1 = \beta_2 = \dots = 0$. The other two tests applied are ADF and Phillips Peron Chi square tests. In both these tests, the null hypothesis is same as the IM, Pesaran test but individual roots are tested by them.

In practice, non-stationary series are transformed by differencing into stationary series for empirically analyzing the series. In economic theory, questions are raised about the model after differencing. Engel and Granger are of the view that to analyze non stationary series at level, all the data series are integrated at same order and co-integrated. As per their study, in case of co-integrated series, long run equilibrium relationship may exist even in case of non-stationary data. Thus, panel co-integration tests are applied to the data series.

Kao test for assessing panel co-integration is applied to the data series. As per Kao test, the null hypothesis indicates that the residual series should be non-stationary if no co-integration exists. Kao's test is based on panel regression model and uses DF and ADF test statistic.

To estimate relationship between variables, fixed or random effect model is applied. The fixed effect model represented in equation 5 takes into consideration sector specific factors.

$$Y_{it} = \beta_1 X_{it} + \beta_2 Z_{it} + \eta_i + \epsilon_{it} \tag{5}$$

Where, Y is the dependent variable, X and Z are independent variables for N units and T time period. Thus, the total number of observations are N times T. On comparing the fixed effect model with the classical linear regression model, the error term is decomposed into two components i.e. unobserved factors varying across units but constant over time (η_i) and unobserved factors varying across units and time (ϵ_{it}). In case of fixed effects model, the unobservable factors which have a net effect on Y are constant and fixed, thus the model can re-represented as equation 6.

$$Y_{it} = \beta_1 X_{it} + \beta_2 Z_{it} + \gamma_1 + \gamma_2 + \dots + \gamma_N + \epsilon_{it} \tag{6}$$

In equation 6, η_i the error term has been replaced by $\gamma_1 + \gamma_2 + \dots + \gamma_N$ for each unit in the data set. These parameters represent unobserved heterogeneity and are called unobserved effects.

The random effects model is expressed as equation 5 with a slight modification in the representation of the error terms. In case of random effect model, $\eta_i = \alpha_0 + v_i$ for $i = 1, 2, 3, \dots, N$. Where, α_0 is the deterministic component and v_i the random component. The N intercepts in this case are random variables rather than being fixed parameters. The ransom effect model is based on the assumption that error is not correlated with the variables. Thus, the random effect model can be expressed as equation 7.

$$Y_{it} = \alpha_0 + \beta_1 X_{it} + \beta_2 Z_{it} + \mu_{it} \tag{7}$$

Where, $\mu_{it} = \eta_i + \epsilon_{it}$.

In order to assess the applicability of fixed versus random effect model, Hausman specification test is applied. This test examines η_i as represented in equation 6 and 7. It represents the unobserved factors varying across unit but constant over time. The model is based on the following hypotheses:

H_0 : η_i is not correlated with explanatory variables.

H_1 : η_i is correlated with explanatory variables.

If the unobserved factors are correlated with the explanatory variables, fixed effect model is considered appropriate and vice versa. As the test is based on Chi-square distribution with k degrees of freedom, a P-value of more than 0.05, rejects the null hypothesis.

Granger causality test for panel data is carried out to examine the causal relationship between FDI and growth. The granger causality test is carried out by running bivariate regression in the panel data as per equation 8 and 9.

$$y_{i,t} = \alpha_{0,i} + \alpha_{1,i} y_{i,t-1} + \dots + \alpha_{k,i} y_{i,t-k} + \beta_{1,i} x_{i,t-1} + \dots + \beta_{k,i} x_{i,t-k} + \epsilon_{i,t} \tag{8}$$

$$x_{i,t} = \alpha_{0,i} + \alpha_{1,i} x_{i,t-1} + \dots + \alpha_{k,i} x_{i,t-k} + \beta_{1,i} y_{i,t-1} + \dots + \beta_{k,i} y_{i,t-k} + \epsilon_{i,t} \tag{9}$$

Where t is the time period and I are the cross sections.

Panel Granger causality test has been performed by treating the panel data as a large stacked set and then performing Granger causality test with the exception of limiting the entry of data from one cross section into lagged values of data from the next cross section. It is assumed in this case that all the coefficients are same across all cross sections and is represented in equation 10.

$$\alpha_{0,i} = \alpha_{0,j}, \alpha_{1,i} = \alpha_{1,j}, \dots, \alpha_{k,i} = \alpha_{k,j}, \forall i, j$$

$$\beta_{1,i} = \beta_{1,j}, \dots, \beta_{k,i} = \beta_{k,j}, \forall i, j \tag{10}$$

For the present study, data across sectors exists at different standardisation levels. In case of assessment of gross output, National Industries Classification (NIC 98, 04, 08) was seen as given by Annual Survey of Industries. In case of service sectors like Financial and Non Financial Services, Telecommunication and Tourism data was obtained from various issues of Economic Survey of India.

In case of exports, Harmonised System Classification was taken from the World Customs Organisation. Whereas in case of FDI, definitions given by DIPP for each sector had to be assessed. While in case of Services, Telecommunication and Tourism there is no HS Classification. The data had to be collected on the basis of sectoral availability of Data.

The Table 2 summarises the collection of data and its mapping for the chosen sectors.

6. EMPIRICAL ANALYSIS

In order to assess the basic feature of the data, descriptive statistics are calculated. The descriptive statistics are depicted in Table 3. It is seen that the mean to median ratio is quite low around 1. The difference between maximum and minimum values is also less. The standard deviation also depicts equality across sectors. In case of normally distributed variables, the value of kurtosis is 3. In the data set of the study, the value of kurtosis is around 3. The Jarque-Bera statistics also points towards the normality of the variables chosen.

In empirical analysis, if the panel data series are non-stationary there is a risk of obtaining spurious results. Thus, the present study checks the stationarity of the data through individual and common tests. In view of this, the stationary properties of panel data are examined and transformation of non-stationary

series into stationary series is undertaken. The long transformed data for FDI, gross output (GO), exports (EX), human capital (HUMK), macroeconomic stability (MS) and institutional quality (INSQUAL) were tested for stationarity. The results are depicted in Table 4. The results suggest that all the above stated variables have unit root at level and are non-stationary. While at the first difference level, none of the variables have a unit root and hence are stationary.

The data series are stationary at first order of integration and hence a need arises to test it for panel co-integration. The study employs Kao residual co integration test and the results obtained reject the null hypothesis. In other words, co-integration exists between the variables as shown in Table 5.

In the Kao test for co-integration it can be seen that the null hypothesis is rejected as the probability is <0.05 and hence,

Table 2: Mapping of data

Sector	NIC 08	NIC 04	NIC 98	HS code	FDI as per DIPP
Services	-	-	-	-	Financial and non-financial services
Telecommunication	-	-	-	-	Radio paging, cellular mobile, basic telephone services
Metallurgy	24 and 25	26 and 27	26 and 27	26, 72, 73, 74, 75, 76, 78, 79, 80, 81, 82, 83	Sectoral definition
Chemicals	20	24	24	28 and 29	Except fertilizers
Drugs and pharmaceutical	21	242	242	30	Sectoral definition
Automobile	29	34	34	8702, 8703, 8704, 8705	Sectoral definition
Tourism	-	-	-	-	Sectoral definition

FDI: Foreign Direct Investment

Table 3: Descriptive statistics

Parameter	FDI	GO	EX	HUMK	INF	INS
Mean	7.789254	13.87703	15.35306	4.069880	1.783458	4.261227
Median	7.989221	14.02057	15.52975	4.091006	1.840550	4.327835
Maximum	10.25822	16.37996	17.78346	4.237001	2.197225	4.356494
Minimum	3.850148	10.48908	11.84079	3.813307	1.163151	4.038549
SD	1.556106	1.439993	1.451224	0.125561	0.294100	0.098943
Skewness	-0.522221	-0.397224	-0.497897	-0.363699	-0.503585	-0.705402
Kurtosis	2.578220	2.414667	2.691135	2.201160	2.435276	2.160059
Jarque-Bera	4.176331	3.205298	3.578057	3.842206	4.388799	8.873900
Probability	0.123914	0.201362	0.167122	0.146445	0.111425	0.011832

FDI: Foreign Direct Investment, SD: Standard deviation

Table 4: Summary of panel root test

Test		Levin, Li and Chu t-test for common unit root	Im, Pesaran and Shin W-test	ADF-Fisher Chi-square	PP-Fisher Chi-square
Variable	Level	Statistic	Statistic	Statistic	Statistic
FDI	Level	-3.42*	-1.16	18.17	26.85*
	First different	-6.88**	-4.97**	50.77**	64.03**
Gross output	Level	-2.20*	0.956	13.46	23.24
	First different	-7.05**	-4.52**	44.91**	51.60**
Exports	Level	-3.55*	-1.30	22.00	60.89*
	First different	-6.01**	-3.35**	37.42**	47.35**
Human capital	Level	-3.62*	0.53	7.38	45.03*
	First different	-9.45**	-6.50**	60.38**	80.48**
Institutional quality	Level	-5.24**	-1.77*	21.12	21.12
	First different	-4.93**	-4.24**	41.24**	40.76**
Macroeconomic stability	Level	-5.74**	-2.48**	27.86*	25.93*
	First different	-30.38**	-22.96**	166.5**	156.4**

*Significant at 5% level of significance, **significant at 1% level of significance, FDI: Foreign Direct Investment

co-integration exists in the data set. It implies that FDI and sectoral growth has a long run equilibrium relationship. Thus, now it is advisable to use fixed or random effect models which are standard panel estimation methods to equation 1 and 2 for estimating the relationship FDI and growth. The fixed effects model, assumes that there exists correlation between sector specific factors with the explanatory variables. While in case of random effects model, there exists the assumption of non-correlation. To determine the applicability of fixed versus random effect model for the present study, Hausman specification test is carried out. The result depicted in Table 6 indicate that the null hypothesis has been accepted and random effects model is preferred over fixed effects model.

The results of random effects model for estimating the impact of growth on FDI is presented in Table 7. The results indicate that gross output exerts a significant and positive impact on FDI for all the sectors chosen. A number of empirical studies like Romer (1986), Lucas (1993) indicate that as FDI increases, physical investment also increases thus leading to growth. Studies by Borensztein et al. (1998) and Lensink and Morrissey (2006) point towards the significant and positive impact of growth on FDI.

It can also be inferred that a 1% rise in gross output leads to a 0.14% rise in FDI inflows. Also a 1% rise in exports leads to a 0.21% rise in FDI inflows. Though the impact of growth on FDI inflows is significant it is very small. Human capital and institutional quality have a significant impact on FDI inflows. It is observed that a 1% rise in human capital i.e., level of secondary education leads to a 1.17% rise in FDI inflows while 1% rise in institutional quality leads to a 2.18% rise in FDI inflows. This result can be due to the assumption of secondary level of education which may be suitable for the sectors in attracting FDI. In other words, there may be a requirement of a secondary or higher level of education in the FDI attracting sectors. Najarzade and Maleki (2005) showed the relationship of FDI and economic growth of Indonesia, Malaysia, Venezuela, Saudi Arabia and Iran being positive but mainly due to human capital. Salisu (2002) in his study suggested effective government policies are required for attracting FDI in Nigeria. This will ensure improvements in infrastructural facilities and also the current financial institutional framework of the Indian economy.

Though, growth has a positive impact on FDI, its relatively small size leads to the conclusion that growth is one of the factors for enhancing FDI inflows. Other factors can be level of education, financial stability and even exports for facilitating higher FDI inflows.

On examining the impact of FDI inflows on growth, the results obtained are presented in Table 8. The results indicate that FDI doesn't have a significant impact on growth of all the sectors chosen. The result has found evidence in the study by Prasad et al. (2007), that developing economies like India, Pakistan and South Africa having underdeveloped financial markets and low absorption capacity do not directly boost growth.

While exports and human capital have a significant and positive impact on growth of the sectors chosen. A 1% rise in exports leads

to a 0.06% rise in growth. Though the impact of exports on growth is significant it is very small. Human capital and institutional quality have a significant impact on growth. It is observed that a 1% rise in human capital i.e., level of secondary education leads to a 0.24% rise in growth while 1% rise in institutional quality leads to a 0.34% rise in FDI inflows.

Apart from analyzing the impact of FDI on growth and vice versa, it is also important to examine causality between the two through

Table 5: Kao residual cointegration test

Parameters	Null hypothesis	Maximum lag	t-statistic	P
All sectors	No cointegration	Automatic lag length selection based on AIC with a max lag of 1	-4.253927	0.0000

Table 6: Hausman specification test results-fixed versus random effects model

Direction of impact (variables)	H ₀ : Difference in coefficients not systematic	
	Chi-square statistic	P
Impact of FDI on gross output	0.000000	1.0000
Impact of gross output on FDI	0.000000	1.0000

FDI: Foreign Direct Investment

Table 7: Result of Random effects model for impact of Growth on FDI

Variable	Coefficient	Standard error	t-statistic	P
C	-25.314	5.725	-4.421	0.0000
Gross output	0.4470	0.141	3.167	0.0022**
Exports	0.039	0.210	0.189	0.8499
HUMK	2.565	1.167	2.197	0.0312*
MS	0.390	0.427	0.914	0.3635
INSQUAL	3.560	2.177	1.635	0.1063***
R ²	0.620447			
Adjusted R ²	0.594450			
P (F-statistic)	0.00000			

*Significant at 5% level of significance, **significant at 1% level of significance, ***significant at 10% level of significance

Table 8: Result of Random effects model for impact of FDI on Growth

Variable	Coefficient	Standard error	t-statistic	P
C	-3.588	1.160	-3.092	0.0028
FDI	0.001	0.023	0.069	0.9451
Exports	0.364	0.064	5.624	0.0000**
HUMK	2.107	0.249	8.453	0.0000**
MS	-0.108	0.078	-1.388	0.1694
INSQUAL	0.836	0.343	2.436	0.0173*
R ²	0.941908			
Adjusted R ²	0.937929			
P (F-statistic)	0.00000			

*Significant at 5% level of significance, **significant at 1% level of significance, ***significant at 10% level of significance, FDI: Foreign Direct Investment

Table 9: Panel causality

Null hypothesis	Observed	F-statistic	P
GO does not granger cause FDI	73	4.88888	0.0104*
FDI does not granger cause GO		4.79056	0.0113*
EX does not granger cause FDI	65	1.11983	0.3331
FDI does not granger cause EX		2.54577	0.0869***
HUMK does not granger cause FDI	73	2.23831	0.1144
FDI does not granger cause HUMK		0.44859	0.6404
MS does not granger cause FDI	73	3.37632	0.0400*
FDI does not granger cause MS		0.07114	0.9314
INS does not granger cause FDI	73	4.26163	0.0180*
FDI does not granger cause INS		1.64318	0.2009
EX does not granger cause GO	69	7.71211	0.0010**
GO does not granger cause EX		0.94265	0.3949
HUMK does not granger cause GO	77	4.41765	0.0155*
GO does not granger cause HUMK		1.63741	0.2016
MS does not granger cause GO	77	3.57090	0.0332*
GO does not granger cause MS		0.03035	0.9701
INS does not granger cause GO	77	4.56234	0.0136*
GO does not granger cause INS		0.07125	0.9313

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

***significant at 1% level of significance, FDI: Foreign Direct Investment

panel granger causality test. The results obtained through the panel causality test are presented in Table 9.

Thus, from the Granger causality test it can be seen that, growth and FDI have bidirectional causality. FDI have a uni-directional causality with exports. While exports cause growth. For other factors, it is seen that macroeconomic stability and institutional quality cause FDI. Similarly, human capital, macroeconomic stability and institutional quality cause growth at the sectoral level Romer, (1990).

7. CONCLUSIONS

It is widely believed and has been validated theoretically and empirically that FDI impacts growth and vice versa for either specific or group of countries. In the present study an attempt has been made to examine the cause and impact of FDI on growth and vice versa at the sectoral level. The sectors have been chosen considering their contribution to FDI inflows, gross domestic product and exports of the Indian economy. The sectors chosen for the study are services, telecom, chemical, metallurgy, drugs and pharmaceuticals, automobiles and tourism. The cause and impact of FDI on growth and that of growth on FDI has been assessed for these sectors over the time period ranging from 2000 to 2014. The service and telecom sectors are the major recipients of FDI while the metallurgy and service sector contribute maximum to GDP of the Indian economy.

The results obtained through empirical analysis indicate that FDI causes and impacts growth at the sectoral level while growth causes FDI but does not have an impact on FDI inflows. For instance the service, telecom and automobile sector have high FDI inflows corresponding to high growth in the Indian economy. While the metallurgy sector has high growth but low FDI inflows. Also in the chemical and drugs and pharmaceuticals sector the FDI inflows are high as compared to their growth. Apart from FDI and growth effecting each other at the sectoral level of Indian economy,

other significant factors which effect FDI and growth are exports, human capital and institutional quality as inferred from literature as well as empirical analysis.

The study suggests that the Indian economy should focus on attracting FDI in diverse fields unlike the present trend where service sector has been receiving maximum FDI since the last 14 years. It is also suggested that the investment policy should focus more on attracting FDI in the infrastructure sector for attaining high growth levels. Steps should be taken to attract FDI in sectors which have spillover effects like the chemical and metallurgy sector. As export emerges as a significant factor impacting growth, it is suggested that steps should be taken for attracting FDI in export oriented sectors so that higher growth could be achieved for these sectors and thus for the Indian economy at the aggregate level too.

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