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From the Editor's Desk...

The year 2020, probably would go down in the history as one of the years which everyone would like to forget. The deadly Cornona virus hit the economies world over, affecting lives and livelihood. Countries hit by the virus experienced shrinkage in GDP due to job losses, fall in production, dip in exports, as a result of lockdown. What was supposed to have started from Wuhan province of China soon spread to almost all countries of the world. Even USA, the lone super power of the world experienced the crisis. Countries of European Union were also hit, with Italy being worst affected.

For India, the crisis started raising its ugly head from mid-March onwards. Indian Economy which was reeling already under recession even before the crisis, had to further experience the shock. The lockdown which was announced in the last week of March in India was considered as most stringent of the lockdowns that were announced elsewhere. Job losses and halt in production reduced GDP, which was already low due to recession. The migrant workers problem was another issue which we had to grapple with.

The Government responded by announcing, what is now called as, 'Atmanirbhar' package aiming at self-reliance, covering various segments and sectors of the society, including, migrant workers, street vendors, public sector undertakings, banks, to name a few. The silver lining is that, there are some green shoots visible now. Rise in rural demand, creating a favorable impact on some of the companies in FMCG sector, upswing in merchandise exports, improvement in Purchasing Managers' Index, are some of the green shoots. As per the latest edition of Mint's Emerging Markets Tracker, among 10 large emerging markets, India has climbed to the fifth position, which shows the signs of revival.

As this issue goes into print, India is going to enter 'Unlock 3' phase and is debating on various issues, as to how to revive the economy, whether banning Chinese products and investment is advisable, whether self reliance would mean more of protectionism and such other issues. The present issue of the journal as usual carries articles that discuss important issues of international economics, which we feel will be a value addition for the readers of the journal. We would always endeavor to publish quality articles in the journal.

Dr Rajesh G

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The Significance of the Theory of Optimum Currency Areas in the Single Currency Zone – A Case Study of Germany and Greece

Susmitha Selvaraj*

Abstract

The European Monetary Union is a very significant step towards closer economic integration among the nineteen member nations that share the common currency the euro. It is a fact that the single currency has created both opportunities and challenges for its member countries. Nonetheless, as the single currency zone doesn't fulfil the criteria put forward by the Nobel laureate in Economics Robert Mundell, the members in the Euro Zone are not able to gain the full benefits of the European Monetary Union. The present study highlights the main criteria of the optimum currency area and explains how the member states such as Germany and Greece will be able to mitigate the problems of sharing the single currency by proceeding towards optimum currency areas. The study argues that it is very important for countries in the European monetary union to become an optimum currency area and concludes that a greater labour mobility, flexibility in prices and wages and a fiscal transfer mechanism are the prerequisites for a monetary union to enable the member countries to deal with asymmetric shocks and ensure economic stability.

Keywords: European Monetary Union, Germany, Greece, Optimum Currency Areas

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Introduction

The European Monetary Union (EMU) is a federation of nineteen countries in Europe that share a common currency, the euro, which was introduced in 1999 and came into common circulation in January 2002. It is a deeper form of economic integration and it involves coordination of economic and fiscal policies and a common monetary policy. The EMU is otherwise called the Eurozone and it has been considered as a means to provide financial stability and sustainable economic growth across the Euro area. The European Central Bank(ECB) is in charge of the monetary policy in the Eurozone and sets interest rates for the Euro area.

The main advantage of having a single currency is it eliminates exchange rate risks and transaction costs, which makes it easier for companies to conduct cross-border trade within the Eurozone. This can help boost investment and economic growth in the monetary union. A common currency also ensures price transparency, and promotes more integrated financial markets.

The main benefit of the euro for the individual country, especially for small and open economies is by eliminating exchange rate volatility and providing complete price transparency, the euro has greatly enhanced the economic activities and increased trade across borders.

As can be seen from the table, trade within the Eurozone peaked at around 50 percent during 1999-2011 and showed a positive growth until January 2018.

Table-1: Intra-Euro area Trade Growth Rate

Time Period	Trade Growth Rate
1999-2011	50%
Oct 2011-Oct 2012	6%
Dec 2014-Dec 2015	2%
July 2016-July 2017	5.6%
Jan 2017-Jan 2018	6.5%

Source: Eurostat

According to (Dinino, De Santis and Taglioni, 2008), the increase in trade among the countries in the Eurozone was mainly due to the fact that the Euro had increased the propensity of firms to export to countries in the Euro area by decreasing the fixed and variable costs of exports and making exports profitable especially for small exporters.

Germany is a country located in the heart of Western Europe with a population of about 82.7 million in 2017 (The Federal Statistical Office, 2018). It is a leading exporter of machinery, vehicles, chemicals, and household equipment and benefits from a highly skilled labour force. It is particularly famed for its high-quality and high-tech goods.(Germany Country Profile Full Overview, BBC news,

28th September 2017).It is the fifth largest economy in the world in terms of GDP measured at PPP and in 2017 the country accounted for 28% of the Euro area economy (IMF, 2017). Germany is one of the first countries in Europe to adopt the euro on 1st January 1999 and the euro bank notes and coins were introduced in Germany on 1st January 2002(Germany and the Euro, European Commission, 2007).

Greece is a peninsular and mountainous country located in southeastern Europe with a population of 11.1 million in 2018. The major exports are refined petroleum, aluminium, machinery, pharmaceuticals and processed agricultural products. Services account for 80 percent of Greece's GDP (OECD, 2018). After the 2008 global financial crisis, Greece experienced a deep and prolonged depression and real GDP fell by 26 percent (OECD, 2018) and it started recovering in 2014. Greece's debt to GDP ratio in the Eurozone was 174.1 percent in 2018 and the unemployment rate was 20.8 percent in 2018. (The European Central Bank,2018). It joined the European Union in 1981 and became a Euro Zone member on 1st January 2001(The European Commission, 2007).

However, both Germany and Greece have encountered macroeconomic problems sharing a common currency, which could have been mitigated if the Euro zone was an optimum currency area.

The Theory of Optimum Currency Areas

Robert Mundell, the Nobel laurete and the Professor of International Economics at Colombia University, New York is the pioneer of the Theory of Optimum Currency Area. According to this theory, countries could join a monetary union if the costs of membership are lower than the benefits (Mundell, 1961).An optimal currency area (OCA) is a geographical region where it is thought a single currency would help to maximise welfare and enhance the macroeconomic performance. Robert Mundell laid the theoretical foundations for the European Monetary Union and is known as "the father of the euro".

In this context, it is worth considering the four main criteria for a successful currency union and assess to what extent the member nations in the Eurozone meet these criteria.

Factor Mobility :An optimum currency area works well with a flexible labour and capital markets. Labour mobility is important because if there is a recession in one area, unemployed workers can migrate to more prosperous areas where there are jobs available and thus, it can act as a shock absorber reducing imbalances. Free capital movements will enable investors to shift their money from industries that suffer from low demand to industries that enjoy surplus demand across the euro area, which can ensure stability in employment and prices. According to the Eurostat Labour Force Survey,

the number of Euro area workers employed in another member state has increased steadily since 2009. For instance, the entry of Spanish citizens in Germany was about 23,000 in 2012 against an average of inflows of about 8,000 per year before the crisis. Nonetheless, net migration amounted to only 4 percent of total population on average between 2000 and 2007 and only 2 percent between 2008 and 2013. Therefore, it can be concluded that labour mobility in the Euro area countries has increased but remains limited (Huart, 2015). There is still quite a lot to be done to increase the impact of cross-border labour mobility on risk sharing among Euro area members (European Commission, 2016). Labour mobility continues to be low, partly due to language barriers and limited portability of social security claims (Aiyar, 2017)

Price and Wage Flexibility: When nominal prices and wages are flexible between and within a monetary union, the transition towards adjustment following a shock is less likely to cause sustained unemployment in country and/or inflation in another. This will diminish the need for nominal exchange rate adjustments (Friedman, 1953).When a demand side shock such as a shift in consumers' preference from domestic to foreign produced goods occurs, an adjustment in relative prices and wages is required to achieve labour market equilibrium and avoid unemployment. However, some of the past studies suggest the existence of a significant degree of nominal wage rigidity in the euro area economy (Arpaia, 2007).The failure of nominal wages to adjust downwards after 2008 despite sizeable increases in unemployment suggests that downward nominal wage rigidity played an important role in the current unemployment crisis in the Euro area (Grohé and Uribe, 2013). The ILO data indicates that the euro area countries most affected by the crisis have still not regained their real wage levels of 2007. For example, the real wage level in Spain is at 96.8 percent and Ireland at 98.1 percent of 2007 wage levels – with Greece being significantly below, at just 75.8 percent (Stuchlik, 2015).

Similarity in Economic Structure and Business Cycles: A currency union's exposure to asymmetric shocks is reduced if the differences in the relative size of the sectors, trade, output, consumption, employment etc among member countries are small. When one country experiences a boom or recession, other countries in the union are likely to follow. This allows the shared central bank to promote growth in downturns and to contain inflation in booms (IMF, 2018).If business cycles are not synchronized, the optimal monetary policy will diverge across nations, making countries worse off with a common monetary policy than outside the monetary union. In the absence of adjustment mechanisms, idiosyncratic business cycles leave a tough burden for national fiscal policy to offset asymmetric shocks(Franks,2018). Nevertheless,some Eurozone policymakers, past

and present, agreed with independent specialists that a core problem is the lack of convergence in economic performance between the currency union's stronger and weaker states. For example, countries such as Germany are now well above their pre-crisis GDP levels, in other countries such as Italy, GDP is only expected to return to its pre-crisis level in the mid-2020s and real convergence of per capita income levels has not occurred among the original euro area members since the advent of the common currency (Franks, 2018).Greece's GDP per capita is around 30 percent below the EU average,while in the Netherlands it is approximately 30 percent higher (Enderlein, 2017).While Greece, Italy and Spain suffer from high unemployment, the unemployment rate in Germany is lower than it has been for a long time. Italy's public debt was twice as high as the Netherlands', Spain's unemployment rate was three times that of Austria and Germany's current account surplus was ten percentage points larger than that of France (Strupczewski, 2017).Public spending ratios in the Euro area vary widely and have shown no sign of lasting convergence since the inception of the EMU. Belgium, Finland and France are countries with especially large public sectors,while the opposite applies to Ireland and the Baltics (Haas,2017).

Fiscal Transfer Mechanism: It is a process by which public resources from countries in cyclical upswing are automatically transferred to those in cyclical downswing, which enables member states to respond to cyclical imbalances in the union by sharing fiscal risks. This kind of cross-country risk sharing through fiscal transfer would help to respond to country-specific economic shocks without imposing additional burden on government spending. However, there isn't a centralized fiscal policy in the Euro area and therefore, it is very difficult to collect taxes from well-performing member states and redistribute tax revenues to under-performing areas. As a result, public risk sharing through fiscal transfers currently is virtually non-existent in the Euro area (Li, 2016).

Thus, it can be deduced that the eurozone doesn't fully meet the requirements of an optimum currency area. In this situation, it is worth examining some of the predicaments of euro zone membership for Germany and Greece and discuss how they can be curtailed by advancing towards an optimum currency area.

Current Account Imbalances in Germany and Greece

One of the main problems that Germany has, being part of the single currency is its inability to change the value of its currency to reduce its huge current account surplus. Its currency is fixed against the Euro and the irrevocable conversion rate is 1 Euro = 1.95583 Deutsche Mark (The European Central Bank,1998). The World Price Index (WPI) published

by research firm World Economics found that a German euro was nearly 17 percent undervalued against the US dollar in PPP terms (McGeever, 2017), which means German goods are 17 percent cheaper and more competitive in terms of prices. This assisted Germany to increase its exports. Moreover, since 2000, German unit labour costs have risen by about 20-30 percent less than its main Euro Zone competitors. (Herzog-Stein, 2015), which helped the country to reduce its costs of production and sell goods to other Euro zone member states at a cheaper price.

Furthermore, the German households save a greater proportion of their income and their total savings as percentage of disposable income have been around 10 percent since 2002 (OECD,2018) and firms invest considerably less than their collective profits due to a low domestic demand. This has created excess savings in the country which have been used to buy foreign assets and earn factor income. Hence, through an increase in exports of goods and primary income receipts, Germany has been able to enhance their current account surplus which has grown substantially since 2002. It had increased from 2 percent in 2002 to 8.23 percent in March 2018 (IMF World Economic Outlook, 2018). However, the European Commission's recommended upper threshold of current account surplus is 6 percent of GDP. This limit is meaningful, as excessive German surplus is likely to cause unsustainable strain on other deficit countries in the Euro Zone, and can eventually affect the stability of the European Monetary Union. Nevertheless, in the single currency zone, as the members have a fixed exchange rate system, Germany is unable to manipulate the value of its currency and reduce its current account surplus by decreasing its exports and increasing its imports.

One of the major disadvantages that Greece experiences, being part of the single currency zone is its inability to devalue its currency in order to decrease the current account deficit. Its currency is fixed against the euro at an irrevocable exchange rate of 1 euro = 340.750 Drachma (European Commission, 2007). Greece has been experiencing a current account deficit for a very long period of time and it went up to 15 percent of GDP in 2007 (OECD,2012). Deteriorating export performance due to low productivity and high labour costs, declining transfers, strong fiscal profligacy and growing net income payments are considered as the major causes of persistent current account deficit in Greece (Kang, 2013). Rising wages in Greece have not been matched by rising productivity. The lack of competitiveness has led to a fall in demand for Greek goods and a very large current account deficit. World Price Index (WPI) published by research firm World Economics found that a Greek euro was overvalued by 7 percent against the US dollar in PPP terms (Mc Geever, 2017), which means, products in Greece are 7 percent more expensive and less competitive in terms of prices.

Moreover,the percentage rise in labour costs in Greece during 2001-2011 was 33.2 percent and for Germany it was only 0.9 percent (OECD, 2018). If Greece had their own currency, it could devalue the currency and restore competitiveness by reducing its export prices. A flexible exchange rate system serves as an economic adjustment mechanism to correct current account imbalances. However, as Greece is in the common currency zone it does not have a currency of their own and therefore, unable to devalue and make its exports internationally competitive. The Euro took away the governments' main adjustment mechanisms interest and exchange rates (Stiglitz, 2016)

Thus,it is very evident that the fixed exchange rate among member countries in the Euro zone has caused current account imbalances both in Germany and Greece and they are unable to adjust these imbalances through manipulating their own currencies. This can be considered as one of the major drawbacks of the membership in the European monetary union. Nonetheless, this study argues that this instability in the current account can be corrected by having flexibility in prices and wages, which is one of the main criteria of the OCA theory.

The Relevance of Wage-Price Flexibility

In fact,changes in consumer preferences have increased the demand for German products and decreased the demand for Greek products. Theoretically, as net export is a component of Aggregate Demand(AD), the reduction in exports decreases AD and total spending in an economy. As a result, firms reduce production and lay off workers and unemployment increases. Due to excess supply of labour, wages fall, cost of production decreases and consequently, firms are able to lower their prices and regain competitiveness leading to more exports and reduction in the current account deficit in Greece. This process is called "internal devaluation" and it is a prerequisite when the exchange rate can no longer be used as an adjustment mechanism in the Euro zone. Nevertheless,according to the Eurostat, in Greece between 2007 and 2012 when the current account deficit was very high, wages fell by 13 percent but prices increased by 2 percent, which clearly shows a lack of product market adjustment. Hence, this price rigidity is one of the main reasons for the underperformance of Greek exports (Arkolakis, 2014)and the current account deficit in Greece.

On the other hand in Germany, an increase in wages and prices will make their products more expensive and internationally uncompetitive and, therefore, the current account surplus can be reduced. However, in Germany the average annual growth in real wages rose very slowly from 0.1 percent in 2007 (Q4) to 0.3 percent in 2017(Q4), (OECD, 2018) which clearly explains wage rigidity. Therefore, it can be argued that it is vital

for Germany and Greece to have the desirable level of price and wage flexibility and move closer to optimum currency areas in order to offset the loss of an independent exchange rate mechanism.

The Bailout Burden in Germany and the Liquidity Crises in Greece

The second problem for Germany is the low interest rate in the Eurozone, which averaged 2.02% from 1998 until 2018 (Eurostat, 2018) primarily to stimulate economic growth outside Germany. However, Germany has an ageing population and households save a greater proportion of their income and so the low interest rate which has been zero since 2015 (The European Central Bank,2018) has adversely affected German savers and life insurers. More importantly, as Germany is considered to be the strongest member in the Eurozone in terms of economic growth and financial stability, German tax payers have been urged to bear the financial burden of bailing out weaker economies in the single currency area. The structural, political and economic differences that exist among the member states have made it difficult for the ECB to absorb the economic shocks effectively through its common monetary policy. Moreover, the fiscal transfer mechanism, which is a way of shifting resources from countries in cyclical upturn to those in cyclical downturn, has not been properly implemented yet. Therefore, in order to avoid serious turmoil in Eurozone financial markets and ensure economic stability, Germany was forced to provide financial assistance to weaker economies like Greece in 2010 with a bailout fund of 56 billion euros (Clarke, 2015).

The second difficulty that Greece has experienced being a Eurozone member is the loss of independent monetary policy and its inability to print its own currency to reduce its high unemployment rate and to stimulate its economy. However, according to senior officials at domestic banks, Greece is nowhere near a swift inclusion in the European Central Bank's quantitative easing (QE) program, which means the Greek banks won't be able to obtain the extra money that is created by the ECB to support weak economies in the Euro Zone. The ECB argues that Greece's inclusion in the bond-buying program requires the safeguarding of the debt's sustainability. Goldman Sachs stated in an analysis that this country is not likely to fulfill the terms the ECB has set to join QE due to its high rate of bad loans. Similarly, Citi estimates that without an agreement on the easing of the debt, both inclusion in QE and a return to the bond markets would be quite difficult for Greece (Papadoyiannis, 2017).

The ECB has insisted any inclusion into QE will only come when the central bank has deemed Greece's 180 per cent debt to GDP pile as sustainable(Khan, 2017). It took Europe's most indebted country out of the

ECB stimulus scheme. As Greek bondsare rated as junk by the international credit rating agencies, they could not be accepted as collateral in regular funding operations. Therefore, the ECB has not bought Greek bonds and thus Greece has been not been able to enjoy the benefits of the 2.55 trillion euro QE scheme which was launched in 2015. Being a member of the Euro zone, Greece does not have its own central bank to undertake monetary stimulus programme independently and increase its money supply in order to boost its economy.

The Role of Fiscal Transfer Mechanism

Germany was forced to bail out Greece under strong pressure from the IMF (Traynor, 2011) in order to maintain financial stability in the Eurozone and Greece was unable to increase its money supply to reduce unemployment and boost economic growth due to a lack of independent monetary policy in the single currency union.

These macroeconomic issues could have been avoided by having a proper fiscal transfer mechanism like in the USA, which would help to redistribute money from a common treasury to those areas that face a fall in output and high unemployment. This kind of risk sharing and fiscal equalisation would have reduced the excessive burden of bail out funding for Germany.

On the other hand, a fiscal transfer system would have helped Greece to acquire funds more quickly as they would be automatically transferred to less prosperous regions. This would have supported the government to boost investment and generate employment in Greece. Therefore, cross-country fiscal risk sharing offers a critical tool to smooth out economic asymmetries at the national level. Without a fiscal union, the Euro area will remain fundamentally vulnerable to shocks and it is worth noting that net fiscal transfers smooth out 10-15 percent of idiosyncratic income shocks at the state level in the USA (Berger, Ariccia and Obstfeld, 2018), which underpins its significance in a monetary union. However, those countries that use the euro are paying a heavy price for the lack of a common system for transferring resources from one part of the single-currency area to another. There is one currency and one interest rate, but there is no fiscal union to stand alongside monetary union. So, unlike in the US or the UK, there is no large-scale method for recycling the taxes raised in those parts of the Eurozone that are doing well into higher spending for those parts that are doing badly(Elliott, 2015).

The Relevance of Labour Mobility

The high unemployment rate in Greece can also be reduced if jobless workers from Greece are able to move freely to countries like Germany

where the unemployment rate is low and it can help to offset asymmetric country level labour demand shocks (Berger, Ariccia and Obstfeld, 2018). Nevertheless, the labour mobility in Greece is limited compared to other European countries (European Commission, 2018), which has adversely affected the cyclical adjustments in the labour market.

Hence, it can be concluded that the potential disadvantages of the membership in a monetary union can be mitigated by factor mobility, flexibility in wages and prices and a centralised fiscal mechanism, which are the main criteria of the OCA theory.

Conclusion

Germany and Greece are the two most divergent economies in Europe as there are wide disparities in the size of these economies, the macroeconomic performance, productivity, competitiveness and the labour market structure. The study emphasises the relevance of the theory of optimum currency areas and argues that the problems that Germany and Greece experience as part of the Eurozone can be reduced by fulfilling the criteria for a successful monetary union.

In fact, the loss of the exchange rate as an adjustment mechanism is one of the main disadvantages of a single currency union. All the member nations have one currency, one interest rate and one exchange rate,irrespective of their economic performance. The Eurozone is a union of nineteen distinctly different countries and thus, the "one size fits all" monetary policy will not work in the best interest of all member nations. Hence, better economic arrangements and institutions are needed which can deal with specific requirements of national economies.

To sum up, the euro has generated greater opportunities for cross-border transactions, business investment and trade and its member states may continue to benefit from lower transaction costs, greater price transparency and exchange rate stability. However, the countries in the Euro zone are not sufficiently integrated to be in a single currency union and it is not well-structured to accommodate the enormous economic heterogeneity of the member states. Therefore, it is essential for the European monetary union to set up the necessary institutional framework and undertake prudent structural reforms. More importantly, it is essential for the European monetary union to become an optimum currency area by ensuring a greater mobility of labour,flexibility in wages and prices, a Euro area treasury and move towards the "United states of Europe" in order to strengthen the economic coordination and resilience of the member countries to asymmetric macroeconomic shocks and achieve economic stability as well as economic efficiency.

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Foreign Direct Investment and Domestic Private Investment: Role of Governance and Financial Development in Emerging Markets

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Abstract

This article examines the role of financial development as well as the quality of governance play in mediating the impact of foreign direct investment on domestic private investment using a sample of 33 emerging economics over the period 1996-2013. Using the Bias Corrected Least Square Dummy Variable (LSDVC) estimator, the relationship between foreign direct investment and domestic private investment is estimated. Our findings show that the foreign direct investment has a positive and significant effect on domestic private investment. The study finds no significant relationship between domestic financial development indicators and the level of domestic private investment. Among the governance indicators, the measure of political stability has a negative and significant effect, while the rule and law has positive effect on the level of domestic private investment. Moreover, our findings show that neither domestic financial sector nor the quality of governance explained the extent to which the FDI inflows translate into domestic private investment in the host countries.

Keywords: Foreign Direct Investment, Financial Development, Governance and Bias Corrected Least Square Dummy Variable (LSDVC)

Introduction

Although there is a widespread belief among the policy makers that Foreign Direct Investment (FDI) enhances productivity and promotes economic development in host countries, the empirical evidence on the relationship between FDI and economic growth is ambiguous (Navaretti and Venables, 2004; and Alfaro and Rodriguez-Clare, 2004). Most of the available studies has established a similar conclusion that a country's

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capacity to take advantage of FDI externalities might be limited by local conditions such as the development of local financial markets (Alfaro et al., 2004; Hermes and Lensink, 2003; and Villegas-Sanchez, 2009) or level of human capital (Brenstein et al., 1998). Recently, Alfaro et al. (2010) examined the role of financial markets in enabling FDI to promote growth through backward linkages and show that an increase in the share of FDI leads to higher additional growth in financially developed economics compared to financially underdeveloped regions. Azman-Saini (2010) find supportive evidence that the FDI impacts growth after financial market exceeds a certain threshold level. However, the other strand of studies focusing on whether FDI has positive spillover effect or not on domestic firm and which effects on domestic investment has arrived ambiguous results. For example, Luca and Spatafora (2012) show that neither institutional quality nor domestic credit affects the extent to which capital flows translate into domestic investment. Similarly, Alfaro et al., (2009) show that if FDI has an effect on growth, it does not seem to be operating via capital accumulation (financial development) of the host countries. The empirical evidence on the international capital mobility on via FDI or other form, contributes to growth is mixed. The empirical literature on the relationship between FDI inflows and domestic private investment has not reached a consensus on whether FDI crowds in or crowds out private investment in the context of developing economies. While some studies focused on the role of local financial market in explaining the relationship between FDI and growth, none of the studies investigated the role of financial development in the effects of FDI on domestic investment.

The present study distinguishes itself from the literature on the relationship between FDI and domestic investment in two important ways. *First*, the study examines the role of financial market development as well as governance in explaining the relationship between FDI inflows and domestic private investment using a sample of 33 emerging economies covering period from 1996-2013. *Second*, to address the endogenity biases, the present study employed the recently developed Bias Corrected Least Square Dummy Variable (LSDVC) estimator to examine the relationship between FDI and domestic private investment. This estimator has better statistical properties in terms of bias and Root Mean Squared Error (RMSE) compared to instrumental variable approach (IV) and GMM approach (Kiviet, 1995; Judson and Owen, 1999; and Bun and Kiviet, 2003). The LSDVC estimator is widely used in other applications[1].

The major findings of the study may be summarized as follows. The study finds that FDI inflows have positive significant effect on domestic private investment in the host emerging economies supporting crowding-in hypothesis. The coefficient of interaction term between FDI and

1 Meschi and Vivarelli (2009) applied for trade and inequality relationships; Huank (2010) applied for political and financial development; and Nepal and Jamasb (2012) used for power sector reform and growth relationships

financial development indicator is negative and statistically significant, but the direct effect of financial market development indicator is not significantly different from zero. Among the governance indicators, the measure of political stability has a negative and significant effect, while the rule and law has positive effect on domestic private investment. Moreover, the study finds no strong evidence of a positive relationship between good governance (except the measure of rule and law) and the level of domestic private investment. The study also observed that the interaction between FDI and regulatory quality measure of governance has a negative mediating effect on domestic private investment.

The paper is organized as follows: Section 2 summarize the review of literature; Section 3 lays out the empirical methodology, econometric method and the data; Section 4 contains a discussion of the empirical findings; and Section 5 concludes.

Literature

There are several attempt made to examine the relationship between FDI and economic growth in the context of both developed and emerging economies. The empirical evidence on the growth enhancing effects of FDI is mixed varying from favorable to detrimental effects of foreign direct investment on growth. While most of the studies find a growth enhancing effects of FDI in the host country (Balasumpranyam et al., 1996; Borensztein et al., 1998; and Zhang, 2001, others find no significant relationship between FDI and growth (Akinlo, 2004; Fry, 1993; Hermes and Lensink, 2003; and Azman-Saini et al., 2010). Similarly, Helzer (2008) examined the FDI-growth led hypothesis using a sample of 28 developing countries and find that no association between FDI, level of percapita income, level of education, the degree of openness and the level of financial development. Other strand of literature focused on the relationship between FDI and domestic private investment and finds a mixed result. For example, a small number of studies find that the FDI stimulates the rate of domestic investment (Borensztein et al., 1998; Bosworth and Collins, 1999; and Agosin and Mayer, 2000; Nidhikumana and Verick, 2008; and Al-Sadig, 2013), others found evidence in supporting crowding-out hypothesis (Misun and Tomsik, 2002; and Adams, 2009). Similarly, Agosin and Machado (2005) find that the FDI has no significant effect on domestic private investment in emerging economies. A few studies examined the role of governance and institution in mediating the linkages between FDI and domestic investment and find mixed result (Morrissey and Udomkerdmongkol, 2012; and Farla et al., 2014). Morrissey and Udomkerdmongkol (2012) find that the FDI has negative effects on domestic private investment in politically stable regimes. By contrast, Farla (2014) found a positive effect of FDI on overall domestic investment, while the interaction between FDI and governance has a negative mediating effect on investment.

Methodology and Data

The previous estimates of the effect of FDI on domestic private investment is criticized by some scholars that the private investment measured by subtracting net capital inflow from private domestic investment is unlikely to be an accurate measure for total private investment (Agosin and Mechado,2005; Ndikumana and Verick, 2008). Farla et al., (2014) also pointed out that this measure of private investment conceptually aggravates the problem because the measure for private investment now also contains private disinvestments, which are transfers of ownership from domestically owned establishments of foreign investors. Followed by Ndikumana and Verick (2008), we use the gross fixed capital formation as a proxy for private Investment, which is reported in the World Development Indicator.

To examine the linkages between FDI and domestic private investment, we estimated the following regression including control variables and governance indictors (Agosin and Mechado, 2005; Morrissey and Udomkerdmongkol, 2012; and Farla et al., 2014).

$$PI_{it} = \alpha_0 + \beta_1 PI_{it-1} + \theta_1 GDP_{it} + \theta_2 IPR_{it} + \theta_3 GIV_{it} + \theta_4 FD_{it} + \theta_6 GI_{it} + \eta + \varepsilon_{it} \quad ...(1)$$

Variables are measured as percentage of GDP and PI is domestic private investment, FDI is net FDI inflows, GDP is annual growth rate of output, GIV is public investment, IPR is interest rate spread. FD is financial development indicators. We use three different measures to proxy for financial market development, such as domestic credit provided by financial sector (DFS), domestic credit to private sector (DS), and domestic credit to private sector by banks (DBS). In addition, the overall index of financial development used as a proxy for the domestic financial sector development to account for the multi-dimensional nature of financial development. The empirical model also includes five governance indicators: voice and accountability (VA), political stability, regulatory quality (RQ), rule of law (RL), and control of corruption (CC). The study followed the Morrissey and Udomkerdmongkol (2012) and Farla et al., (2014) methods to construct a binary variable from the ordinal data of governance indicator.

In this dynamic framework, we include one period lag of dependent variable as well as year fixed effects which are likely to play an important role in determining the domestic private investment. While the inclusion of lagged dependent variable as an independent variable partly addresses the reverse causality, it creates another problem of endogeneity bias. The endogeneity bias arises because of the joint presence of the lagged dependent variable and country-specific heterogeneity effects in the model (Baltagi, 2001). A natural solution for the first-order dynamic panel data

model is to use Generalized Method of Movements (GMM) proposed by Arellano and Bond (1991) and Blundell Bond (1998). However, these methods are designed for small T and large N and can be severally biased and imprecise in panel data with a small number of cross- sectional units. For the present case of small N (33) and large T (18), the above mentioned GMM estimator is inappropriate. It is also well established in the literature that the parameter estimates derived from the dynamic Least Square Dummy Variable model (LSDV) would be biased when lagged dependent variable is included in a small sample (Roodman,2009).

An alternative approach to dynamic LSDV panel estimates would be to use other instrumental variables such as Anderson-Hsiao (AH), Arellano-Bond (AB) and Blundell-Bond (BB). These approaches are bias-corrected Least Square Dummy Variable (LSDVC) dynamic panel-data models has recently been popular in econometric literature. We use this LSDVC estimator, a method recently proposed by Kiviet (1995), Judson and Owen (1999), Bun and Kiviet (2003) and extended by Bruno (2005). This estimator has been used by several empirical applications2. Monte Carlo evidence by Kiviet (1995) show that the bias corrected LSDV estimator often outperforms all other estimators (i.e., IV and GMM estimators) in terms of bias and root mean squared error (RMSE). Bun and Kiviet (2003) and Bruno (2005) proposed three possible nested approximations of the LSDVC bias3 and extended these bias corrections up to third order. Since the bias approximation depends upon the unknown population, the procedure has to be initialized by a consistent estimator to make the correction feasible. The task of bias correction in the LSDVC estimation involves selecting consistent estimator (initialize), determination of the order of bias and selection of iteration for calculating Bootstrap standard error. The possible options for selecting efficient estimator are the Anderson-Hsiao, Arellano and Bond, and Blundell-Bond. The present study initialized the Arellano and Bond estimator for bias correction. Since the first order error term approximation evaluated at the true parameter value is capable of accounting for more than 90 percent of the actual bias4, we have used first order error term approximation. In addition, we calculated bootstrap standard errors using 50 iterations for the significance of the coefficients from LSDVC.

Data

The data set consists of cross-country observations for 33 emerging economies over the 1996-2013 periods. The FDI data was extracted

2 For example, Meschi and Vivarelli (2009) applied for trade and inequality relationships; Huank (2010) applied for political and financial development; and Nepal and Jamasb (2012) used for power sector reform and growth relationships.

3 These are 1) $O(1/T)$,2) $O(1/NT)$ and 3) $O(N-1T-2)$

4 Bun and Kiviet (2003)

from the World Bank database on World Development Indicators (WDI) and expressed as net FDI over GDP. The growth rate of GDP, public investment, interest rate spread and other financial development indicators were obtained from WDI. A summary measure of financial development index (FD) is taken from the study of Sahay (2005). Governance data were obtained from World Bank database on Worldwide Governance Indicator (WGI).

Results and Discussions

This section discusses a detailed econometric analysis of the relationship between FDI inflows and domestic private investment, with a particular focus on the role of financial development for a sample of 33 emerging economies covering the period from 1996-2013.

Table-1: Summary Statistics

Variables	No. Observations	Mean	Std.Dev	Minimum	Maximum
PI	594	16.730	7.107	-4.079	52.166
GDP	594	4.314	3.881	-16.70	26.268
GIV	594	6.409	3.677	0.406	25.007
FDI	594	4.752	5.875	-16.588	54.062
IPR	594	11.673	9.848	-2.808	58.36
FD	594	0.251	0.167	0.010	0.721
DFS	594	48.636	43.639	-79.092	192.660
DS	594	37.594	34.379	1.385	166.504
DBS	594	34.417	29.218	1.383	167.504
FDUMMY	594	0.411	0.492	0	1
PS	594	0.294	0.456	0	1
VA	594	0.443	0.497	0	1
RQ	594	0.467	0.469	0	1
RL	594	0.326	469	0	1
CC	594	0.434	0.496	0	1

Table-2 presents the results of estimating equation (1) using LSDVC estimator. The result (Column 1) shows that the co-efficient of FDI is positive and statistically significant indicating a 1 percent increase in FDI would increase the private investment level by 0.13 percent in the host countries.

Table-2: FDI and Private Investment

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	DFS	DS	DBS	DFS	DS	DBS
Lagged Private Investment	0.710***	0.713***	0.714***	0.703***	0.691***	0.690***
	(0.0358)	(0.0361)	(0.0362)	(0.0369)	(0.0360)	(0.0362)
GDP Growth rate	0.140***	0.147***	0.146***	0.143***	0.152***	0.152***

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	DFS	DS	DBS	DFS	DS	DBS
	(0.0461)	(0.0455)	(0.0453)	(0.0465)	(0.0455)	(0.0453)
Interest Rate spread	0.0168	0.0153	0.0140	0.0165	0.0170	0.0176
	(0.0299)	(0.0301)	(0.0299)	(0.0300)	(0.0300)	(0.0299)
Government Investment	-0.237***	-0.236***	-0.236***	-0.244***	-0.235***	-0.234***
	(0.0645)	(0.0644)	(0.0644)	(0.0650)	(0.0641)	(0.0641)
FDI	0.125***	0.131***	0.133***	0.149***	0.240***	0.243***
	(0.0385)	(0.0388)	(0.0389)	(0.0500)	(0.0599)	(0.0609)
DFS	-0.0116			-0.00748		
	(0.0109)			(0.0124)		
DS		-0.0139			0.00743	
		(0.0160)			(0.0191)	
DBS			-0.0164			0.00834
			(0.0169)			(0.0207)
DFS*FDI				-0.00072		
				(0.00102)		
DS*FDI					-0.00335**	
					(0.00150)	
DBS*FDI						-0.00350**
						(0.00160)
No. of observations	561	561	561	561	561	561
No. of country	33	33	33	33	33	33

Notes: bootstrapped standard errors (300 iterations) in parentheses. Arellano and Bond estimator.

* significance at 10%.

** significance at 5%.

*** significance at 1%.

This result confirms to the hypothesis of complementarity between domestic private investment and FDI. The present finding of crowding-in effect of FDI is in line with the major empirical studies including Al-Sadig (2013) for developing countries, Ndikumana and Verick (2008) for Sub-Saharan African countries. In addition, the results also show that the private investment is a positive function of past domestic private investment. The coefficient on GDP growth is positive and significant. The co-efficient on public investment is found to be negative and significant and implies that 1 percent increase in public investment will result in a reduction of 0.24 percent private investment.

Column (1) of Table-3 considers the role financial market development using domestic credit provided by financial sect to GDP the measure. The result finds no strong evidence of the positive relationship between the share of domestic credit provided by private sector to GDP and the level of private investment. Column (3) and (4) shows a similar result for the other measures of financial market development variables, such as

domestic credit to private sector to GDP and domestic credit to private sector by banks to GDP. The results for the interaction terms between the various measures of financial market development and FDI are presented in Column (5)-(7). The co-efficient of the interaction term between domestic credit provided by financial sector to GDP and FDI is negative and insignificant. Column (6) and (7) show that the interaction between the other measures of financial market development indicators and FDI has negative and statistically significant. This result is consistent with the earlier finding of Luca and Spatafora (2012) that the mediating affects of domestic credit on private investment is weak.

Robustness analysis with Financial Development index

So for, using various measures of financial market development, we consistently find negative and significant mediating effect of financial development on private investment. Since these measures of financial development indicator do not take into account the complex multidimensional nature of financial development, one needs to look at multiple indicators to measure the financial development in terms of access, depth and efficiency financial markets. Followed by Sahay et al., (2015) and Katsiaryna and Svirydzenka (2015) we use overall index for financial sector development to investigate whether these findings persist to using summary measure of financial sector development as a proxy for the domestic financial sector development.

Column (2)-(3) of Table-3 report the results of the analysis using financial development index as a measure of overall financial development of the country. As in the previous results, the coefficient of financial development remains insignificants in the model. The co-efficient of the interaction terms between financial development and FDI is also negative and significant. The analysis using alternative measure of financial indicator does not alter the sign and significance of other variables. The choice of the financial development proxy does not influence the sign and overall significance of the coefficient of the financial development and the coefficient of the interaction terms between FDI and Financial development.

The empirical studies on the role of financial markets in mediating the impact of FDI and growth emphases that the positive response of growth through FDI exerts only if the financial market exceeds a threshold level (Alfaro et al., 2010; and Azman-Saini et al., 2010). We use the binary variable FDUMMY equal to 1 if the country has a high value of the financial development indicators and 0 otherwise. Thus, each country is allocated a high and low value of financial development index in each year depending on whether or not country is above the mean value of 0.25. The results are presented in column 3 of Table-3. The result finds a weak evidence of the relationship between high financial development and domestic private investment.

Table-3: Alternative Estimation Results Using Overall Financial Sector Development Index

Variables	(1) FD	(2) FD	(3) FDUMMY	(4) FDUMMY
Lagged PI	0.697***	0.676***	0.749***	0.668***
	(0.0365)	(0.0363)	(0.0360)	(0.0372)
GDP	0.155***	0.157***	0.176***	0.158***
	(0.0444)	(0.0442)	(0.0450)	(0.0444)
IPR	0.0247	0.0320	0.0304	0.0235
	(0.0288)	(0.0289)	(0.0292)	(0.0284)
GIV	-0.228***	-0.205***	-0.174***	-0.208***
	(0.0640)	(0.0641)	(0.0638)	(0.0641)
PS	-1.171**	-1.080*	-1.202**	-1.250**
	(0.585)	(0.584)	(0.596)	(0.584)
FD	1.889	8.224*		
	(3.580)	(4.356)		
FDUMMY			0.557	0.979
			(0.581)	(0.686)
FDI	0.125***	0.292***		0.199***
	(0.0389)	(0.0715)		(0.0489)
FDI*FD		-0.716***		
		(0.269)		
FDUMMY*FDI				-0.133**
				(0.0580)
No. of observations	561	561	561	561
No. of country	33	33	33	33

Notes: bootstrapped standard errors (300 iterations) in parentheses. Arellano and Bond estimator.
* significance at 10%; ** significance at 5%; and *** significance at 1%.

Governance and Private Investment

Table-4: Results for Governance Indicators

Variables	(1) VA	(2) PS	(4) RQ	(5) RL	(6) CC
L.PI	0.709***	0.697***	0.709***	0.683***	0.710***
	(0.0360)	(0.0365)	(0.0361)	(0.0361)	(0.0358)
GDP	0.154***	0.155***	0.152***	0.153***	0.154***
	(0.0448)	(0.0444)	(0.0447)	(0.0445)	(0.0447)
IPR	0.0280	0.0247	0.0245	0.0336	0.0281
	(0.0291)	(0.0288)	(0.0291)	(0.0287)	(0.0294)
GIV	-0.234***	-0.228***	-0.229***	-0.250***	-0.234***
	(0.0643)	(0.0640)	(0.0646)	(0.0643)	(0.0647)
FD	2.611	1.889	2.164	2.224	2.619
	(3.618)	(3.580)	(3.599)	(3.578)	(3.599)
FDI	0.122***	0.125***	0.122***	0.135***	0.122***
	(0.0391)	(0.0389)	(0.0391)	(0.0390)	(0.0393)
VA	0.00439				
	(0.532)				

Variables	(1) VA	(2) PS	(4) RQ	(5) RL	(6) CC
PS		-1.171**			
		(0.585)			
RQ			-0.854		
			(0.574)		
RL				1.514**	
				(0.625)	
CC					0.0270
					(0.540)
No. of observations	561	561	561	561	561
No. of country	33	33	33	33	33

Notes: bootstrapped standard errors (300 iterations) in parentheses. Arellano and Bond estimator.
* significance at 10%; ** significance at 5%; and *** significance at 1%.

Table-4 summarize the estimation results for the Governance Indicators (Column 2-6), and the results for the estimates of the interaction between governance indicators and FDI are given in Table-5. In column (2), we consider the quality of voice and accountability indicator of governance which appears is not to be significant. In contrast to earlier findings, the estimate of the coefficient of political stability is negative and statistically significant to private investment (Column 3). None of the other governance indicators are statistically significant to domestic private investment.

The estimated results for the interaction between various governance indicators and FDI are presented in Table-5. The sign and coefficient of the control variables are largely unchanged in the model. The interaction terms of voice and accountability, political instability, regulatory quality and control of corruption are statistically insignificant and the coefficient for the interaction term with rule of law and GE are negative and significant. The interaction effects for political stability are insignificant, but there is a direct negative and significant effect on domestic private investment. This result implies that political stability does not affect the FDI and private investment relationships.

Table-5: Results for Interaction Variables

Variables	(1) PS	(2) VA	(3) RQ	(5) RL	(6) CC
L.PI	0.695***	0.702***	0.699***	0.678***	0.708***
	(0.0369)	(0.0362)	(0.0360)	(0.0361)	(0.0358)
GDP	0.155***	0.155***	0.154***	0.149***	0.155***
	(0.0445)	(0.0448)	(0.0445)	(0.0445)	(0.0450)
IPR	0.0246	0.0282	0.0259	0.0338	0.0273
	(0.0290)	(0.0291)	(0.0288)	(0.0287)	(0.0297)

Variables	(1)	(2)	(3)	(5)	(6)
	PS	VA	RQ	RL	CC
GIV	-0.229***	-0.237***	-0.242***	-0.262***	-0.233***
	(0.0646)	(0.0644)	(0.0641)	(0.0646)	(0.0649)
FDI	0.125**	0.147***	0.161***	0.180***	0.118**
	(0.0505)	(0.0484)	(0.0407)	(0.0484)	(0.0486)
FD	1.876	2.441	3.432	2.503	2.541
	(3.585)	(3.621)	(3.631)	(3.602)	(3.625)
PS	-1.183**				
	(0.602)				
VA		0.267			
		(0.635)			
RQ			0.209		
			(0.744)		
RL				2.013***	
				(0.665)	
CC					-0.00371
					(0.598)
PS*FDI	0.00204				
	(0.0602)				
VA*FDI		-0.0491			
		(0.0604)			
RQ*FDI			-0.189**		
			(0.0812)		
RL*FDI				-0.0884	
				(0.0626)	
CC*FDI					0.00716
					(0.0608)
No. of observations	561	561	561	561	561
No. of country	33	33	33	33	33

Notes: bootstrapped standard errors (300 iterations) in parentheses. Arellano and Bond estimator.
* significance at 10%; ** significance at 5%; and *** significance at 1%.

Conclusion

This study presented empirical evidence on the role of financial market developments as well as the quality of governance play in mediating the impact of FDI on domestic private investment using a sample of 33 emerging economies over the 1996-2013. Our findings suggest that the foreign direct investment positively influences a host country's domestic private investment. Thus, we establish the absence of evidence for crowding out hypothesis. However, we find no evidence of positive relation between the domestic private credit indicators and the level of domestic private investment. Besides, neither domestic credit to private sector nor the quality of governance explained the extent to which the FDI inflows translate into domestic private investment in the host countries. Since

the foreign direct investment has a positive spillover effect on domestic private investment, the policy measures aimed at stimulating FDI inflows is likely to have a positive effect on host emerging economies.

Appendix- A

List of Sample Countries

Albania
Bangladesh
Belarus
Belize
Bolivia
Brazil
Botswana
Georgia
Guatemala
Guyana
Honduras
Jordan
Kyrgyz Republic
Lesotho
Madagascar
Mexico
Macedonia, FYR
Mongolia
Mauritius
Malawi
Malaysia
Peru
Philippines
Romania
Sierra Leone
Suriname
Seychelles
St. Vincent and the Grenadines
South Africa
Thailand
Tajikistan
Tajikistan
Uganda

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Estimation and Decomposition of Total Factor Productivity Growth of the Organized Manufacturing Industries in Andhra Pradesh: A Stochastic Frontier Approach

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Abstract

Most of the studies relating to productivity growth of the Indian manufacturing measured total factor productivity growth (TFPG) as a residual of the Solow growth accounting. In this approach technological progress and total factor productivity growth (TFPG) are implying the same idea and TFPG is shown only by shifting the production possibility frontier. But recent development of TFP estimation by means of stochastic frontier approach acknowledges that along with technological progress, changes in technical efficiency, economic scale effect and changes in allocative efficiency can also contribute to productivity growth. The study estimates and decomposes the sources of TFPG of the 2-digit manufacturing industries in Andhra Pradesh as well as total manufacturing of the state during the period from 1981-82 to 2010-11, during the entire period, during the pre-reform period (1981-82 to 1990-91) and post-reform period (1991-92 to 2010-11), and also during two different decades of the post-reform period, i.e., during 1991-92 to 2000-01 and 2001-02 to 2010-11 using a stochastic frontier approach. The result that the estimates show, technological progress (TP) is the major contributing factor to TFPG of the organized manufacturing industries of the state during the entire study period. However, TFPG of the Andhra Pradesh manufacturing industries declined during the post-reform period which is accounted for by the decline in combined effect of scale change and allocation efficiency change of the state during this period. The empirical findings

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clears that although factor accumulation may lead to TFP growth through increasing returns to scale in case of these industries, resource allocations in the states' manufacturing industries have been hampered during the post-reform period and the most important factor of TFP growth of the organized manufacturing industries in Andhra Pradesh becomes the technological progress.

Keywords: Organized Manufacturing Industries in Andhra Pradesh, Scale Effect and Allocative Efficiency Effect, Stochastic Frontier Production Function, Technical Efficiency Change, Technological Progress, Total Factor Productivity Growth

Introduction

Manufacturing and production activities have long been the drivers of economic growth for economies across the world. They provide an institutional foundation for the advancement of productivity, competitiveness, skills and innovation. Production systems trigger a multitude of social and environmental externalities, both positive and negative. A strong manufacturing base is crucial for nations to sustain economic growth, generate employments and ameliorate social problems (particularly relating to poverty).

Within the country, the state of Andhra Pradesh has been a growth miracle. As one of the fastest growing state in the country, it has been able to sustain a double digit inclusive growth rate over the past decade, and has consistently ranked as the top manufacturing state in India for ease of making business. Government of Andhra Pradesh concur top priority to industrial development to make Andhra Pradesh a progressive and highly industrialized state, a state that is a centre of technology and innovation and a cheerful population confident of its bright future. Industrial Development Policy 2015-20 has been framed to make Andhra Pradesh most preferred landing place for investors by providing favourable business environment, excellent infrastructure, better law and order and peaceful industrial relations. The new industrial policy also focuses on creating a helpful ecosystem which makes industries located in Andhra Pradesh innovative and worldwide competitive. Government of Andhra Pradesh put utmost emphasis on sustainable industrial development tied up by capacity building at the grassroots level and thereby enhancing industrial productivity of the state.

Most of the studies relating to productivity growth in the manufacturing industries, measured total factor productivity growth (TFPG) as a residual

of the "Solow" growth accounting or used production function approach to measure TFPG. In the first case, TFP growth is derived residually as a measure of output growth that cannot be accounted for by inputs growth. In the second case, parametric approaches are applied by relating economic growth to a list of potential explanatory variables to obtain direct measure of TFP growth. But neither methodology decomposes TFP growth into its components. However, Aigner et al. (1977) and Meeusen and van den Broeck (1977) simultaneously proposed a stochastic frontier model that allows decomposing TFP growth into two components: technological progress (TP) and change in technical efficiency (TE). The former component reflects the improvement stemming from innovation and the diffusion of new knowledge and technologies, while the latter measures the movement of production towards the frontier. The model was further made larger by Pitt and Lee (1981), Schmidt and Sickles (1984), Kumbhakar (1990) and Battese and Coelli (1992, 1995) to plan for panel data estimation, in which technical efficiency and technological progress vary over time and across industries.

Although a large number of empirical studies have contributed to identify the sources of TFP growth by focusing on its decompositions; representative studies are Nishimizu and Page (1982), Kumbhakar (1990), Fecher and Perelman (1992), Domazlicky and Weber (1998), to mention only a few. Some studies have extended their analysis to deal with issues such as scale effects and allocative efficiency effects. By putting in a pliable stochastic translog production function, Kumbhakar and Lovell (2000), Kim and Han (2001) and Sharma et al. (2007) decompose TFP growth into four components: technological progress (TP), changes in technical efficiency (TEC), economic scale effect (SC) and allocation efficiency effect (AEC).

The objective of our study is to decompose TFP growth of the Andhra Pradesh manufacturing industries using the stochastic frontier approach. Having a detailed panel data set of the 2-digit manufacturing industries in Andhra-Pradesh during the period from 1981-82 to 2010-11, we break down TFP growth of the state's manufacturing industries into the aforementioned four components. The manufacturing industries of Andhra Pradesh considered in our study are: (1) manufacture of food, beverages and tobacco products (20-22), (2) manufacture of textile and textile products (23+24+25+26), (3) manufacture of wood and wood products; furniture and fixtures (27), (4) manufacture of paper and paper products (28), (5) manufacture of chemicals and chemical products (30), (6) manufacture of rubber, petroleum and coal products (31), (7) manufacture of non-metallic mineral products (32), (8) manufacture of basic metals and alloys industries (33), (9) manufacture of metal products and machinery equipments (34-36), (10) manufacture of transport equipments (37) and total manufacturing industry of the state. Decomposing TFP growth of

the Andhra Pradesh manufacturing industries into technological progress and efficiency changes is important to better understand whether gains in industries' productivity levels are achieved through the efficient utilization of factor inputs or through desirable technological progress. From this perspective, we argue that the decomposition carried out in this study may be very helpful to elicit the correct diagnosis of Andhra Pradesh manufacturing productivity problem if any and develop effective policies to reverse the situation, and thereby reduce A.P.'s lagging productivity gap. The paper is organized as follows. The next section outlines the stochastic frontier production function and methodology employed to decompose TFP growth. Following this, data and variable definitions are presented. Section 4 presents the empirical results and the final section contains some concluding remarks.

Methodology

A stochastic frontier production function [Aigner, Lovell and Schmidt (1977) and Meeusen and van den Broeck (1977)] defined by:

$$y_{it}=f(x_{it}, \beta, t) \exp(v_{it}-u_{it}) \quad ...(1)$$

where it y_{it} is the maximum possible output produced by i^{th} industry (i= 1, 2,……., N) in the th period (t=1,……, T); with f (.) being the production frontier; x_{it} being the input vector used by i^{th} industry; β being the vector of technology parameter; t being the time trend index that serves as proxy for technological change; and $u_{it}\geq 0$ is the output oriented technical inefficiency. The random error, v_{it}, accounts for measurement error and all other random factors outside the control of the industry. It is to be noted that technical inefficiency in equation (1) varies over time. The derivative of the logarithm of equation (1) with respect to time is given by:

$$\dot{y}_{it}=\partial \ln f(x_{it},\beta,t)/\partial t+\sum_j \partial \ln f(x_{it},\beta,t)/\partial x_{jt}.dx_{jt}/dt-du_{it}/dt \quad ...(2)$$

The first two terms on the right-hand side of equation (2) measure the change in frontier output caused by TP and by change in input use respectively. From the output elasticity of input j, $\varepsilon_j=\partial \ln f(x_{it},\beta,t)/\partial \ln x_{jt,}$ the second term can be expressed as $\sum \varepsilon_j \dot{x}_{jt}$, where a dot over a variable indicates its rate of change. Thus, equation (2) can be written as:

$$\dot{y}_{it}=TP_{it}+\sum_j \varepsilon_j \dot{x}_{jt}-du_{it}/dt \quad ...(3)$$

The overall output growth is not only affected by TP and changes in input use, but also by changes in technical inefficiency. TP is positive (negative) if the exogenous technological change shifts the production frontier upward (downward), for a given level of inputs. If $du_{it}/dt$is negative (positive), TE improves (deteriorates) over time, and du_{it}/dt can be interpreted as the rate at which an inefficient producer catches up with the production frontier.

To examine the effect of TP and a change in efficiency on TFP growth ($\dot{TFP}$), $\dot{TFP}$ is defined as output growth unexplained by input growth:

$$\dot{TFP} = \dot{y}_{it} - \sum S_j \dot{x}_{jt} \quad ...(4)$$

where S_j denotes observed expenditure share of input x.

By substituting equation (3) into equation (4), equation (4) can be rewritten as:

$$T\dot{F}P_{it} = TP_{it} - du_{it}/dt + \sum_j (\varepsilon_j - S_j)\, \dot{x}_{jt} = TP_{it} - du_{it}/dt + (RTS-1)\sum_j \lambda_j \dot{x}_{jt} + \sum_j (\lambda_j - S_j)\, \dot{x}_{jt} \quad ...(5)$$

where $RTS = \sum \varepsilon_j$ denotes the measurement of returns to scale (RTS) and $\lambda_j = \varepsilon_j / RTS$. The last component in equation (5) measures inefficiency in resource allocation resulting from the deviations of input prices from the value of their marginal product. Thus, in equation (5), TFP growth can be decomposed into TP, measures shift in production frontier over time, the technical efficiency change ($-du_{it}/dt$) measures the movement of production towards the known production frontier, scale components, $SC=(RTS-1)\sum \lambda_j \dot{x}_{jt}$, measures the amount of benefit a production unit can derive from economies of scale through access to a larger market and the allocative efficiency change denoted by $\sum (\lambda_j - S_j)\dot{x}_{jt}$, measures deviation of an inputs' normalized output elasticity from its expenditure share (Kumbhakar and Lovell 2000).

Model Specification

We consider a time-varying stochastic production frontier, originally proposed by Aigner, Lovell and Schmidt (1977) in translog form with two inputs labour (L) and capital (K) as:

$$\ln y_{it} = \beta_0 + \beta_L \ln L_{it} + \beta_K \ln K_{it} + \beta_t t + 1/2\beta_{LL} L_{it}^2 + 1/2\beta_{KK} K_{it}^2 + 1/2\beta_{tt} t^2 + \beta_{LK} \ln L_{it} \ln K_{it} + \beta_{Lt} L_{it} t + \beta_{Kt} K_{it} t + v_{it} - u_{it} \quad ...(6)$$

where y_{it} is the level of output (gross value added), K and L are two primary inputs capital and labour respectively. The above specification allows for estimating both technological progress and time varying technical efficiency. The above translog parameterization of stochastic frontier model allows for non-neutral technological progress (TP). Technological progress will be neutral if all β_{tj}'s are equal to zero.

The efficiency error, u_{it} represents production loss due to industry-specific technical inefficiency; thus it is always greater than or equal to zero ($u_{it} \geq 0$), and it is assumed to be independent of the statistical error, v_{it}, which is assumed to be independently and identically distributed as $N(0,\sigma^2_v)$.

The distribution of technical inefficiency effects, u_{it}, is taken to be non-negative truncation of the normal distribution $N(\mu, \sigma^2 u)$, modelled, following (Battese & Coelli 1992, Greene 1997: pp119) to be the product of an exponential function of time as

$$u_{it} = \eta_t u_i = u_i \exp(-\eta\,[t-T]),\ i = 1,\ldots, N;\ t = 1, \ldots, T \quad ...(7)$$

Here the unknown parameter 'η' represents the rate of change in technical inefficiency, and the non-negative random variable u_i, is the technical inefficiency effect for the i^{th} production unit in the last year of the data set. That is, the technical inefficiency effects in earlier periods are deterministic exponential function of the inefficiency effects for the corresponding

forms in the final period (i.e., $u_{it}=u_t$), given the data for the i^{th} production unit are available in the final period. So the production unit with a positive 'η' is likely to improve its level of efficiency over time and vice-versa. A value of η=0 implies technical inefficiency is time invariant in nature. Since the estimates of technical efficiency are sensitive to the choice of distributional assumption, we consider truncated normal distribution for general specifications of one-sided error u_{it}, and half - normal distribution can be tested by LR test.

Technical efficiency of the i^{th} production at time t (TE_{it}), defined as the ratio of the actual output to the potential output determined by the production frontier, can be written as

$$(TEit)= \exp (-u_{it)} \quad ...(8)$$

and technical efficiency change is the change in TE, and the rate of technological progress (TPit) is defined by,

$$TP_{it}=\partial \ln f(x_{it},\beta t)/\partial t=\beta t+\beta_{tt}t+\beta_{Lt}\ln L_{it}+\beta_{kt}\ln K_{it}. \quad ..(9)$$

where βt and β_{tt} are 'Hicksian' parameters and β_{Lt} and β_{kt} are 'factor augmented' parameters. It is noted that when technological progress is non-neutral, the change in TP will vary for different input vectors. To avoid this problem, Coeli et al (1998) suggest that the geometric mean between the adjacent periods be used to estimate the TP component. The geometric mean between time't' and t+1 is defined as

$$TPit= [1+\partial \ln f(x_{it},\beta,t)/\partial t]*[1+\partial \ln f(x_{it+1},\beta,t+1)/\partial t+1]^{1/2}-1 \quad ...(10)$$

So that both TE_{it} and TP_{it} vary over time and across the production units. The associated output elasticities of inputs labour and capital can be defined as

$$\varepsilon_L=\partial \ln f(x_{it},\beta,t)/\partial \ln L_{it}=\beta_L+\beta_{LL}\ln L_{it}+\beta_{LK}\ln K_{it}+\beta_{Lt}t \quad ...(11)$$

$$\varepsilon_K=\partial \ln f(x_{it},\beta,t)/\partial \ln K_{it}=\beta_K+\beta_{KL}\ln L_{it}+\beta_{KK}\ln K_{it}+\beta_{Kt}t \quad ...(12)$$

These two factor elasticities are used to estimate the returns to scale component (RTS). The scale elasticity of output, i.e. the change in output with respect to change in scale, is given by the formula:

$$\epsilon=\varepsilon_L+\varepsilon_K \quad ...(13)$$

If scale elasticity exceeds unity, then the technology exhibits increasing returns to scale (IRS); if it is equal to one, the technology obeys constant returns to scale (CRS), and if it is less than unity, the technology shows decreasing returns to scale (DRS).

Data and Variables

The study is based on panel data collected from the various issues of Annual Survey of Industries (ASI), Central Statistical Organization (CSO), Ministry of Statistics and Program Implementation, Government of India, New Delhi. To arrive at the measures of output and inputs in real terms, suitable deflators for the variables were constructed. In cases where the exact deflators were not available, the best suitable proxies for the industry concerned were picked up from the WPI series. Series on real gross value added of each industry was obtained by deflating the nominal figures by GDP deflator that is obtained by dividing nominal and real GDP, the data of

which are obtained from different volumes of National Accounts Statistics (NAS). Implicit price deflator, used to deflate the series on capital stock at current prices, is also constructed by taking data on gross fixed capital formation at current and constant prices from the National Accounts Statistics (NAS).

The variables used in this exercise are output and labour and capital inputs. We have taken gross value added as the measure of output. Gross output is not taken directly as the measure of output, in order to avoid the possibility of double counting. However, it may appear that net value added might have been a better measure of output index, but since the depreciation figures are not reliable as the entrepreneurs often provide us with inflated figures to avoid tax-laws, we have preferred gross value added as a measure of output to net value added. Data regarding gross value added are collected from various issues of Annual Survey of Industries and the data regarding the price level are collected form National Accounts Statistics published by CSO.

If value-added is used as a measure of output, nominal value-added needs to be converted into real value-added. This conversion can be done with either single deflation (SD) or double deflation (DD) method. In the case of single deflation, nominal value-added is deflated by the output price index, i.e., both nominal output and nominal material inputs are deflated by the output price index. Whereas in case of double deflation gross value added is deflated by the manufacturing price index and the material inputs by the weighted index of the material input prices. In this study we could not use DD method as i) ASI data consists of large number of multi-product firms; ii) value added as a proportion of output is low in the formal sector which leads to GVA becoming negative for several industries with DD method for cases where the input price deflator is higher than the output price deflator; and iii) the non-availability of industry specific input deflators. Accordingly we used SD method.

Total number of persons employed is taken as the measure of labour input. As workers, working proprietors and supervisory/managerial staff/ technicians etc. can affect productivity; number of persons engaged is preferred to number of workers. For recent issues, it is reported in the ASI under the head 'persons engaged', for earlier issues, it is reported as 'number of employees. This relates to all persons engaged by the factory for wages or not in work directly connected or indirectly with the manufacturing process and includes administrative, technical and clerical staff as also labour used in the production of capital assets for the factory's own use. Implicit in such a measure is the assumption that workers and other than workers are perfect substitutes. This may not be a proper assumption to work with when the objective of the study is to compare productivity growth across industries, and management is one of the vitally important

factors in explaining inter-industry differentials. Total emoluments divided by the total number of persons engaged in production are considered as price of labour input in this study.

The measurement of capital input is the most complex of all input measurements. There exists no universally accepted method for its measurement and, as a result, several methods have been applied to estimate capital stock. In many studies, the capital unit is treated as a stock concept measured by the book value of fixed assets. Some studies have applied the perpetual inventory accumulation method to construct capital stock series from annual investment data. In this case it is assumed that the flow of capital is proportional to the stock of capital.

However, it is essential to point out that each of these measures has drawbacks. The book value method has three limitations. First, the use of 'lumpy' capital data underestimates or overestimates the amount of capital expenditure. Second, the book value may not truly represent the physical stock of machinery and equipment used in the production. Third, it does not address the question of capacity utilization. Perpetual inventory method also does not address the question of capacity utilization. The flow measure is criticized on the ground that the depreciation charges in the financial accounts may be unrelated to the actual wear and tear of hardware.

In this study, however, we compute a new capital stock data set following the perpetual inventory accumulation method (PIAM) introduced by Goldsmith (1951). In short, the PIAM consist of adding the net investment data of the current year to an assumed base year of capital stock. The capital stock series for Indian manufacturing industry are computed following Equation,

$$K_t = K_t + (1-\delta)\, K_{t-1} + I_t$$

where K is capital stock, I is net investment, δ is the depreciation rate (here δ=0.05) and t denotes time. Rental price of capital which equals the ratio of interest paid and capital invested (Jorgenson and Griliches (1967) is treated as price of capital in our study.

Empirical Results

Estimation of the Stochastic Production Frontier

The maximum likelihood estimates for the parameters of the stochastic frontier model, defined by equations (6) and (7), are obtained using the program FRONTIER 4.1, in which the variance parameters are expressed in terms of $\gamma = \sigma^2_u / \sigma^2$ and $\sigma^2 = \sigma^2_u + \sigma^2_v$ (Coelli,1996) which are also reported in the result table (Table-1). These are associated with the variances of the stochastic term in the production function, and the inefficiency term uit. The parameter γ must lie between zero and unity. If the hypothesis γ=0 is accepted, this would indicate that σ^2_u is zero and thus the inefficiency

error term, uit should be removed from the model, leaving a specification with parameters that can be consistently estimated by OLS. On the other hand, if the value of γ is one, we have the full-frontier model, where the stochastic component is not present in the model. The μ parameter detects the distribution the inefficiency effects have, either a half-normal distribution or a truncated normal distribution. The η parameter determines whether the inefficiencies are time varying or time invariant.

Table-1 shows the results of the estimation of translog stochastic frontier production function in which the technical inefficiency effects, uit, have the time varying structure and follow truncated normal distribution.

Table-1: Parameter Estimates of the Stochastic Production Frontier and Technical Inefficiency Model in Andhra Pradesh Manufacturing

Variables	Parameters	Coefficients
Constant	β_0	-1.16 (1.76)
lnL	B_L	1.06*** (0.42)
lnK	β_K	0.17 (0.23)
t	β_t	0.059** (0.03)
lnL^2	β_{LL}	-0.073*** (0.03)
lnK^2	β_{KK}	-0.075*** (0.02)
t^2	β_{tt}	-0.0008** (0.0004)
lnL*lnK	β_{LK}	0.125*** (0.046)
lnL*t	β_{Lt}	-0.014*** (0.004)
lnK*t	β_{Kt}	0.017*** (0.0037)
Sigma squared	σ^2	0.78 (0.81)
Gamma	γ	0.89*** (0.12)
Mu	μ	0.38 (0.90)
Eta	η	-0.10* (0.66)
Log-Likelihood		-87.60

Standard errors are mentioned in the parenthesis

***,** & * denote statistical significance at the 1%, 5% and 10% levels, respectively

Source: Authors' own calculation

The estimate of γ which is the ratio of the variance of industry-specific performance of technical efficiency to total variance of output is statistically significant at 1 per cent probability level. This implies that the variation in productivity performances among the industries is not due to statistical chance factor but principally to individual technical efficiency differences.

The estimated average technical efficiency of the 2-digit industries is as high as 0.89 which implies that the industries are operating at 89% of their potential output determined by the frontier technology. But statistical test suggests (Table-2) that technical efficiency of the 2-digit industries in Andhra Pradesh remain absent and/or it is time invariant in nature, i.e. overtime changes in technical efficiency are not statistically significant in spite of a moderate level of technological progress taking place in the manufacturing industries in Andhra Pradesh. So it can be inferred from this result that each year or within a range of years the innovating manufacturing industries in Andhra Pradesh keep on shifting for better technologies; however, for various reasons, such as incomplete knowledge of the best practice and other organizational factors, they are unable to follow the best practice techniques of the chosen technology. As a result, the industries fail to achieve 100% technical efficiency and the level of efficiency seems to be more or less at the same percentage level over the year. On the other hand, non-innovator industries, due to technology spill over, are also moving towards the best practice frontier i.e. they are catching up with the frontier and thereby maintaining the same distance from the frontier set by the best practice techniques. The possible reasons, for which none of the 2-digit industries in Andhra Pradesh is able to follow the best practice techniques and thereby attaining 100 % efficiency, are as follows. Due to inadequate number of domestic machinery suppliers, most of the machineries and equipment used in the 2-digit manufacturing industries in Andhra Pradesh are borrowed from abroad. There are certain factors which lead to below par absorption and adaptation capabilities of the borrowed technology. Firstly, poor infrastructure of the receiving companies; secondly, very limited R&D activities of the recipient companies; thirdly, inadequate technology support services of the Indian manufacturing industries and lastly, absence of any long term training programme for the local personnel, Since technical efficiency remains absent, it has not contributed to TFP growth.

Tests of Hypotheses of the Parameters

Various tests of hypotheses of the parameters in the stochastic frontier function can be performed using the generalized likelihood ratio-test statistic, defined by

$$\lambda = -2 [L (H_0)-L (H_1)]$$

where $L (H_0)$ is the log-likelihood value of a restricted frontier model, as specified by a null hypothesis, H_0; and $L (H_1)$ is the log-likelihood value

of the general frontier model under the alternative hypothesis, H_1. This test statistic has approximately a Chi-Square distribution (or a mixed chi-square) with degrees of freedom equal to the difference between the parameters involved in the null and alternative hypotheses. If the inefficiency effects are absent from the equation, as specified by the null hypothesis H_0: $\gamma=0$, then the statistic λ is approximately distributed according to a mixed chi-square distribution. Table-2 presents the test results of various null-hypotheses.

The first likelihood test is conducted to test the null hypothesis that the technology in the organized manufacturing sector in Andhra Pradesh is a Cobb-Douglas (H_0: $\beta_{LL}=\beta_{KK}=\beta_{LK}=\beta_{tt}=\beta_{Lt}=\beta_{Kt}=0$), is rejected. This is shown in Table-2 where a likelihood ratio of the value 28.34 indicates the rejection of null hypothesis at both 5% and 1% significance level. Thus, Cobb-Douglas production function is not an adequate specification for Andhra Pradesh manufacturing sector, given the assumption of the translog stochastic frontier production model, implying that the translog production better describes the technology of the Andhra Pradesh manufacturing industries.

Table-2: Generalized Likelihood Ratio Tests of Hypotheses for Parameters of the Stochastic Frontier Production Function in Andhra Pradesh Manufacturing

Null Hypothesis	Log-likelihood Value		Test statistics	Critical value		Decision
	$L(H_0)$	$L(H_1)$	$\lambda = -2[L(H_0)-L(H_1)]$	At 1% level	At 5% level	Reject H_0/ Accept H_0
Cobb-Douglas production function H_0:$\beta_{LL}=\beta_{KK}=\beta_{LK}=\beta_{tt}=\beta_{Lt}=\beta_{Kt}=0$	-101.77	-87.60	28.34	16.81	12.59	Reject H_0
No technological change H_0: $\beta_t=\beta_{tt}=\beta_{Lt}=\beta_{Kt}=0$	-152.46	-87.60	129.72	13.28	9.49	Reject H_0
Neutral technological change H_0: $\beta_{Lt}=\beta_{Kt}=0$	-96.59	-87.60	17.98	9.21	5.99	Reject H_0
No technical inefficiency effects H_0:$\Upsilon=\mu=\eta=0$	-88.76	-87.60	2.32	11.34	7.81	Accept H_0
Half-normal distribution of technical inefficiency H_0:$\mu=0$	-87.65	-87.60	1.00	6.63	3.84	Accept H_0
Time invariant technical inefficiency H_0: $\mu=0$	-88.59	-87.60	1.98	6.63	3.84	Accept H_0

Source: Authors' own calculation

The second null hypothesis, that there is no technological change over time (H_0: $\beta_t=\beta_{tt}=\beta_{Lt}=\beta_{Kt}=0$) is also strongly rejected. The value of the test statistic as shown in Table-2 is 129.72 which is significantly larger than the critical value of respectively 9.49 and 13.28 at 5% and 1% probability level.

This indicates the existence of technological change over time in Andhra Pradesh manufacturing, given the specified production model.

The third null-hypothesis is that, the technological change is Hicks neutral (H_0: $\beta_{Lt}=\beta_{Kt}=0$). The value of the test statistic in this case becomes 17.98 which is much greater than the critical value of 5.99 and 9.21 respectively at 5% and 1% probability level. This indicates that the translog parameterization of the stochastic frontier model does not allow for Hicks neutral technological change.

Fourth, null-hypothesis that technical inefficiency effects are absent (H_0: $\gamma=\mu=\eta=0$) is accepted. This implies that the traditional production function is an adequate representation for the organized manufacturing industries in Andhra Pradesh. In this case, it can be said that inefficiencies are absent in the Andhra Pradesh manufacturing industries.

The fifth null-hypothesis, specifying that technical inefficiency effects have half-normal distribution (H_0:$\mu=0$) against truncated normal distribution, is accepted both at 5% and at 1% level of significance.

The sixth null-hypothesis, that technical inefficiency is time-invariant (H_0:$\eta=0$) is accepted both at 5% as well as at 1% level of significance. This implies that technical inefficiency in the organized manufacturing industries in Andhra Pradesh is time-invariant in nature.

Estimation and Decomposition of TFPG

The study has estimated the average annual rates of total factor productivity growth (TFPG), technological progress (TP), economic scale effects (SC) and allocation efficiency effects (AEC) in case of two-digit level disaggregated manufacturing industries in Andhra Pradesh during the period from 1981-82 to 2010-11 (entire study period), during the pre-reform period (1981-82 to 1990-91), during the post-reform period (1991-92 to 2010-11) and during two different decades of the post-reform period, i.e., during 1991-92 to 2000-01 and during 2001-02 to 2010-11. Further, TFPG of the 2-digit manufacturing industries of the state is decomposed into changes in technological progress (TP), economic scale effect (SC) and allocation efficiency effect (AEC) i.e., TFPG is the sum-total of technological progress (TP), economic scale effect (SC) and allocation efficiency effect (AEC). Besides, the intertemporal comparison of the changes in TFPG, TP, SC and AEC has also been made in the study to see the consistency of the estimates by applying monotonicity and convexity properties of the production theory. Tables 3, 4, 5 and 6 below respectively present the average annual rates of TFPG, TP, SC and AEC of the 2-digit manufacturing industries in Andhra Pradesh during the periods mentioned above.

Table-3: Average Annual Rates of Total Factor Productivity Growth (TFPG) in the Manufacturing Industries in Andhra Pradesh

I/P	1981-82 to 2010-11 (Entire Study Period)	1981-82 to 1990-91 (Pre-reform Period)	1991-92 to 2010-11 (Post-reform Period)	1991-92 To 2000-01 (Post-reform Period-Decade 1)	2001-02 To 2010-11 (Post-reform Period-Decade-2)
20-22	3.65	3.10	3.92	3.61	4.23
23-26	2.63	4.37	1.75	1.58	1.92
27	2.89	4.73	1.97	2.46	1.49
28	3.29	6.34	1.75	0.07	3.46
30	1.44	2.63	0.83	-0.55	2.22
31	3.51	5.33	2.61	1.69	3.52
32	0.20	0.72	-0.05	1.20	-1.32
33	-3.33	-23.33	6.67	8.77	4.57
34-36	3.86	4.28	3.65	4.18	3.13
37	2.24	3.25	1.75	1.01	2.49
TOTAL	3.34	1.65	4.18	5.98	2.38

Source: Authors' own calculation

I/P- Industries/Periods

Table-4: Average Annual Rates of Technological Progress (TP) in the Manufacturing Industries in Andhra Pradesh

I/P	1981-82 to 2010-11 (Entire Study Period)	1981-82 to 1990-91 (Pre-reform Period)	1991-92 to 2010-11 (Post-reform Period)	1991-92 to 2000-01 (Post-reform Period-Decade 1)	2001-02 To 2010-11 (Post-reform Period-Decade-2)
20-22	2.79	2.97	2.70	2.72	2.68
23-26	4.40	4.37	4.41	4.68	4.14
27	3.13	4.30	2.55	2.22	2.88
28	5.77	6.24	5.53	5.58	5.49
30	6.70	7.59	6.25	6.76	5.75
31	6.44	6.89	6.22	6.55	5.88
32	6.08	6.71	5.77	6.18	5.35
33	7.25	7.01	7.37	8.10	6.64
34-36	4.69	5.58	4.24	4.55	3.92
37	4.08	5.11	3.57	4.06	3.08
TOTAL	5.84	6.46	5.53	5.95	5.11

Source: Authors' own calculation

I/P- Industries/Periods

Table-5: Average Annual Rates of Scale Effect (SC) in the Manufacturing Industries in Andhra Pradesh

I/P	1981-82 to 2010-11 (Entire Study Period)	1981-82 to 1990-91 (Pre-reform Period)	1991-92 to 2010-11 (Post-reform Period)	1991-92 to 2000-01 (Post-reform Period-Decade 1)	2001-02 to 2010-11 (Post-reform Period-Decade-2)
20-22	-1.65	-0.79	-2.08	-2.13	-2.04
23-26	-0.92	-1.02	-0.87	-0.03	-1.71
27	-0.46	0.28	-0.84	-1.09	-0.58
28	-0.80	-0.54	-0.93	-0.54	-1.31
30	-2.40	-3.46	-1.88	-2.08	-1.67
31	-0.37	1.97	-1.54	-1.07	-2.01
32	-1.27	-1.43	-1.19	-0.83	-1.56
33	-0.19	0.15	-0.36	0.52	-1.24
34-36	-1.27	-1.42	-1.19	-0.13	-2.24
37	-0.50	0.54	-1.02	-1.42	-0.62
TOTAL	-1.25	-0.94	-1.41	-0.23	-2.59

Source: Authors' own calculation
I/P- Industries/Periods

Table-6: Average Annual Rates of Allocation Efficiency Effect (AEC) in the Manufacturing industries in Andhra Pradesh

I/P	1981-82 to 2010-11 (Entire Study Period)	1981-82 To 1990-91 (Pre-reform Period)	1991-92 To 2010-11 (Post-reform Period)	1991-92 to 2000-01 (Post-reform Period-Decade 1)	2001-02 to 2010-11 (Post-reform Period-Decade-2)
20-22	2.51	0.92	3.30	3.02	3.59
23-26	-0.85	1.02	-1.79	-3.07	-0.51
27	0.22	0.15	0.26	1.33	-0.81
28	-1.68	0.64	-2.85	-4.97	-0.72
30	-2.86	-1.50	-3.54	-5.23	-1.86
31	-2.56	-3.53	-2.07	-3.79	-0.35
32	-4.61	-4.56	-4.63	-4.15	-5.11
33	-10.39	-30.49	-0.34	0.15	-0.83
34-36	0.44	0.12	0.60	-0.24	1.45
37	-1.34	-2.40	-0.80	-1.63	0.03
TOTAL	-1.25	-3.87	0.06	0.26	-0.14

Source: Authors' own calculation
I/P- Industries/Periods

The main finding of our decomposition is that TFPG (Table-3) of most of the 2-digit manufacturing industries in Andhra Pradesh declined during the post-reform period. Further, TP (Table-4) is found to be the major contributor to TFPG of the 2-digit manufacturing industries in Andhra Pradesh and the decline in TFPG of the 2-digit manufacturing industries of the state during

the post-reform period is due to decline in technological progress of the same during that period. The decline in technological progress of the said industries in Andhra Pradesh may be explained by the fact that economic reforms failed to increase competition through improved technology and opening of the organized manufacturing industries of the state. However, the rates of TFPG in most of the 2-digit industries of the state remained higher during the second half of the post-reform period comparing to the first half although the rate of technological progress remained higher during the first half of the post-reform period. This may be due to the fact that technological progress took a few years to accelerate TFPG. Now, as we have mentioned earlier that technical efficiency change of the organized manufacturing sector in Andhra Pradesh is totally absent and/or it time-invariant in nature, the TFPG of the 2-digit manufacturing industries in Andhra Pradesh as well as total industry of the state is calculated as the sum total of the changes in technological progress (TP), economic scale effect (SC) and allocative efficiency effect (AEC).

The scale effects (Table-5), which measure the effect of input changes on output growth, will be zero if RTS is constant; it will be greater (less) than zero if RTS is increasing or decreasing (assuming positive input growth) [Kim and Han (2001)]. It can be seen from Table-4 that the contribution of scale effect to TFPG of most of the 2-digit manufacturing industries as well as total manufacturing industry in Andhra Pradesh were very low or even negative in most of the cases. This could be due to larger per unit cost of production. It can therefore be said that the 2-digit manufacturing industries in Andhra Pradesh have not been benefitted from economies of scale.

The effect of allocation efficiency (Table-6) on TFPG of most of the 2-digit manufacturing industries and in total manufacturing in Andhra Pradesh has, however, improved during the post-reform period. This implies that deregulation in the 2-digit manufacturing industries in Andhra Pradesh and in total manufacturing of the state during the post-reform period has reduced price distortions. Thus, it can be said that factor inputs may have been paid closer to the values of their marginal products during the post-reform period, i.e., output elasticities of inputs moved closer to factor shares during that period.

Conclusion

The paper examines the sources of TFPG in the organized manufacturing industries in Andhra Pradesh during the period from 1981-82 to 2010-11, during the entire period, pre-reform period (1981-82 to 1990-91), post-reform period (1991-92 to 2010-11) and during two different decades of the post-reform period (1990-91 to 2000-01 and 2001-02 to 2010-11) at the

2-digit industry level as well as at the total industry level using stochastic frontier approach. The methodology involves decomposition of the sources of TFPG into four components, i.e., technological progress, technical efficiency change, economic scale effect and allocation efficiency effect.

The main findings of the decomposition analysis is that during the periods under study, technological progress has been the main driving force of productivity growth in the 2-digit manufacturing industries in Andhra Pradesh as well as in total manufacturing industry of the state. The growth of technological progress of the 2-digit manufacturing industries in the state as well as in total manufacturing industry of the state has declined during the post-reform period and this is mainly responsible for the decline in TFPG of the state's industries during that period. The technical efficiency of the 2-digit manufacturing industries of the state is, however, found to be time-invariant in nature i.e., over-time changes in technical efficiency are not statistically significant. With respect to scale effect, its contribution to TFPG in the manufacturing industries of the state has been very low or even negative. The changes in allocation efficiency component show that resource allocation in the organized manufacturing industries in Andhra Pradesh has improved during the post-reform period. This implies that deregulation and delicensing of the economy in the post-reform period has reduced the price distortion measured by the gap between price and marginal cost in the 2-digit manufacturing industries in Andhra Pradesh as well as in the total manufacturing of the state.

The study surmises that, supported by effective and forward-looking industry and policy initiatives, Andhra Pradesh will have to provide favourable conditions for the adoption of advanced technologies in order to accelerate productivity growth in the state's manufacturing industries. For the time being, measures such as more numerous technological infrastructure and greater technological access for the industry and investments in smart skilling and up skilling programmes to skill the new talent pool for the future of manufacturing will be crucial for the state to maximize the impact of emerging technologies, maintain its growth momentum and realize the full potential of its production capabilities.

APPENDIX

Table-7: Concordance between NIC'87, NIC'98 & NIC'04 and NIC'08 of 2-Digit Manufacturing Industries

Industries	NIC'87 Code	NIC'98 & NIC'04 Code	NIC 2008 Code
Food, Beverages and Tobacco Products	20-22	151+152+153+ 154+155+160	101+102+103+104 +105+106+107+108 +110+120
Textile and Textile Products	23+24+25+26	171+172+173+181	131+139+141+143

Industries	NIC'87 Code	NIC'98 & NIC'04 Code	NIC 2008 Code
Wood and Wood Products	27	20+361	16+310
Paper and Paper Products	28	21+22	17+18
Chemicals and Chemical Products	30	24	20+21
Rubber, Petroleum and Coal Products	31	23+25	19+22
Non-Metallic Mineral Products	32	26	23
Basic Metals and Alloys Industries	33	271+272+273+371	241+242+243
Metal Products and Machinery Equipments	34+35+36	28+29+30+31+32	25+26+27+28
Transport Equipments	37	34+35	29+30
Total Manufacturing			

Source: Article by Pulapri Balakrishnan & M Suresh Babu published in EPW Sept. 20, 2003, Page 4004

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A Comparative Analysis of Macroeconomic Outcomes amongst the BRICS (2000 – 2015)

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Abstract

BRICS (Brazil, Russia, India, China and South Africa) economic block is a strategic partnership, pursuing common interests at national and international level because it brings together the world's fastest growing nations. Notwithstanding the partnership,macroeconomic effects across the member nations are not the same. BRICS have achieved different levels of economic growth and development, with different macroeconomic policies but the world seems to remain optimistic about their future, which is uncertain. This article compares the economic indicators across the BRICS for the period *2000 - 2015*. Using desktop approach, we sourced our data from the World Bank and United Nations Publications. Statistics indicate that China and India are fast growing in term of GDP within the period, more than the other member countries. Nonetheless, China the major strength of the BRICS, survived the global financial crisis of 2008 with GDP growth just decreasing to about 9.0 percent. All other BRICS members GDP growth rates have been declining recently. Overall, the growth rates of the BRICS countries have declined tremendously after 2010 and macro aggregates are unstable. This, however, has led to negative growth in investment in fixed assets in two of the BRICS countries (Russia and Brazil). Our analysis suggest that, all BRICS members need to strive for inclusive economic growth, in order to eradicate poverty, address unemployment and promote social inclusion. New measures have become imperative if the BRICS countries are to be larger than the G6 in 50 years.

Keywords: BRICS, Economic Development, Economic Growth, GDP, Macroeconomic Policies

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Introduction

The BRICS countries are widely recognised as the most dynamically fast growing economies in the world and have a potential of playing a significant role in the global affairs. In fact, the BRICS countries have been growing significantly even prior to the formation of the BRICS concept in 2001 (IMF, 2014). BRICS now brings together five major emerging economies, comprising approximately 40 percent of the world's human resource and about 20 percent of the world's Gross Domestic Product (Khalid, 2014). Seven BRICS Summits have taken place so far, the last one was held in Ufa (Russia) on 8-9 July 2015 under the theme 'BRICS Partnership – a Powerful Factor of Global Development' (BRICS Ministry of external relations, 2015). Nonetheless, the BRICS is a strategic partnership aimed at pursuing common interests at national and international level since it brings together the world's fastest growing nations. Howbeit, member countries of BRICS urgently need to re-modify their growth models.

Capital account opening, stable monetary system, flexible labour markets, anti-corruption, sustainable balance of payments, stable exchange rate, reduced budget deficits to non-inflationary levels as well as increased government expenditure on education and investment are basically some of the main policy recommendations for developing nations in their pursuit of sustained economic development (Gaider, 2014). Most of these recommendations are part of those also provided by the Washington Consensus (2003) and to a certain extent, supported by International Monetary Fund (IMF), World Trade Organisation (WTO) and World Bank. Gaider (2014) argues that these are the main policies that many developing countries including Brazil and South Africa have adopted for more than two decades. However, Priewe (2005) did argue that these recommendations are not sufficient for developing countries such as Brazil and suggested otherwise by recommending that other nations should learn from China and other Asian countries. Consequently, most countries that adopted the IMF and World Bank policy recommendations did not perform well due to the 2008 global financial crisis including some of the BRICS countries namely, Brazil, Russia and South Africa (Frenkel, 2012). However, South Africa (like the rest of the African economies) was the least affected by the global economic crisis.

As in many other developing and developed countries, BRICS countries are also concerned with their macroeconomic outcomes especially with the general need to increase government revenue as well as investments (except for China) or decrease budget deficits and government debt (IMF, 2014). Many African countries including South Africa are, facing problems of under-investment (IMF, 2014). With regard to the issue of under-investment in South Africa, Khamfula (2014) argues that in order to achieve

a balance between savings and investments, government should focus more on the consumption side since some investment stimulating measures that were adopted for years have not achieved the desired outcomes. However, the analysis did not specify the exact consumption approaches, which nations must adopt. With regard to consumption side approaches, the Asian Development Bank (2009) showed that inflation tend to rise rapidly when imbalances between savings and investments are approached from the consumption side. Jha, Prasad and Terada-Hagiwara (2009) conclude that savings-investment balance is achievable if social safety net, specifically the Health Insurance Coverage (HIC),is expanded especially in India and Russia. Overall, it was predicted that the weight of BRICS GDP would grow significantly (led by China) and their overall economic performance would reach and exceed the level of G7 countries' (Canada, France, Germany, Italy, Japan, the United Kingdom and the United States) economic performance (Goldman, 2003). As of 2017, the seven countries involved represent 58% of the global net wealth ($317 trillion) and more than 46% of the global gross domestic product (GDP) based on nominal values, and more than 32% of the global GDP based on purchasing power parity (World Economic Outlook, 2017).

Various scholars and experts argue that the BRICS countries have achieved different levels of economic growth and development, with different macroeconomic policies but the world seems to remain optimistic about their future. Given the size of its economy, China is the major source of the strength of BRICS partly due to its sustained high growth rate and influence on international affairs. Nevertheless, it remains to be seen whether amidst the coronavirus if this status-quo would be maintained. India has also managed to achieve high growth in Gross Domestic Product (GDP) and its growth rate remained positive even during the 2008 global financial crises. The GDP of other BRICS countries has fluctuated but mostly positive since the year 2001. These differences are attributed partly to the fact that the BRICS countries vary widely when it comes to population size, economic performance, income levels, political systems and background.

BRICS countries have been major players in the global finances and trade since the early 2000s. Trade and capital accounts in BRICS have been liberalised in one form or another (IMF, 2009). India signed full capital account convertibility in the mid-90s while China and Russia included some restrictions on their capital account transactions (Rodrik, 2005). Various research papers conducted by IMF (2014) and World Bank (2012) suggest that most developing nations across the world including Brazil and South Africa that have achieved some positive-growth rate since the late 1990s have somehow adopted the Washington Consensus

policy recommendation along with some of the requirements of inflation targeting. The World Bank (2014) research concluded that South Africa, India, and Brazil have sound financial systems and well-functioning policy transmissions that are able to facilitate strong growth in investment and consequently, support growth in gross domestic product. On the other hand, Haihong (2009) argue that China does not differ significantly from other BRICS members while Priewe (2009) founded that Chinese exchange rate regime, indicators and monetary policy framework differs from all other four BRICS members. In Russia, Adam (2014) explains that inflation targeting in Russia was formally adopted in 2007, hence it is too early to tell the real effects of changing monetary policy objectives. However, Reddy (2013) argued that the Russian Currency crisis has forced Russian Central Bank to focus more on Interest rates and output stabilisation.

If BRICS partnership brings together the world's fastest growing nations in the world, one would expect the macroeconomic indicators of the BRICS countries to follow the same trajectory. It is only fair to expect the GDP, GDP per capita and employment of all the BRICS countries to be growing at a significant rate. However, Khafula (2014) argues that the growth rates of the BRICS countries have slowed down over the past few years. As a result, this paper compared selected macroeconomic indicators of the BRICS countries (2000 – 2015). This period signifies the watershed history of the BRICS member states. The selected macroeconomic indicators include the Gross Domestic Product (GDP), GDP per capita, Inflation, Unemployment, Inequality (Gini-Index), Investment, Foreign Direct Investment (FDI) and Poverty Rates. These variables signify and indicate in broad terms the trajectory of the macroeconomic situation of countries. a review of these variables will partly assist in ascertaining whether the partnership between Brazil, Russia, India, China and South Africa brings together the fastest growing nations that have the potential to be larger than the G6 countries in the next fifty years if Goldman Sachs (2003, P.05) predictions are correct.

Data and Method

We used desktop approach and sourced data from the World Bank, United Nations Publications and International Monetary Fund. To compare macroeconomic indicators of the BRICS within the period, graphs and tables were used. These indicators include Gross Domestic Product growth rate (2000-2015), GDP per capita (2000-2015), Gross Fixed Capital Formation (2000-2015), Unemployment rates (2000-2015), Inequality as measured by the Gini-coefficient (2000-2015), Public debt, Consumer price index, interest rates and tariffs, which are widely accepted as the major indicators of economic development process. Also, Graphs were

used to analyse the trends in these major economic indicators with the main aim of identifying similarities or differences in in macroeconomic performance of Brazil, Russia, India, China and South Africa.

Results and Discussion

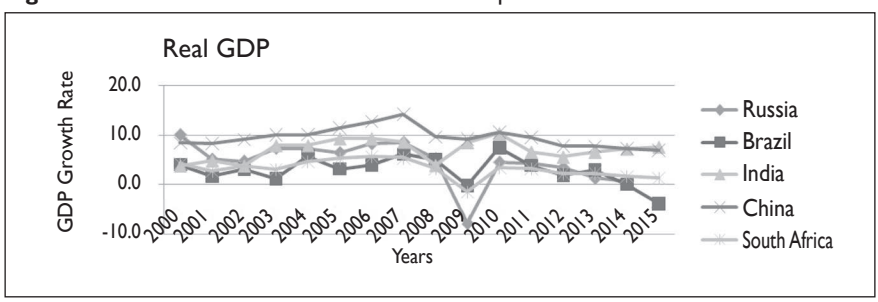
Macroeconomic Indicators of the BRICS Countries

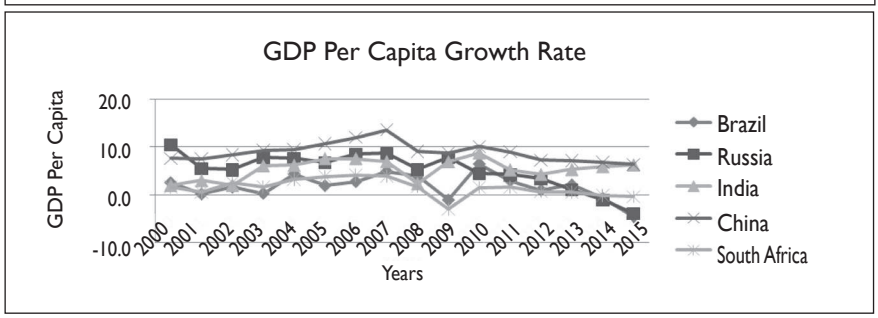
Table-1: Real GDP, GDP per Capita and Gross Fixed Capital Formation

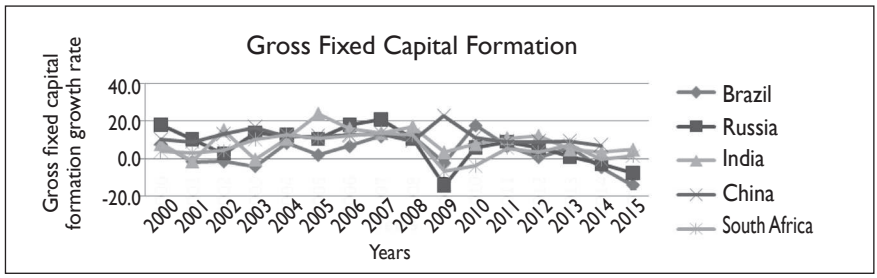
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Real GDP growth rate %																
Brazil	4.1	1.7	3.1	1.2	5.8	3.2	4	6.2	5.1	-0	7.5	3.9	1.9	3	0.1	-3.8
Russia	10	5.1	4.7	7.3	7.2	6.4	8.2	8.5	5.2	-8	4.5	4.3	3.4	1.3	0.6	
India	3.8	4.8	3.8	7.9	7.9	9.3	9.3	8.6	3.9	8.5	10	3.3	5.6	6.6	7.2	7.6
China	8.4	8.3	9.1	10	10	11.4	12.7	14	9.6	9.2	11	905	7.8	7.7	7.3	6.9
South Africa	4.2	2.7	3.7	3	4.6	5.3	5.6	5.4	3.2	-2	3.4	3.2	2.21	2.2	1.6	1.3
GDP per capita Growth rate																
Brazil	2.6	0.2	1.6	0.3	4.4	1.9	2.8	4.9	4	-1	6.5	2.9	1	2.1	-0.8	-4.7
Russia	11	5.5	5.2	7.8	7.6	6.8	8.5	8.7	5.3	7.9	4.5	4.2	..3	1.1	-1.1	-3.9
India	2	3	2.1	6.1	6.2	7.6	7.6	7	2.4	7	8.8	5.2	4.3	5.3	5.9	6.3
China	7.6	7.5	8.4	9.3	9.4	10.7	12.1	14	9.1	8.7	10	9	7.2	7.2	6.7	6.4
South Africa	1.7	0.6	2.5	1.6	3.2	3.9	4.2	3.9	1.7	-3	1.5	1.7	0.7	0.6	-0.1	-0.4
Gross Fixed Capita Formation																
Brazil	7.8	-1.5	-1.4	-4	8.5	2	6.7	12	12	-2	18	6.7	0.8	5.8	-4.5	-14
Russia	18	10.3	2.8	14	13	10.6	18	21	11	-14	5.9	9.1	6	0.9	-2.6	-7.6
India	7.9	-1.4	15.3	-0	11	24	16.2	14	17	3.5	7.7	11	12.3	4.9	3.4	4.9
China	10	9.2	13.2	17	12	12.1	12.7	14	9.7	23	12	9.1	9.2	9.4	7.2	
South Africa	3.9	3.2	4.3	10	13	11	12.1	14	13	-7	-3.9	5.7	3.6	7.6	-0.4	1.4

Source: World Bank, world development indicators

Figure-1: GDP Growth Rates and Gross Fixed Capital Formation







Brazil, Russia, India, China and South Africa have been widely accepted as the most dynamically emerging economies that have the potential to produce more than they have produced previously. This theoretically means one can expect to see the gross domestic products of these countries increasing year after year especially when looking at the past performance of each country. However, that is not what happened in reality when looking at the GDP growth rates of these countries as shown in Table-1. From 2000 to 2007, all BRICS countries real GDP was growing year after year with only Brazil and Russia showing some fluctuations but mostly rising.

Table-1 and Figure-1 show that China and India have performed exceptionally well when compared to other BRICS countries. For instance, the annual real GDP growth rate in China has been well above 7 percent for the entire sample period from 2000 to 2015, while other BRICS countries barely reached 6 percent. China attained the highest growth rate in 2007, with real GDP growing by more than 14 percent. This marks the year when all five BRICS countries were performing very well with Russia reaching 8.5 percent, India grew by 8.6 percent and the smallest growth was in South Africa reaching slightly more than 5 percent as shown in Table-1 and Figure-1. During the global financial meltdown in 2008, all the BRICS countries GDP rates declined significantly with India reaching 3.9 percent while China performed well at 9 percent in 2008. Brazil, Russia and South Africa experienced a decline (with negative real GDP) in 2009 and started to recover in 2010 from which, every BRICS members real GDP showing a downward trend. This has puzzled many experts and scholars because the BRICS performance reflects the opposite of initial predictions. After more than 10 years of growth, some BRICS nations are struggling to achieve sustained growth with Russia and Brazil experiencing 0 percent growth and South Africa only 1 percent in 2014.

GDP Per Capita

GDP per capita has been widely accepted as a more reliable measure of growth rate per average person in a country (Siuzzi, 2015). GDP per capita has fluctuated in Brazil but mostly positive reaching an all time high of 4.9 percent in 2010 after which it has been declining and became -4.6 percent

in 2014 as shown in Table-1 and Figure-1. The GDP per capita growth rate in Russia was well above 5 percent before 2010 after which it has declined year after year and was -1.0 and -3.9 in the years 2014 and 2015, respectively (this trend is clearly showed by Figure-1). The Asian countries, India and China still outperformed the other BRICS countries with GDP per capita growth rate rising since 2000 in China and reached maximum of 13.6 percent in 2007 after which it has fluctuated but mostly declined to 6.4 percent in 2015. Indian GDP per capita has been fluctuating but mostly increasing during the entire sample period and reached maximum of 8.7 percent in 2010 and declined ever since then. South Africa is the least performing country in terms of GDP per capita within BRICS except for some of the years before the 2008 global financial meltdown. However, it is worth noting that South Africa performed better in terms of GDP per capita although its GDP growth rate has been low since 2008.

Gross Fixed Capital Formation

In terms of investing in fixed assets within the economy, Table-3 and Figure-3 show that even the best performing countries can sometimes be out performed with Brazil being the lowest among the BRICS especially, since gross fixed capital formation annual growth rate was mostly negative during the entire sample period.

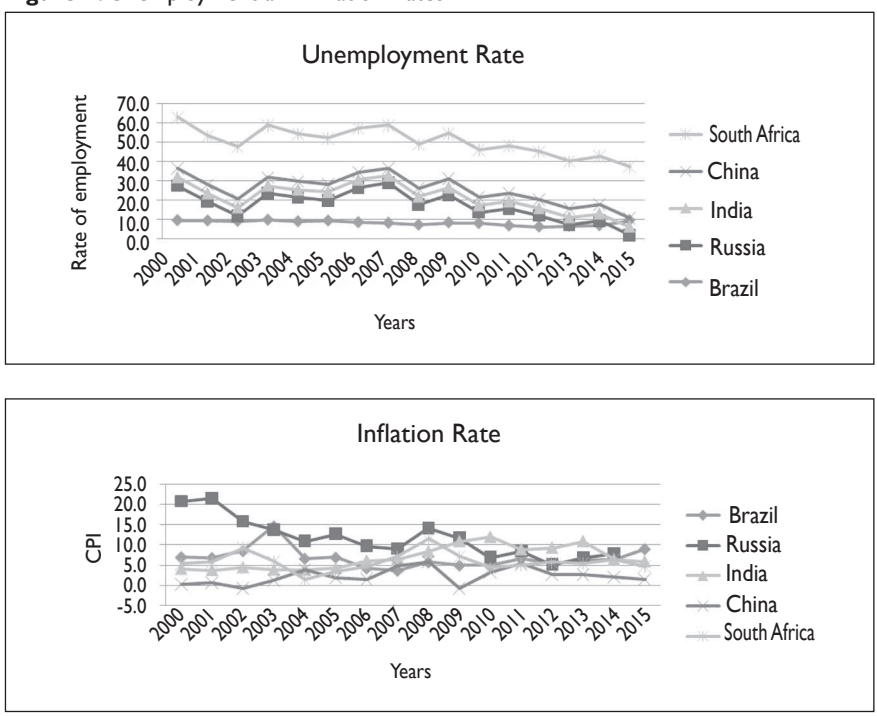
Table-2: Unemployment Rate, Inflation Rate and Gini Index

Unemployment rate	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Brazil	9.5	9.3	9.1	9.7	8.9	9.3	8.4	8.1	7.1	8.3	7.9	6.7	6.1	6.5	6.8	9.5
Russia	18.1	10.3	2.8	13.9	12.6	10.6	18	21	10.6	14.4	5.9	9.1	6	0.9	2.6	-7.6
India	4.3	4	4.3	3.9	3.9	4.4	4.3	3.7	4.1	3.9	3.5	3.5	3.6	3.6	3.6	4.3
China	4.5	4.5	4.4	4.3	4.3	4.1	4	3.8	4.4	4.4	4.2	4.3	4.5	4.6	4.7	4.5
South Africa	26.7	25.4	27.2	27.1	24.7	23.8	22.6	22.3	22.7	23.7	24.7	24.7	25	24.6	25.1	26.7
Inflation rate																
Brazil	7	6.8	8.5	14.7	6.6	6.9	4.2	3.6	5.7	4.9	5	6.6	5.4	6.2	6.3	9
Russia	20.8	21.5	15.8	13.7	10.9	12.7	9.7	9	14.1	11.7	6.9	8.4	5.1	6.8	7.8	
India	4	3.7	4.4	3.8	3.8	4.2	6.1	6.4	8.4	10.9	12	8.9	9.3	10.9	6.4	5.9
China	0.3	0.7	-0.8	1.2	3.9	1.8	1.5	4.8	5.9	-0.7	3.3	5.4	2.6	2.6	2	1.4
South Africa	5.3	5.7	9.2	5.9	1.4	3.4	4.6	7.1	11.5	7.1	4.3	5	5.7	5.4	6.4	4.6
Gini Index																
Brazil		0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.5		0.5	0.5	0.5		0.6
Russia	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.4	0.4	0.4	0.4
India					33.4		0.6			33	0.6	0.6	0.6	0.6	0.6	0.6
China			0.4			0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
South Africa	0.6					0.6	0.6		0.6		0.6	0.6	0.7	0.7	0.7	0.7

Source: World Bank: World Development Indicators

Russia, India and China are more or less similar in this case but it is important to note that China is the only BRICS country that has never experienced a negative growth rate in gross fixed capital formation during the entire sample period. For instance, Figure-3 reflects that in 2009, gross fixed capital investment was declining within BRICS except in China. In 2007, all BRICS countries were performing similar to each other in this regard with 12.0%, 21.0%, 13.8%, 13.6 and 13.7% for Brazil, Russia, India, China and South Africa respectively, then it started to decline in 2008 except for India. Recently, Brazil and Russia decreased their investment in fixed capital (World, Bank, 2012). This is shown by -14.0 percent and 7.0 percent in Table-1. At the same time, Indian and South African Growth rates in fixed capital investments were significantly low in 2015.

Figure-2: Unemployment and Inflation Rates



Source: World Bank Development Indicators

Unemployment Rate

The unemployment rate is also a well-accepted measure of economic performance since it reflects the proportion of citizens who are able, willing and looking for employment but cannot find one. It is important to note that the unemployment rate in South Africa (more than 20 percent since the early 90s) is among the world largest unemployment rates. This is shown in Figure-2 where South African unemployment rate graph is well above

that of other BRICS countries. Various scholars as well as experts as shown in the literature have argued that this is mainly due to the skills shortage in labours market. Both India and China have relatively low unemployment rates that are below 5 percent throughout the entire sample period. This trend can be partly attributed to the fact that these Asian nations have also been performing significantly well in terms of GDP growth since the 90s. Although Russia performed well in terms of GDP especially in 2007, the unemployment rate was also at its maximum level at 21.0 percent but it has declined significantly since then and reached 0.9 percent in 2013. This is good for the Russian federation although its GDP was relatively low in 2013. Hence, according to the data obtained from World Bank, unemployment is not a huge problem in BRICS countries except in South Africa where the figures are not abating.

Consumer Price Index (Inflation rate)

The increase in the general price level of goods and services within the BRICS countries has been mostly below 10.0 percent except for Russia. In fact, the Russian economy has been characterised by high inflation rate (World Bank, 2014). For instance, the inflation rate in Russia was 20.0 and 21.5 percent in the year 2000 and 2001 respectively as shown in Table-2. On the other hand, the Chinese inflation rate has been mostly below 5.0 percent and sometimes negative except for the year 2008 and 2011. On the other hand, South African economic agents have sometimes managed to keep the inflation rate below 6.0 percent but failed in 2007 to 2009 when the CPI was 7.1 percent. The Brazilian inflation rate has been fluctuating throughout the sample period as shown in Table-2. In addition, the Brazilian CPI has jumped from 3.9 percent in 2007 to 9.0 percent in 2009. The Indian CPI has been low during the first half of the sample period reaching 3.8 percent in 2004 but rose sharply to 12 percent in 2010 as shown in Table-4.

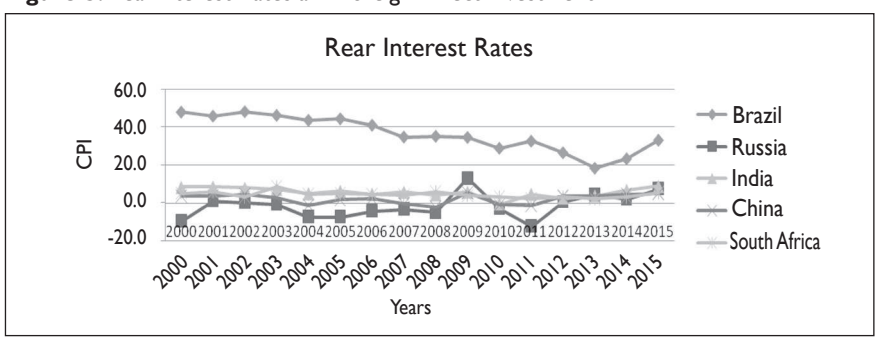
Gini-coefficient

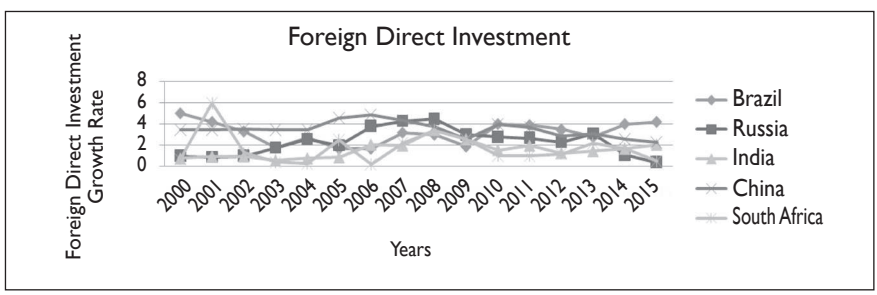
South Africa does not only have one of the highest unemployment rates in the world but also has a very high inequality in income distribution (Gini index). In fact, Table-2 shows that the inequality rate in South Africa has been well above 50.0 percent during the entire sample period. This has been largely attributed the periods of apartheid prior to 1994. On the other hand, the distribution of income in Russia and China is quite well since the Gini-coefficient has been below 50 percent since 2000 as shown in Table-2. India previously had a Gini-index of 33.0 percent but that has changed quite significantly with a Gini-index reaching 60.0 percent in 2014. This reflects that as India grows in terms of GDP, Inequality in income distribution also becomes larger. Finally, Brazil also has problems with income distribution with Gini-index of 0.6 before 2005 after which it has remained constant at 0.5 then increased again in 2015 to 0.6.

Table-3: Interest Rates, FDI and Current Account Balance

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Real Interest Rates																
Brazil	48.1	46	48.3	46.4	43.8	44.6	41.2	35	35.4	34.8	29.1	32.8	26.7	18.6	23.5	33.3
Russia	-9.6	1.2	0.2	-0.7	-7.3	-7.2	-4.1	-3.3	-4.9	13.1	-3	-12.3	0.7	4.5	2	**7.5**
India	8.3	8.6	7.9	7.3	4.9	6.2	4.5	5.7	4.3	5.8	-0.6	4.7	2.6	3.8	6.7	8.9
China	3.7	3.7	4.7	2.7	-1.2	1.6	2.1	-0.3	-2.3	5.4	-1.1	-1.5	3.5	3.7	4.7	4.8
South Africa	5.2	5.7	3.2	8.7	4.5	4.9	4.6	4	5.8	3.9	3.3	2.2	3.1	2.4	3.1	5.4
Foreign Direct Investment as % of GDP																
Brazil	5	4.2	3.3	1.8	2.7	1.7	1.7	3.2	3	1.9	4	3.9	3.5	2.8	4	4.2
Russia	1	0.9	1	1.8	2.6	2	3.8	4.3	4.5	3	2.8	2.7	2.3	3.1	1.1	0.4
India	0.8	1	1	0.6	0.8	0.9	2.1	2	3.5	2.6	1.6	2	1.3	1.5	1.7	2.1
China	3.5	3.5	3.6	3.5	3.5	4.6	4.9	4.4	3.8	2.6	4	3.7	2.9	3.1	2.6	2.3
South Africa	0.7	6	1.3	0.4	0.3	2.5	0.2	2.2	3.4	2.6	1	1	1.2	2.2	1.7	0.5
Current Account Balance (% of GDP)																
Brazil	-3.7	-4.2	-1.5	0.7	1.8	1.6	1.2	0.1	-1.7	-1.5	-3.4	-2.9	-3	-3	-4.3	-3.3
Russia	17.5	10.5	8	7.7	9.9	11	9.3	5.6	6.3	4.1	4.4	4.8	3.3	1.5	2.9	5.2
India	-1	0.3	1.3	1.4	0.1	-1.2	-1	-0.7	-2.5	-1.9	-3.2	-3.4	-5	-2.6	-1.3	
China	1.7	1.3	2.4	2.6	3.6	5.8	8.5	10	9.2	4.8	3.9	1.8	2.5	1.6	**2.7**	**3**
South Africa	-0.1	-0.3	-0.9	-0.9	-2.8	-3.1	-4.4	-5.4	-5.7	-2.7	-1.5	-2.2	-5	-5.8	-5.5	-4.4

Figure-3: Real Interest Rates and Foreign Direct Investment





Real Interest Rates

Real interest rates in the economy are widely accepted as one of macroeconomic variables that the monetary authorities of a nation can

influence in the short run. Brazil's economy has highest level of real interest rates as shown in Table-3. The real interest rates in Brazil were well above 40.0 percent from 2000 to 2007 then started to decline until 2013 where they reached 18.6 percent. Russia's real interest rates were mostly negative during the entire sample period except in 2015 when they reached the maximum of 7.5 percent. India and South Africa had positive real interest rates during the entire sample period. It is importance to note that in macroeconomic theory, higher interest rates are expected to generate foreign investment while at the same time discourage domestic investment by raising the cost of borrowing. Statistics indicate that the Chinese economy was one of the nations that was able to achieve a significantly high GDP growth rate with very low interest rates.

Foreign Direct Investment, Net Inflows (% of GDP)

Foreign direct investment assists in capturing the lasting interest of an entity residing in one country (direct investor) in an entity in another country. The Foreign Direct Investment (net inflows) of the BRICS countries has remained positive from 2000 to 2015 as shown in Table-3. Figure-3 also shows that China has always had higher FDI net inflows as percentage of GDP when compared to other BRICS Countries. The years 2007 and 2008 brought higher net inflows of foreign investment in all five BRICS countries. On the other hand, Table-3 and Figure-3 shows that the FDI net inflows have fluctuated in all BRICS Countries and this is among one of the similarities among the BRICS countries. In 2015, China had FDI net inflow of more than 2.0 percent as well as India. Russia and South Africa had only 0.4 and 0.5 percent respectively. Lastly, Brazil for the first time since the year 2000 had the highest FDI net inflows of 4.2 percent in 2015.

Current Account Balance (% of GDP)

The Current account reflects all the transactions that involve adding economic value between residents and non-residents of the country. India, Brazil and South Africa had negative current account balances for most of the entire sample period. It is worth noting that Table-3 shows that China and Russia have maintain current account surplus for the entire sample period. In fact, the Chinese current account balance have improved from 1.7 percent in 2000 to 10.0 percent in 2007 after which it started to decline year after year till it reached 3.0 percent in 2015. During the same period, the Russian current account balance as percentage of GDP has declined year after year from more than 17.0 percent in 2000 to just 5.0 percent in 2015. In South Africa, the Current account balance was declining year after year from -0.1 percent in 2000 to a negative -5.7 percent in 2008 then started to improve to -1.5 percent in 2010 after which, it started to decline again.

Table-4: Tariff Rate, Applied, Simple Mean, All Products (%)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Brazil	16.5	14.8	14.6	14.4	13.3	12.4	12.2	12.3	13.2	13.4	13.4	13.6	13.75		13.7	16.6
Russia		10.7	10.3			11.4		9.9	8.1	8.1	6	7.5	7.1	8.1	6.8	
India		31.8			29	17.1			10	9.7						
China	16.4	15.3		10.7	9.8	9.2	8.9	8.6	8.4	8.2	7.7	7.8			7.6	16.4
South Africa		8.36			9.2	8.5	8.3	8.1	7.8	7.5	7.6	7.1	7.1	6.3	6.3	

Source: World Bank: World Development Indicators

Tariff Rates

A tariff is a tax on imported goods and services and has the effect of increasing the price of the imports thus, making domestic products more attractive to consumer. Tariff is also a major macroeconomic variable that many governments have used to encourage or discourage competition from foreign suppliers within a country. Table-4 shows that in Brazil, the average tariff rate has mostly fluctuated from more than 16.5 percent in 2000 to more than 12.0 percent in 2008 then started to increase again till the tariff rate reached 16.0 percent again in 2015. Russia has been trying to achieve higher growth while aligning the country with international markets (economic liberating). Table-4 shows that the need for Russia to align the country to the international markets has partly led the government to decrease tariffs after 2005 from 11.0 percent to less than 7 percent in 2013. India had the highest tariff rate when compared to other BRICS countries before 2005. In fact, Table-4 shows that the tariff rate in India was more than 30.0 percent in 2001, which was more than double that of China. Indian data on tariff is only available for some years during the entire sample period. However, both these Asian nations have declined the tariff rates until they were equal in 2015 at slightly more than 16.0 percent. From 2005, the average tariff rate has declined in South Africa and this might have contributed to the increase in cheaper/competitive imports within the country. Hence, all the BRICS nations have been following the same trajectory of declining the tariffs in order to align the economies to the requirements of the World Trade Organisation.

Conclusion

Overall, the growth rates of the five BRICS countries have declined tremendously especially after 2010. This has been accompanied by negative growth in investment in fixed assets in some of the BRICS countries; especially Russia and Brazil. On the other hand, the Gini index of BRICS members seems to have improved a lot since the year 2000 except for South Africa. In addition, the Current account has also been improved within the BRICS with China being the only BRICS country with Surplus since the year 2000. Statistics indicate that Brazilian interest rates are significantly high and inflation rate has been above the point target for several years

since the year 2000. On the other hand, Russian inflation has declined significantly from 21.7 percent in 2001 to less than 8 percent in 2014 while the real interest rates have been mostly negative since 2000. Indian and Chinese inflation rates are not too high and have remained low since 2011; while real interest rates have been sometimes negative. In South Africa, the Inflation target range has been achieved sometimes while the interest rates have remained relatively stable.

Following from above, all BRICS members need to strive for inclusive economic growth, in order to eradicate poverty, address unemployment and promote social inclusion. Lending for infrastructure development purposes need to be encouraged within the BRICS partnership by promoting the objectives of the BRICS bank in order to assist some of the BRICS members. Furthermore, there needs to be a development of proper channels that aim to deal specifically with trade disputes that may arise within the BRICS country in the future because it is not obvious at the moment. In addition, these channels might assist in protecting vital information from leaking into the hands of international speculators that can harm the growth prospects of the BRICS. All BRICS members should be encouraged and supported by other partner to promote and maintain economic stability. The rural/urban disparities within each BRICS country need to be addressed by collaborating with private sector. Addressing systemic and structural deficits would be a step in the right direction for the BRICS. This will definitely influence structural deficiencies neglected in the past. It has therefore become imperative that an inclusive economic agenda be adopted across board to tackle unemployment and poverty. South Africa in particular needs to change the unsupportive international climate as wells address domestic challenges.

The Solow growth model, which was introduced in 1956, follows the neoclassical framework, suggests that growth will be very strong when countries first begin to accumulate capital, and will slow down as the process of accumulation continues (Barrosi and Fillow, 2005). The model firstly, proved that Growth comes from adding more capital, labour and from ideas and new technology. The Solow growth model, further suggest that a sustained increase in capital investment will increase the growth rate (production and employment) only temporarily because the ratio of capital to labour goes up (Barrosi and Fillow, 2005). In addition, the differences in the rate of technological change between countries are said to explain much of the variation in economic growth rates that are observed in reality (Williamson, 1998). These processes of technological advancement assist countries in terms of economic growth and development. Overall, the expansion of each member country's citizen participation and public debate on the role of the BRICS in the international system is crucial in order to discuss the challenges and potential solutions of each BRICS country.

Furthermore, as emerging economies with large populations, landmasses and disparities among their people, the BRICS countries stand to be significantly impacted by climate change. Their particular vulnerability thus requires them to actively participate in the negotiations and planning underway within their regions and internationally to promote sustainable development.

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Foreign Direct Investment in India: Theory and Empirics[1]

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Abstract

The study attempts to identify the determinants of foreign direct investment (FDI) in India after incorporating new determinants such as labour cost, interest rate differential and other macroeconomic variables like GDP, openness, and exchange rate. The study explores determinants of FDI in India for updated time series period 2001-02 Q1 to 2017-18 Q2 on the quarterly basis. The results of our analysis, drawn from a theoretic model of time series analysis shows that the size of the GDP matters in the determination of FDI flows, bolstering the theory of market-seeking FDI. The major factor determining FDI in India is cheap labour cost that is in line with the theory of location specific advantages and underpins the FDI of vertical type. An open economy and an appreciating exchange rate have positively affected FDI flows in India.

Keywords: Determinants, FDI, India

Introduction

Foreign direct investment (FDI) serves the long-term investment purpose of the host country and is considered the most stable form of investment in comparison to all other types of foreign investment. India has constantly

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been an economy with low savings and with humongous investment requirements. FDI, therefore, not only supplements our domestic savings, but also provides technical know-how, managerial skills and adds competition to the domestic market which in turn leads to efficient output and generation of employment. The share of FDI in total investment of the Indian economy has risen from a mere 0.1% of total investment in 1990-91 to a significant high of 10% in 2008-09 albeit the decline witnessed worldwide in wake of the global financial crisis. Additionally, it also provides the much-needed foreign exchange to finance the burgeoning import bill of India. Despite the large number of proponents in favour of FDI, there are critics as well. The critics state that FDI causes an adverse impact on the host countries. They argue that foreign firms monopolize resources, replace small and medium-size domestic enterprises, and sometimes sell their obsolete technology to the host countries. Foreign firms could take away significant amounts of profits from their Indian subsidiaries in the form of royalty, technical fees and dividend and thus may create a balance of payments problem.[1]

On the whole, recognizing the apparent benefits from FDI and in order to capture them fully, the Indian government has adopted a liberalized approach and continues to raise FDI shareholding ceilings on many sectors. For most of the sectors, FDI is allowed through automatic route wherein no prior approval needs to be sought from the central government. The government has been endeavoring to abate impediments in the path of foreign investors both at the entry level and later in the process of establishing the enterprise. Moreover, all the emerging economies are in the process of liberalizing their economies so that they can attract more FDI flows. Therefore, given the present scenario, it is essential to know what the determinants of FDI are, i.e., – whether it is the domestic factors or external factors or a combination of both that are responsible for an increase or decrease in FDI for a given period. Despite India being an emerging superpower, the magnitude of FDI received is significantly less when compared to China. Thus, the present study attempts to estimate the determinants of FDI for India so that appropriate factors can be recognized and suitable policies can be formulated in order to achieve the desired results.

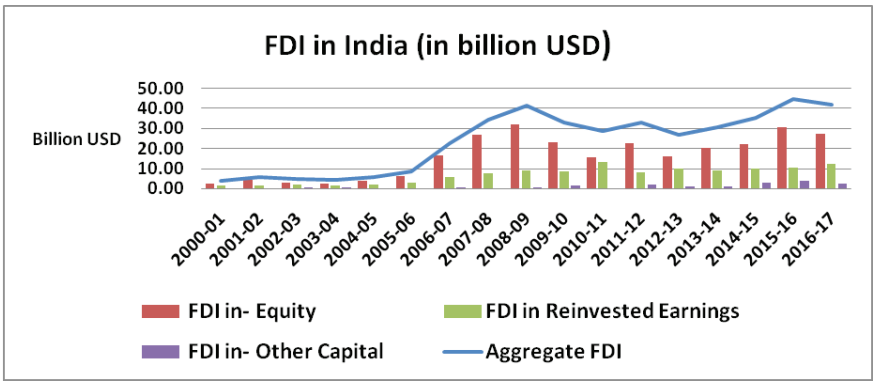
The paper is structured as follows. Section 1 briefly traces the trends in FDI flows to India and components of FDI in India followed by the sources and the sectoral composition of FDI in India. Section 2 presents a review of theoretical literature on FDI and empirical studies finding the determinants of FDI followed by research gaps. The data used and the methodology adopted for the analysis is explained in Section 3. Empirical results of the study are summarized in Section 4. Concluding observations are set in Section 5.

FDI Flows in India

Since the beginning of 1990s with the opening up of the Indian economy, FDI inflows have increased substantially as compared to the earlier regime wherein the scope of foreign investment was controlled. From a meagre sum of less than $1 billion in the early 1990s, it rose more than $2 billion in 1995. From 2001-05, FDI inflows increased to around $ 5-9 billion. Thereafter, there was a sharp rise in FDI flows from around $9 billion in 2005-06 to $42 billion in 2008-09, a more than 4 times increase in the short span of 3 years (Figure-1). This could be broadly attributed to the further liberalization of the FDI policy and change in definition of FDI since 2002 (Rao and Dhar, 2011). As per the committee on Compilation of Foreign Direct Investment in India 2002, the definition of FDI was standardized as – 'any equity investment of at least 10% of the value of firm by non-residents' (DIPP, 2002). This definition provides a benchmark to measure ownership control. In addition to this, earlier only FDI equity flows were counted as FDI but from 2002 onwards, re-invested earnings and inter-company debt were added to the definition of FDI. These changes led to increase in aggregate FDI; however they are in consonance to international practice.

In the presence of global financial crisis, FDI flows slowed down but continue to rise during post-crisis period and recorded a high of $ 45 billion in 2015-16, crossing the pre-crisis level (Figure-1).The dominant share of FDI comes through equity investments, constituting around 70% of total FDI while the rest goes to reinvested earnings and the other capital (Figure-2).

Figure-1: Trends and Components of FDI



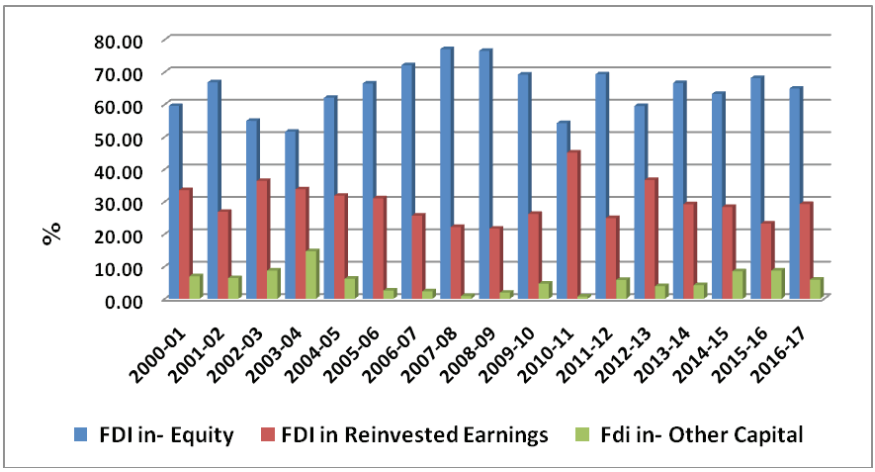
Source: RBI

Route-wise Components of FDI in Equity

FDI in equity comprises equity investments through four different channels. First, investment through automatic route which does not need any prior

approval from the government. The opening of this route was initiated in 1992 and since then investment has continuously been increased. Second, investment through approval route or government route which has been also the oldest route of FDI investments in India. As the name suggests, foreign investors are required to seek prior permission to invest.

Figure-2: Proportion of Total FDI in Equity & Reinvested earnings



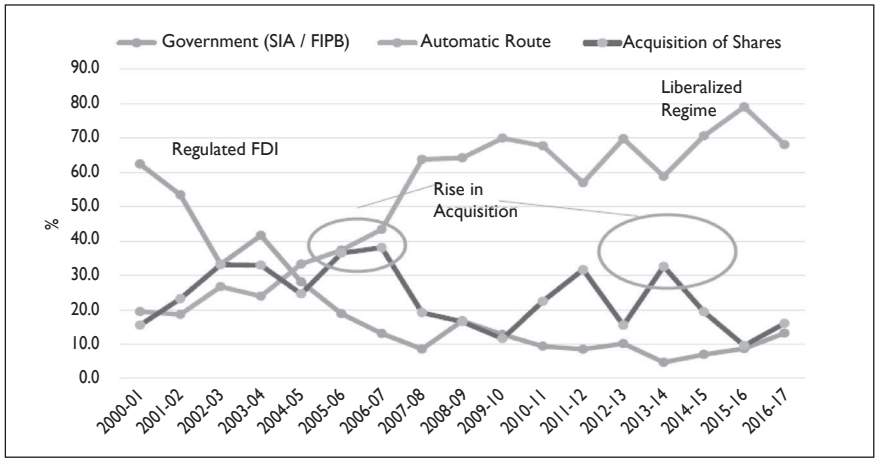
Source: RBI

Foreign Investment Promotion Board (FIPB) which is now named as Foreign Investment Facilitation Board (FIFB) of Department of Economic Affairs (DEA) under the Ministry of Finance of GOI acts as a nodal agency to obtain permission for FDI in India. Third, FDI equity data since 1996 includes acquisition of shares by non-residents. Lastly, a new component of FDI in equity capital of unicorporated bodies was added in mid-2003 and the data was revised on FDI from the financial year 2000. This includes foreign bank branches operating in India and branches of Indian bank operating abroad.

In the early 2000s, the FDI through regulated route constituted the dominant share of FDI in equity of over 65% which has been continuously declining due to opening up of various sectors under automatic route and raising the FDI ceilings on the existing sectors. From the last decade, on an average, its share has hovered around 10% of total FDI in equity (Figure-3). This fall in regulated investments has been captured by rise in investments through automatic route. Its share rose by mere 20% in 2000-01 to 80% in 2016-16. The third component – acquisition of shares by non-residents have witnessed a fluctuating trend. A jump was witnessed in acquisition activity in the golden years of the Indian economy when economic growth was close to two-digit and corporates were registering high profitability.

These have helped in contributing to 38% increase in its share in 2006-07 from a small share of 15% in 2000-01. However, in the aftermath of global financial crisis the FDI flows through this channel declined to 11% in 2009-10 and rose to over 30% in 2011.

Figure-3: Trends in Components of FDI in Equity

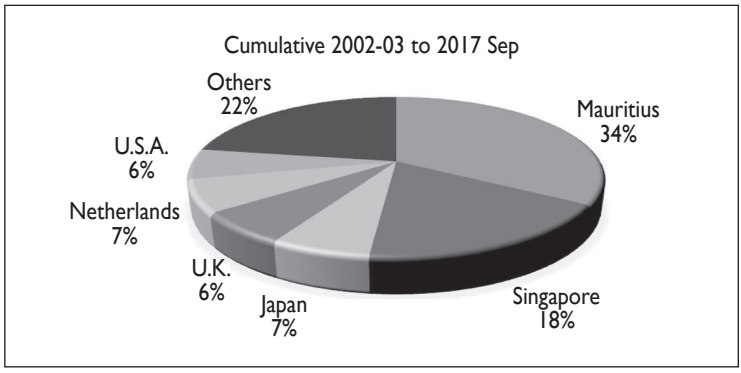


Source: RBI

Share of top Investing Countries in India

The top-5 investor nations have been Mauritius, Singapore, Japan, U.K and Netherlands over the period of April, 2000 to September, 2017. Their cumulative investments contribute around 70% of total FDI equity flows. FDI inflows from Mauritius have being as high as 34% followed by Singapore, that has a share of 18%.

Figure-4: Share of Top Investing Countries FDI Equity Inflows (Rs Crore) (only equity investments, not other forms)



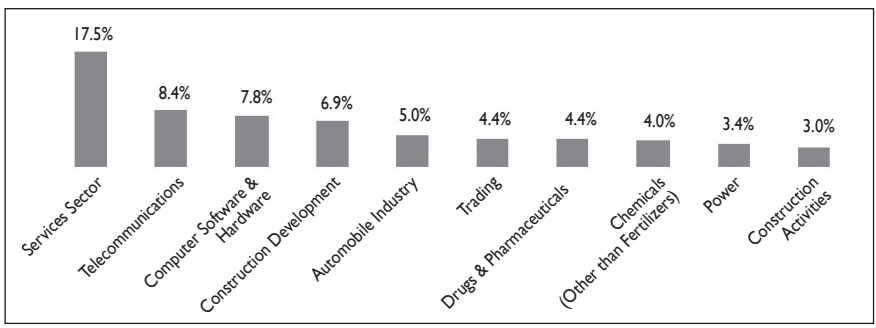
Source: DIPP

The respective shares of Japan, UK, Netherlands and USA in FDI inflows are 7%, 6%, 7% and 6% (Figure-4). Mauritius has been the largest source of FDI for India as its tax rates are lowest in the world and India has signed a double tax avoidance treaty (DTAA) with Mauritius which enables investors to either pay taxes in India or Mauritius. Due to this, dual coincidence of taxes is avoided. Many other countries also take advantage of tax havens like Mauritius by routing their funds through these tax havens in order to escape from tax obligations.

Sectoral Analysis of FDI Equity Inflows

Coming to sectoral analysis of cumulative FDI inflows into India over the past decade (precisely from April, 2000 to September, 2017), maximum FDI equity flows has taken place in the service sector including financial and non-financial services, telecommunication, information technology, followed by secondary and primary sectors. This is also in line with their sectoral share in GDP. Services sector received FDI inflows of Rs 6,608.5 billion or US$ 120 billion during the period 2000-2017. Among the secondary sector, automobile industry has been growing very fast, attracting large investments and consequently, this sector ranked amongst the top five receivers of FDI inflows. It has received 5% of total FDI flows and attracted over Rs 1,000 billion during April, 2000 to September, 2017. After the further liberalization of foreign investment policy during 2005, FDI in new sectors like construction, housing and real estate was opened up. Since then, construction sector has witnessed large amount of FDI and marked its presence in under top 5 sectors attracting the highest FDI equity flows (Figure-5).

Figure-5: Top 10 Sectors Attracting Highest FDI Equity Inflows from April, 2000 to September, 2017



Notes: Services sector consists of Financial, Banking, Insurance, Non-Financial/ Business, Outsourcing, R&D, Courier, Technology Testing and Analysis. Construction development sector includes Townships, Housing, Built-up Infrastructure

Source: DIPP, Ministry of Commerce

Literature Review

Until 1960s, the foreign capital traversed cross-borders in search of higher rate of returns as proposed under the neoclassical capital theory. This theory, however, did not differentiate between foreign direct investment and foreign portfolio investment. Over the period, with plethora of theoretical and empirical research, Stephen Hymer (1960) made a distinction between FDI and portfolio investment. He identified level of control that a foreign firm obtain by directly investing in the host country as the motivation factor behind FDI. Due to this, he explained the concept of ownership advantage which describes that transnational firms have various advantages over domestic firms including technical know-how, managerial expertise, brand name and economies of scale. With the proliferation of MNCs across borders, the prospects of FDI were extended with the internationalisation theories of FDI. These theories have largely focused on pruning down of transaction costs. The eclectic research of Dunning (1980, 1993) provides a broad analysis of FDI based on ownership, location and internalization advantage-based framework to analyze why, where and how MNCs would invest abroad. He summarised it as OLI paradigm which explains "the ownership-specific advantages comprising access to spare capacity, economies of joint supply, greater access to markets and knowledge, diversification of risk, technology and trademarks, firm size; the location-specific advantages consisting of distribution of inputs and markets, costs of labor, materials and transport costs, and government intervention and policies, commercial and legal infrastructure, etc.; internalisation-specific advantages encompassing reduction in search, negotiation, monitoring costs, tariff avoidance, etc." (RBI, 2012). In sum, the foreign capital could be market-seeking, resource-seeking and efficiency-seeking. As per recent theories on FDI based on general equilibrium model, imperfect competition and economies of scale — firm-specific advantages which MNCs possess is the major factor behind FDI inflows. Itcan include human capital, patents, trademarks, etc. (Markusen 1995, 1997).

FDI inflows can be categorized into two types: horizontal and vertical. The former takes place because of differences in trade costs and the latter takes place to exploit the differences in relative prices of factors of production in the host economy. In other words, horizontal FDI refers to producing the same good in other than home country while vertical FDI infers that a part of production takes place in the host country in order to reap the benefits of cheaper factor inputs. All these theories have summarized the supply side factors that push FDI into a host country. But there are demand side factors as well. Studies like World Bank (1995), Markusen & Venables (1999) pointed that host countries also adopt liberalized policy measures to receive FDI inflows. Since developing economies suffer from low saving base and high investment requirements, they try to attract FDI. In addition,

they also receive superior technology, competition in domestic market leading to efficiency gains, and it also provides additional liquidity and depth to their domestic capital markets.

Coming to the empirical studies, there are numerous studies which have worked on finding the determinants of foreign capital for various countries. These studies have largely focused on macroeconomic, political and institutional factors of FDI. Market size, openness, exchange rate, rate of inflation, comparative cost of labour, differential rate of return, etc. are all macroeconomic determinants of FDI. Market size is predominantly measured by gross domestic product (GDP) or national output and has been confirmed as a major and positively significant factor in finding the determinant of FDI (Greene & Villanueva, 1991; Banga, 2003; Azam & Lukman, 2010; Kaur & Sharma, 2013; Gupta & Ahmed, 2018). Real GDP or growth in real GDP has been considered as proxy to market size. The basic idea is that the host countries with larger economy will have higher purchasing power that will enhance sales opportunities and likely to yield higher profit to MNCs. Due to this, they exploit their ownership advantages and thus a positive relationship between Market Size and FDI is presumed.

Openness of an economy is usually measured by value of trade as a proportion to GDP. The more liberalized the host country is, the better are chances to receive FDI as liberalized regime encourages foreign investors (Zhang, 2001;Banga 2003; Sahoo 2006). Moreover export oriented MNCs prefer to invest in open economy as high tariffs can raise transaction costs and thus costs of exports. On contrary, protectionist trade regime of a host country may have a positive impact on market-seeking firms so that production activity could take place within the geographical territories of those regulated economies (Azam & Lukman, 2010).

Foreign exchange rate is the value of domestic currency in terms foreign currency. Either the domestic currency appreciates or depreciates with respect to the foreign currency. The depreciation of the host currency reduces its wages and production costs relative to those of its foreign counterparts and therefore vertical FDI is likely to increase. On the other hand, stronger exchange rate is likely to incentivize horizontal FDI and costs of imported intermediate inputs will be reduced in the production process. Therefore, theoretical models provide no clear indication as to which effect is dominant; hence it remains an empirical question (Harchaoui et al., 2005; Walsh & Jiangyan, 2010).

Infrastructure facilities: the availability of state-of-the-art physical infrastructure in terms of constant power supply, water, transportation in all modes- roads, waterways and airways, telecommunication, high-speed internet, etc. help in attracting foreign investments. In addition, availability of skilled labour has a positive impact on FDI (Sahoo, 2006).

Interest rate differential: According to capital market theory – higher interest rate in the host country than the home country attracts foreign firms to invest in higher return country. However, this theory ceases to take into account difference between foreign direct investment and portfolio investment. Many studies have measured this variable by considering the difference between two different interest rates. One interest rate is representative of the host economy and the other is of MNC's home country, say the US or any European country (Verma & Prakash, 2011; Garg&Dua, 2014)

Cost of labour: To reap the benefits of comparative cheap labour in developing economies, firms invest in these countries; subsequently cost of production diminishes and avenues of profit rises. The significance of lower comparative cost of production, mainly labour cost, has been well-articulated under location specific advantage theory and resource seeking FDI theory as proposed by Dunning, 2001. This also specifies type of vertical FDI. However, there is a lack of empirical studies validating this specific argument (Tsai, 1994; Jadhav, 2012). To the best of authors' knowledge there is no study in context to India which have considered this aspect into their study. In this study, construction of wage gap has been attempted by taking difference between wages offered by US and India wherein US is proxied as home to MNCs and India is represented as FDI receiving country.

Political and Institutional Factors: There are many studies (Mauro, 1955; Poirson, 1998; Leite&Weidmann, 1999; Svensson, 2005; Shera, Dosti&Grabova, 2014) which have suggested that political stability and weak institutions inhibit economic growth and investment.Corruption acts as a major constraint in attracting foreign investments as it leads to inefficiency in public projects and slows down private investment since it raises the cost of doing business. On the contrary, there are studies (Colombatto, 2003; Paul, 2010; Swaleheen, 2011; Helmy, 2013) which have found a positive relationship between corruption and FDI inflows. As it is believed that corruption, as a bribe, enhances administrative efficiency of the government and diminishes the transaction cost of time which eventually positively affects economic growth and investment. Some studies (Méon&Sekkat, 2007; Gupta & Ahmed, 2018) have found that corruption neither induces nor inhibits FDI flows.

Research Gaps

On the basis of literature review discussed, it is found that there are various studies pertaining to different country, time-period, variables and methodology, which have investigated potential determinants of FDI. However, to the best of authors' knowledge, there is a need of comprehensive study on finding the determinants of India after incorporating new

determinants such as wage differential and also updated time-series data for robust results which are better suited for policy prescriptions.

Data and Methodology

Data

The study explores determinants of FDI in India for the period 2001-02 Q1 to 2017-18 Q2 on the basis of quarterly data. For this purpose, FDI in equity is considered as the dependent variable, not the aggregate FDI flows to India. A part of total FDI flows including reinvested earnings and inter-company debt do not contribute to infusion of fresh capital in the country. Thus, we are taking FDI equity flows to find out its determinants as this is the form of foreign capital India wants to gain and acquire as much as possible.

The data for the same is culled from DIPP, Ministry of Commerce and is denominated in Rs billion. On the basis of literature review discussed in the previous section, the underlying independent variables are market size, openness, wage differential, exchange rate and interest rate differential. These variables are further explained in Table-1 below.

Table-1: Description of Explanatory Variables

Explanatory Variables	Indicator	Expected Sign	Data Sources
Market Size (GDP)	Real GDP in Rs billion	Positive	Handbook of Statistics of Indian Economy, RBI
Openness (OPEN)	(Export+ Imports)/GDP	Positive	Handbook of Statistics of Indian Economy, RBI
Exchange Rate (e)	Nominal Effective Exchange Rate2	Positive/ Negative	Handbook of Statistics of Indian Economy, RBI
Interest Rate Differential (i-i*)	Difference between 91-day treasury bill rate for India and 3-month treasury bill rate for US	Positive	RBI Bulletin, RBI and IMF Statistics
Wage Differential (w*-w)	Difference between Nominal daily earnings of wage and salary workers in US (converted in Rs) and Average Daily Wage Rate in Rural India for Men (Rs)*	Positive	Labour Bureau of India and Federal Reserve Bank of St. Louis Economic Data

*see foot note 3 for details[3]

In our study, all the variables except interest rate differential have been transformed in natural logarithmic form in order to penalise the large values as well as to correct for heterogeneity bias.[4] This will also enable us an easy interpretation of regression results. However,the results drawn on the basis of aforementioned macro level data is useful for drawing macro level inferences. It may not necessarily take into account firm specific determinants of FDI, which is the limitation of our study.

Methodology

In order to assess the determinants of FDI in India, we have first tested whether the data series is stationary or not as the presence of unit roots may lead to spurious results. If data series are found to be non-stationary then in the next step the order of integration is estimated. For robustness, in this study we have applied Augmented Dickey Fuller (ADF) unit root test by using *eviews* software. This test assumes the presence of unit root at level and rejection of null suggests that data series are stationary. Furthermore, it is usually recommended by experts that non-stationary series be transformed into stationary series by appropriate differencing, before any empirical testing. However, it is not easy to interpret variables in a differenced form as economic theory always explains them in a level form. As a result, transformation of series by appropriate differencing further raises questions about its suitability in applying it to econometric models,even when it is statistically correct. The way out for this was proposed by Engle and Granger(1987)to model non-stationary series at levels only if all data series are integrated of the same order and are co-integrated as well. This is due to the fact that a long-run relationship may exist between the variables despite the presence of unit roots. In this scenario, co-integration tests can be applied to find out suitability of estimation methods at levels. We applied Johansen Co-integration test with the help of statistical software *eviews 9*. The null hypothesis assumes that there is no co-integration between the variables and the rejection of it signifies the presence of long-run association between the variables.

After establishing the long-run association among the variables, we applied a theoretical model wherein Ordinary Least Squares (OLS) multiple regression analysis has been used. The generic form of the model is as following:

$$LNFDI_t = \alpha + \beta 1\ LNGDP_t + \beta 2\ LNOPEN_t + \beta 3\ LNE_t + \beta 4\ i_t - i_t^* + \beta 5\ LN\ (w_t^* - w_t) + \varepsilon_t$$

Empirical Results

In this paper we have conducted empirical analysis to find out the determinants of foreign direct investment inflows into India, covering the period 2001-02 Q1 to 2017-18 Q2. Descriptive statistics (DS) are calculated to demonstrate the primary features of our data series used in this paper. These are estimated for individual seriesconsisting of 66 observations, each as presented in following Table-2. The average value of FDI per quarter that India received is Rs 234.07 billion while the average size of India in terms of real GDP is 53 times larger than FDI inflows. Before the second-generation liberalization reforms started in the sector of FDI, the lowest inflows amounted around Rs 17 billion while the highest

inflows touched a peak of Rs 710 billion in the recent years. The quarterly real GDP has spiraled around 3.5 times from minimum of Rs 6118 billion to the maximum of Rs 21042 billion. Coming to wage-gap between the U.S. and India, on an average, US pays nearly Rs 7899 higher than India to its workers. As per the mean value of exports and imports as a proportion to GDP, sum of value of exports and imports is one-third of GDP at current prices. The mean value of nominal effective exchange rate which acts as a proxy to exchange rate indicates depreciation of Indian rupee against a basket of foreign currencies by nearly 10%. On an average, India offers 5% higher interest than the U.S.

Table-2: Descriptive Statistics

	FDI (Rs billion)	GDP (Rs billion)	WAGEDIFF (Rs)	OPEN (Exports+ Imports/GDP)	E (NEER)	i-i* (%)
Mean	234.07	12354.24	7898.53	0.32	90.63	5.32
Maximum	709.56	21042.55	11491.74	0.48	106.65	10.91
Minimum	16.75	6118.50	6029.31	0.17	71.57	1.13
Std. Dev.	185.98	4280.80	1766.40	0.08	10.91	2.37

Source: Authors' Calculations

We have tested for the stationary properties of our time series in order to rule out possibilities of spurious regression results. For this, first of all the data variables have been transformed into logarithmic form, so as to correct for heterogeneity bias and thereafter the transformed series were tested for stationary ADFtest. The results are presented in Table-3. There is a presence of unit root in levels for all the variables. However, the data series have been observed to be stationary at first-difference, i.e., they do not contain unit root in first difference.

Table-3: Unit Root Test

	Augmented Dickey-Fuller (ADF) Test				
Variables	**Levels**	**(P-Value)***	**First Difference**	**(p-value)***	**Decision**
LNFDI	-1.77	0.71	-6.80	0.00	I(1)
LNGDP	-2.82	0.19	-4.26	0.01	I(1)
LNWAGEDIFF	-1.80	0.69	-4.74	0.00	I(1)
LNOPEN	-0.39	0.99	-4.94	0.00	I(1)
LNi-i*	-1.72	0.73	-8.73	0.00	I(1)
LE	-1.79	0.70	-6.84	0.00	I(1)

Source: Authors' Calculations

We observed unit roots at level in our data series. As its absence is noted after first differencing, there is a need to test for co-integration. A co-integration test has to be applied in order to find out the suitability of applying a standard estimation method. In this regard, Johansen Co-integration test has been applied. The results of Cointegration Trace test and Maximum Eigenvalue test are presented in Table-4 and Table-5 respectively, which indicate two cointegrating equations. In other words, it suggests the rejection of the null hypothesis of no co-integration between the variables. It signifies a long-term relationship between the variables – FDI, GDP, openness, exchange rate, interest rate differential and wage differential. Despite individual series of the aforementioned variables are found to be non-stationary; some linear combinations of these series are stationary.

Table-4: Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	Critical Value at 5%	P-values**
None *	0.87	221.94	117.71	0.00
At most 1 *	0.48	89.72	88.80	0.04
At most 2	0.27	47.71	63.88	0.52
At most 3	0.24	27.18	42.92	0.67
At most 4	0.09	9.65	25.87	0.94
At most 5	0.06	3.68	12.52	0.79

Notes: Trace test indicates 2 cointegratingeqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values
Source: Authors' Calculations

Table-5: Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	Critical Value at 5%	P-values*
None *	0.87	132.23	44.50	0.00
At most 1 *	0.48	42.00	38.33	0.02
At most 2	0.27	20.53	32.12	0.61
At most 3	0.24	17.53	25.82	0.41
At most 4	0.09	5.96	19.39	0.96
At most 5	0.06	3.68	12.52	0.79

Notes: Max-eigenvalue test indicates 2 cointegratingeqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values
Source: Authors' Calculations

As the variables are co-integrated, it is possible to apply standard times series theoretic methods such as Ordinary Least Squares multiple regression analysis and their results can be interpreted in level form. However, it should be noted that any relationship that would be suggested

between FDI and its determinants shall be applicable only in the long-run, not in the short-run.

The results of the model are explained in Table-6. The explanatory power of the model is very high. All the variables except interest rate differential proved statistically significant at 5% level or lower. The key variable GDP (LNGDP) proved statistically significant and its coefficient confirms that FDI inflows grow by 1.2 % when the GDP rises by 1%. This confirms that foreign firms exploit domestic markets to obtain a larger market access. Considering the larger size of Indian economy and growing purchasing power of people residing, it becomes profitable for MNCs to come and invest into the Indian economy. Thus, FDI is market-seeking is nature as confirmed by other studies as well (Jadhav, 2012; Kaur & Sharma, 2013; Gupta & Ahmed, 2018). The next vital variable in support of location-specific advantage and resource seeking FDI theories is comparative labour costs or wage-gap which is measured by wage differential between the US and India, is found highly statistically significant at 1% level. It confirms that when there is 1% increase in wage-gap, FDI inflows into India are expected to rise by 5.6% specifying that lower wages in India attracts foreign investments as it reduces the comparative cost of production. In this way, it strengthens the FDI of vertical type.This result is highly convincing in context to India which continues to be a low wage economy wherein larger part of population is dependent on self-employment activities (Papola&Kannan, 2017).

Another key variable, openness, is found to have positive relation with FDI inflows and is at statistically significant at 1% level. The positive coefficient indicates that 1% increase in this variable is expected to causes 1.95% increase in FDI inflows. It suggests that an economy open to external trade tends to attract more of foreign investments which reflect the nature of export-oriented foreign firms (Sahoo, 2006; Kaur &Sharma, 2013). The next variable foreign exchange rate measured by nominal effective exchange rate is positive and statistically significant at 1% level. Its positive coefficient indicates that appreciation of exchange rate by 1% stimulates FDI flows by 8.78%. This indicates that a rise in the value of domestic currency leads to fall in costs of intermediate inputs that are to be imported for the production of goods in the host country. On the other hand, it shows that higher returns to the foreign investors in the presence of appreciation of domestic currency (Lily et al., 2014; Garg&Dua, 2014). Last variable, the differential between domestic interest rate and foreign interest rate found statistically insignificant. It suggests that FDI inflows are not motivated by higher interest rate offered by the host country. In other words, FDI in India does not chase returns as it largely serves long-term investment purpose unlike portfolio investors having shorter horizon. Thus, it invalidates the neo-classical capital theory.

Table-6: Estimated Long-term Relationship using OLS Model

Dependent Variable: LNFDI			
Explanatory Variables	**Coefficient**	**t-Statistic**	**P-value**
LGDP	1.20	1.96	0.05**
LWAGEDIFF (w*-w)	5.66	2.84	0.01*
LOPEN	1.95	3.98	0.00*
LE	8.78	2.92	0.00*
i-i*	0.03	0.49	0.62
C	-94.05	-3.47	0.00*
	No. of observations		66
	R-squared		0.76
Diagonstic Statistics	Adjusted R-squared		0.74
	F-statistic		38.05
	Prob (F-Statistic)		0.00

*Coefficient statistically significant at 1%; **Coefficient statistically significant at 5%

Source: Authors' Calculations

Conclusion

In this study we attempted to probe the determinants of FDI in India since it plays a vital role in the economic development of India. The present study reveals that size of the GDP matters, as it has proved to be a highly influential factor in the determination of FDI. Thus, it confirms that FDI in India is market seeking as foreign firms invest to exploit the large market size of the country. Wage-gaphas proved to be highly significant factor in determining the FDI. The theory of location specific advantage and resource seeking hypothesis is further reinforced, so the FDI of vertical type is fortified. This result is highly convincing as India continues to be a low wage economy in comparison to her foreign counterparts (Papola and Kannan, 2017).However, Indian labour market suffer fromlabour market rigidities such as archaic labour laws which obstruct the operations of various firms and hinder them to reap the benefits of scale economies.

The other macroeconomic variables such as exchange rate and trade openness have proved to be highly influential. Thus the present study contends that policymakers in this region must be cautious in the movement of exchange rate and measures should be adopted for further liberalised trade regime.

Despite the fact that India is becoming increasingly attractive to FDI flows, it constitutes a minuscule share in world's FDI, thus indicative of the regulatory regime and policy barriers in the region. Thus to facilitate greater flows, there is a need for further liberalisation of FDI policies and removal of labour rigidity.

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Endnotes

1 http://www.business-standard.com/article/companies/royalty-bigger-than-dividends-for-mncs-114011701117_1.html

2 NEER is defined as 36 country export-based. We have also conceptualized considering NEER adjusted for inflation (i.e. REER) as a proxy of exchange rate but the series turn out to be integrated of order zero while all other variables are integrated of order 1. So we dropped this variable and replaced it by NEER.

3 For Indian wage rate- Average Daily Wage Rate in Rural India for Men is considered, which comprises 12 Agricultural and 13 Non-Agricultural occupations across 20 major States of India. And to obtain a comparative wage rate we have considered U.S. wage rate as a proxy to foreign wages. The U.S. Bureau of Labour Statistics provides large quantum of wage data pertaining to various occupations, states and of frequencies. For our study, we have used quarterly series on Nominal Weekly Earnings of Wage and Salary Workers up to High School Graduates. They have not attended college. Their weekly US dollar earnings are then transformed to daily earnings denominated in Indian Rupees in order to construct a differential wage series.

4 In the log transformation of level variables, the problem of heteroscedasticity may be less serious because it compresses the scale in which variables are measured. For further details refer to P-413, Gujarati (2009).

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