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Is the Evolution of India's Outward FDI Consistent with Dunning's Investment Development Path Sequence?

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IS THE EVOLUTION OF INDIA'S OUTWARD FDI CONSISTENT WITH DUNNING'S INVESTMENT DEVELOPMENT PATH SEQUENCE?

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Abstract

This paper examines whether India's Outward Foreign Direct Investment (OFDI) pattern is consistent with Dunning's Investment Development Path (IDP) sequence using macro data over the period 1980-2010. We test whether the level of development - proxied by GDP per capita - is the main factor explaining OFDI, and augment the IDP by studying other major determinants such as Exports, Inward FDI (IFDI), Human Capital, and R&D using the Cointegration and Error Correction Model techniques. Our results support the main proposition of the IDP, but also highlight the importance of other factors. We also find that OFDI Granger-causes R&D, suggesting a possibility of reverse technology spillover.

JEL Classification: F21, F23, O30

Keywords: Outward FDI, Investment Development Path, Error Correction Model, Granger Causality, Reverse Technology Spillovers

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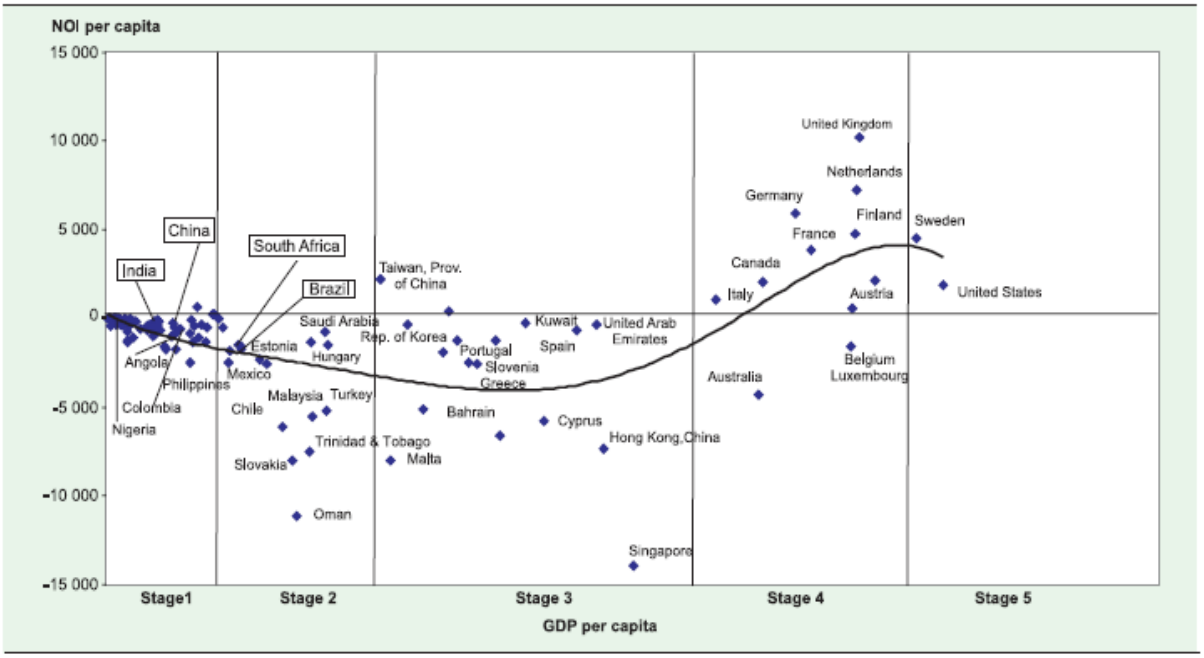
1. INTRODUCTION

The emergence of Transnational Corporations (TNCs) from developing countries is often analysed in terms of the IDP theory. According to the IDP theory, the OFDI and IFDI position of a country is systematically related to a country's level and structure of development. Outward investment is expected to be undertaken only when a country has reached a certain minimum level of development. A brief overview of the IDP theory is depicted in Figure 1 (taken from World Investment Report 2006) which correlates Net Outward Investment (NOI) with GDP per capita, showing that in the broadest sense IDP holds.

Figure 1: Relationship between NOI per capita and GDP per capita for selected countries, during 2004



Source: UNCTAD.
Note: A total of 135 countries were included in a regression equation, which postulated a relationship between the level of development and the net outward investment (NOI) position of countries (i.e. outward FDI stock less inward FDI stock). Only a small number of countries have been indicated in the figure, for illustrative purposes. The points on the bottom axis at which the stages are divided from each other were chosen to correspond with theoretical predictions of the relationship between the NOI and level of development, and in this sense are notional. These points dividing the stages are roughly $2,500 (between stages 1 and 2), $10,000 (between stages 2 at 3), $25,000 (between stages 3 and 4), and $36,000 (between stages 4 and 5).

However the main question that needs to be addressed is whether there is a case for a refined theory for investment from developing nations. Many authors, such as Mathews (2002), have argued for alternative theories to explain internationalisation. Compared to developed nation TNCs, a developing country's TNCs, at a similar stage of development, may be investing overseas at a very early stage. Furthermore, there could be a wide range of either firm-specific advantages or policy implications affecting the investment climate. For example, the introduction of the Foreign Exchange Management Act (FEMA) in 2000 brought about significant policy liberalisation in India. Indian firms could now take 100 percent stakes in their overseas subsidiaries in any line of business (Satyanand & Raghavendran, 2010).

The paper thus aims at studying to what extent the IDP sequence explains the pattern of OFDI from India. The paper also augments the IDP model to include other significant factors affecting OFDI. The twofold contribution highlighting the novelty of our paper is:

1. As supported by studies such as Stoian (2013), Kalotay (2008), and Kalotay & Sulstarova (2010), the IDP alone cannot explain the surge in OFDI for countries that are in stage 2. Moreover, many emerging economies have leapfrogged the development path. India whose NOI position is negative throughout (stage 2 or stage 3) (Verma & Brennan, 2011), and is witnessing an increase in both OFDI and IFDI flows, thus suggests a break in the IDP pattern. Also, the empirical findings from the past literature on India, suggesting a U-shaped pattern, do not fall in line with the actual investment sequence. Moreover, the same IDP equation cannot be used to explain the pattern for both developed and developing countries. Therefore, our paper examines IDP as a conventional theory explaining OFDI (and not the commonly used NOI) by augmenting the IDP to explore other home country determinants. This forms our first contribution.

2. Unlike previous studies that use an augmented IDP version, we undertake an extensive Time Series analysis by looking at India's overseas investment data for the period 1980-2010. Furthermore, the paper looks at the question of whether a two-way causal relationship exists between OFDI and the determining factors. We also include Human Capital as one of the factors

explaining the growth of outward investment (Dunning & Narula, 1996). This is the second important contribution.

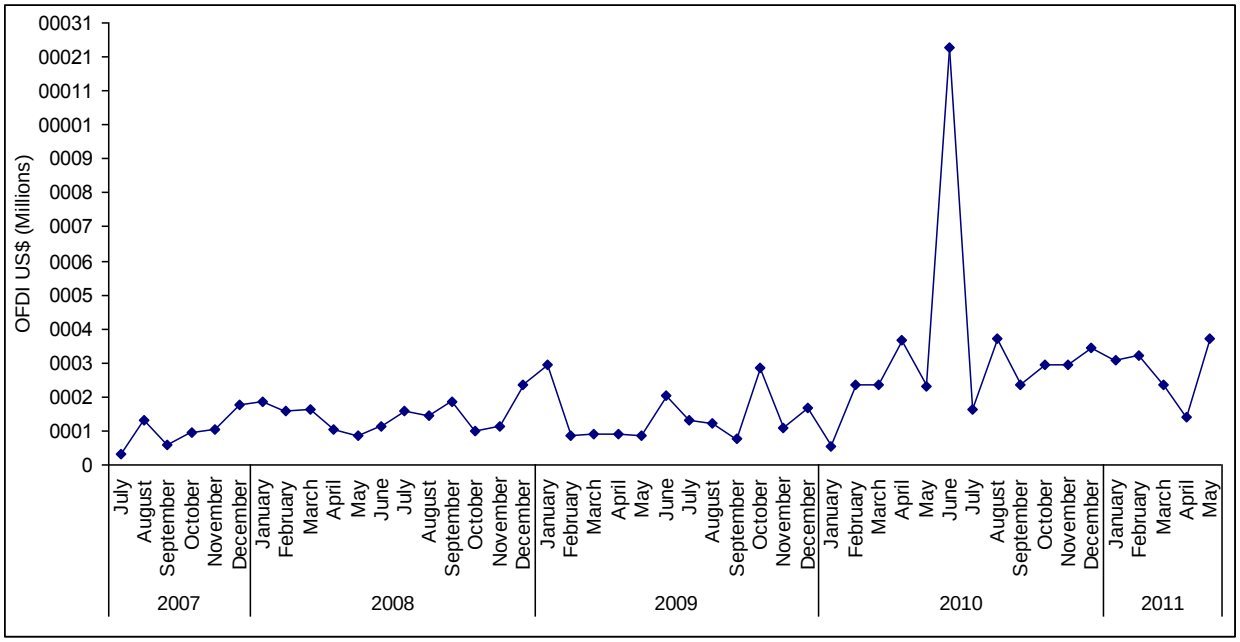
Apart from these main contributions, the issues raised here have important policy implications for other developing nations. Should the countries seeking internationalisation wait for their per capita incomes to grow to undertake OFDI or should they invest at an early stage of their development, breaking with IDP theory? In case of latter, this would emphasise the importance of other factors - apart from the income level of a country - which need to be considered.

2. RECENT TRENDS: INDIA'S OFDI POSITION

Indian firms expanded overseas in two waves, first in the 1970s and 1980s, and, second, after 1995 with a major liberalisation in the 2000s. During the second wave outward investment was not just on a bigger scale, but 60-70 percent of the investment was realised in highly advanced countries. Despite having a low income per capita in 2005 and 2006, India had more OFDI than inward, an outcome contradictory to the IDP sequence (Ramamurti & Singh, 2009). This section mainly aims at sketching the profile of India's OFDI position, outlining its sectoral and geographical distribution.

Figure 2 summarises the trends for the period of July 2007 – May 2011, showing aggregate monthly overseas investment by various Indian Companies, in Joint Ventures and Wholly Owned Subsidiaries abroad. The graph shows a fairly consistent trend with OFDI ranging between US$1 and US$4 billion over the entire period, except for a very high peak in June 2010. The latter was due to the substantial overseas investment by Bharti Airtel Limited (a communication services company) in two joint ventures in Netherlands and Singapore.

Figure 2: India's monthly OFDI position (US$ million): 2007-2011



Source: RBI Database (www.rbi.org.in/scripts/statistics.aspx)

(Compiled by the Foreign Exchange Department, Central Office, Overseas Investment Division)

The sectoral composition of OFDI in US$ millions for the months of April-June for 2008 and 2009 is presented in Table 1. In both years the manufacturing sector accounted for the highest percentage; 36.9 percent in 2008 and 47.29 percent in 2009. The share of trading was 15.26 percent (2008) and 12.4 percent (2009), and that of non-financial services was 12.26 percent (2008) and 12.98 percent (2009).

An interesting aspect of India's OFDI is its rising share in developed countries compared to developing countries: 86.1 percent of India's OFDI was targeted at developing countries until up to 1990. It then fell to 46.2 percent between 2002 and 2006. On the other hand, OFDI to developed nations increased from 35 percent in 1990-95 to 53.8 percent in 2002-06 (Athukorala, 2009). The direction of India's OFDI is given in Table 2, for the same April-June period during 2008 and 2009. The main destinations were Singapore, Netherlands and the US in 2008, and Mauritius, Singapore and the US in 2009. Thus most of the outward investment was in the resource-rich industrialised countries.

Table 1: Sectoral Distribution of India's Outward FDI (US$ millions)

Sectors	April – June	
	2008	**2009**
Trading	463.8	290.0
Manufacturing	1121.7	1105.3
Financial Services	97.2	10.0
Non-Financial Services	372.6	303.4
Others	983.6	628.5
Total	**3039.0**	**2337.2**

Source: RBI, Monthly Bulletin, October 2009

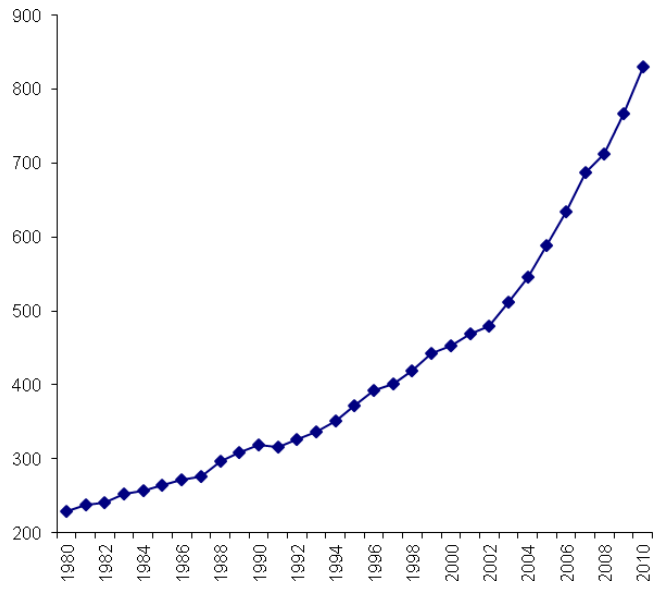
Table 2: Direction of India's Outward FDI (US$ millions)

Country	April – June	
	2008	**2009**
Mauritius	284.1	551.1
Singapore	1023.8	480.1
US	352.4	446.0
UAE	275.8	346.3
Netherlands	723.4	149.8
Switzerland	42.6	64.2
British Virgin Islands	49.8	59.3
Cyprus	13.3	56.1
Hong Kong	22.8	23.0
Germany	14.8	20.8
Others	352	341.4
Total	**3154.8**	**2538.2**

Source: RBI, Monthly Bulletin, October 2009

To finish this section we provide a brief summary of India's GDP per capita growth trends (Figure 3). This is done to help establish a theoretical link between OFDI and growth in case of India, something which will be analysed more formally later in the paper. India's GDP per capita has almost quadrupled between 1980 and 2010. Since the mid-1980s, India has slowly opened up its markets through economic liberalisation. After more fundamental reforms since 1991, and their renewal in the 2000s, India has progressed towards a free market economy. The late 2000s saw India's annual GDP growth reaching 7.5 percent. The rising trend of GDP per capita poses the question of whether overseas investment also took an upward trajectory during the same period. Another issue concerns what, if any, OFDI-promoting advantages may have been initially gained from increasing IFDI in India, mainly because of a surge in ODFI despite being in stage 2/3 of IDP. Finally, as Indian Multinational Enterprises (MNEs) are different from Developed Countries' MNEs, studying the pattern of India's OFDI gives a chance to understand and further develop the process of internationalisation. These factors form the motivation for testing the IDP theory for India.

Figure 3: **India's GDP per capita (Constant 2000 US$): 1980-2010**



Source: World databank, World Development Indicators & Global Development Finance. (www.databank.worldbank.org)

In the following sections we discuss the theoretical background, focusing on the factors determining OFDI. Further, we revisit the IDP theory in detail, followed by a review of the empirical literature based on other countries' case studies, before setting up the hypotheses for subsequent analysis. Next, we discuss the methodology, data and results before reaching some preliminary conclusions.

3. THEORETICAL OVERVIEW

There is an extensive literature focusing on the factors driving OFDI. The most widely used approach is based on Dunning's Eclectic Paradigm, which attributes the level and structure of a firm's foreign value-adding activities according to four conditions (Dunning & Lundan, 2008):

1. The extent to which a firm possesses Ownership-specific (O) advantages vis-à-vis firms of other nationalities in servicing of a group of markets, such as possession of intangible assets.
2. The extent to which the enterprise adds value to its O-advantages rather than selling them. This is achieved either by greater organisational efficiency or by exercising monopoly power. Such advantages are called Internalisation (I) advantages.
3. The extent to which the global interests of a firm are met by creating and utilising its O-advantages in a foreign location. This gives a competitive advantage to the country that possesses them, called Locational (L) advantage.
4. Given the Ownership-Localisation-Internationalisation (OLI) advantages, the extent to which a firm believes that foreign production would fulfil the long term objectives of its stakeholders underpinning its managerial and organisational strategy.

The Eclectic Paradigm therefore seeks to offer a general framework for determining the extent and pattern of foreign-owned production undertaken by a country's own enterprises. However, the evidence from developing countries suggests that there are a wide range of other important factors. These include market access for exports, the degree of vertical integration, and access to technology. For example: Dr. Reddy's Laboratories acquired Betapharm in Germany suggests that overseas investment is driven by the aim of accessing markets for exports. Similarly, the

acquisition of New Logic in Austria by WIPRO is an example of how access to technology is an important factor (Nayyar, 2008). Stoian (2013) also supports the role of home country institutional factors, such as trade openness and liberalisation, as determinants of OFDI. Das (2013) shows that a source country's political risk, technology investments, and degree of openness contribute significantly to OFDI from developing countries.

A recent survey on TNCs from developing countries carried out by UNCTAD, revealed that these enterprises are motivated by market-seeking, efficiency seeking, resource seeking or created-asset-seeking behaviour. The survey showed that 51 percent of the respondents said that market access was the most significant motive, 22 percent aimed at efficiency seeking, searching for low cost inputs, while 13 percent and 14 percent of investments were directed at resource-seeking and created-asset-seeking behaviour respectively (UNCTAD, 2006). A number of other theoretical models, including Neoclassical Trade theory, and approaches using Aggregate and Policy Variables, analyse the determinants of FDI using a combination of factors. For example, Neoclassical Trade theory suggests that capital moves to countries with higher returns, while the Aggregate Variables approach assesses the affect of host country characteristics such as market size, cultural similarity, and firms' experience (Faeth, 2009).

The Indian story is consistent with the strategic factors mentioned above, but there is another significant dimension explaining OFDI from India: the changes in policy regime. Indian TNCs started emerging in early 1960 when conglomerates like Tata and Birla began to expand by investing in Sri Lanka and other African countries (Pradhan, 2005). However, as compared to the past trends, Indian companies rapidly began investing abroad only in the 1990s and, in particular, India's overseas investment underwent a major liberalisation since 2000, with the introduction of FEMA. An investment limit of up to US$ 50 million was now available annually without any profitability conditions. Companies could now invest 100 percent of the proceeds of their American Depository Receipts (ADR) and Global Depository Receipts (GDR) issues for acquisition of foreign companies (RBI Bulletin, 2009).

Further in 2002, the automatic route was liberalised and the limit for investment in Joint Ventures (JV) and Wholly Owned Subsidiaries (WOS) was increased to US$ 100 million. In

2004, the permitted end-use for External Commercial Borrowings (ECB) was enlarged to include overseas direct investment in JVs/WOSs. Also in 2007, the ceiling of investment by Indian entities was revised to 400 percent of the net worth. Finally, the Registered Trusts and Societies engaged in manufacturing and education sector were allowed in 2008 to make investment in the same sector(s) in a JV/WOS outside India; with prior approval of the Reserve Bank of India (RBI Bulletin, 2009). Thus, in the post 2003 period, policy changes enabled corporate entities to invest in bona fide businesses abroad. Also, the focus during this period shifted from green-field investments to overseas acquisitions globally as a mode of foreign market entry (Hattari & Rajan, 2010).

Lastly, Indian firms could not have initiated their overseas investment without the capacity and ability to compete in the world market. The Industrial Deregulation, Trade Liberalisation and the Public Sector Reforms together subjected the Indian industries to a major restructuring in the 1990s. There were closures, mergers, and acquisition of foreign technologies and R&D capabilities. This phase marked the emerging competitiveness of Indian firms. Entrepreneurial abilities were created and legal frameworks necessary for a more market-based economy were put into place. Thus, the foundations of building up the management, technological and international capabilities were laid in the era of economic liberalisation.

The research question now arises as to whether India's OFDI is consistent with the IDP sequence. Few studies have tested the IDP pattern for India, such as Sathye (2008) and Verma & Brennan (2011). However, these studies failed to take into account in their empirical testing the fact that the actual NOI trend is quite different from that suggested by conventional theory. Despite observing a break from the conventional theory as apparent from the convergence of OFDI and IFDI flows in the 3rd stage, these studies still apply the same quadratic specification instead of reframing the IDP equation. Our paper therefore tries to fill the gap in the literature firstly by using the IDP concept to focus on the pattern of India's OFDI and not its net investment position, and secondly by augmenting IDP to take into account other important explanatory factors, in addition to economic growth, that could explain the divergence from the theory. Moreover, our study contributes by undertaking a detailed Time Series analysis. Let us begin our discussion with a brief revision of the IDP theory.

4. REVISITING THE INVESTMENT DEVELOPMENT PATH THEORY

IDP is a theoretical notion that seeks to relate the IFDI and OFDI positions of a country to different stages of development (Dunning, 1981, 1986, 1988). As a country increases its GDP per capita and its asset base evolves, the level and pattern of its investment displays a systematic change. The basic hypothesis is that as a country develops, its domestic Ownership-Localisation-Internalisation (OLI) advantages alter. This affects both foreign owned firms considering IFDI projects and national firms contemplating overseas investment.

In Stage 1 of the IDP, a country's competitive advantages rest mainly on its possession of natural resources. The country receives only a small amount of IFDI, and this is likely to be directed towards primary product sector and labour intensive manufacturing sectors supplying simple consumer goods for sale. In this stage the country undertakes insignificant OFDI due to no O-advantages, giving a zero or even negative net FDI position.

Stage 2 is characterised by growing importance of investment capital in value added activity. With rapid economic growth and enlargement of the domestic market, both market seeking and resource seeking IFDI are induced. Elements of OFDI do emerge, due to experience gained from international operations, but outward investment by indigenous MNEs is much less important than IDFI. Hence, the country is still a net recipient of FDI. In both Stage 1 and 2, FDI tends to be inter rather than intra industry in character.

In Stage 3, a country approaches economic maturity, with an emphasis on innovation driven growth. The role of IFDI continues to be valued for the provision of O-specific assets in which the country has comparative disadvantage. And as the indigenous firms begin to generate their own O-advantage, there emerges a growing trend of OFDI. At this stage, in addition to the resource or market seeking investment, firms also begin to engage in efficiency-seeking and strategic asset seeking MNE activity.

By Stage 4, a country's O-advantages begin to match those of developed countries. The country is now characterised as a net outward investor, with OFDI exceeding IFDI. In both Stages 3 and 4, the composition of FDI becomes increasingly intra-industry in character. Finally, beyond Stage 4, a country becomes a leading investor in R&D. The country continues to receive IFDI and engages in OFDI in almost equal measure. Therefore, the net FDI position again hovers around zero.

Thus the central crux of IDP hypothesis is that OFDI depends mainly upon level of growth, and that high levels of OFDI only start in Stage 3. A brief summary of the stages of IDP is shown in Table 3. A country moves from virtually zero FDI position to being a net outward investor as its GNP per capita rises from less than $1000 to greater than $10000 mark.

Table 3: Investment Development Path Stages

Stages	GNP Per Capita	FDI Position
1	< $1000	No IFDI or OFDI
2	$1000 - $3000	IFDI but No OFDI
3	$3000 - $10000	IFDI > OFDI
4	> $10000	OFDI > IFDI

Source: Dunning et. al 2001

Dunning et al. (2001) incorporated the IDP theory in their case study on Korea and Taiwan to incorporate the linkage between composition of trade and FDI with each other. Tolentino (1993) tested the IDP hypothesis for thirty countries and found a significant relation between OFDI and GNP. Dunning & Narula's (1994) study, using a cross section analysis for both developed and developing countries, supported the IDP sequence. Verma & Brennan's (2011) findings suggested that Indian NOI follows IDP theory. Sathye (2008) also indicated that in the initial stages of development, the relationship between India's economic development and NOI is similar to the IDP theory.

However, the IDP stage theory can be criticised. There is a possibility that a developing country is unable to launch international activities despite going through the development stages, as in

case of Ghana (Kuada and Sorensen, 2000). Moreover, as in case of Turkey, high rates of OFDI may not occur because of localisation advantages (developed as a result of IFDI), but due to the political and economic factors. New markets outside Turkey, political uncertainty at home, and back-to-back domestic economic crises could be important factors (Erkilek, 2003).

At the same time, economic liberalisation may give a massive stimulus to OFDI, and as a result, some of the stages of IDP may be skipped. This is known as accelerated IDP, and found in case of 'Leapfrogging Globals' where firms are anxious to escape the strictures of local markets (Svetlicic, 2003). Therefore, the relationship between rapid economic growth and OFDI, as postulated by the IDP hypothesis, may not fully explain the internationalisation process of all countries. Studies such as Das (2013) and Stoian (2013) respectively propose that IDP is restrictive in nature as it takes for granted that underlying economic forces work in certain fashion, and that inclusion of institutional factors would increase the explanatory power of the IDP theory.

This paper looks at the relationship between India's OFDI position and its development levels, proxied by GDP per capita, to check whether there is a consistency with the Dunning's IDP sequence. It also extends the hypothesis by estimating a relationship between OFDI and other determinants such as IFDI, Exports, Human Capital and R&D. In addition, the research even tries to capture the endogeneity between OFDI and the independent variables, given that OFDI could also affect a country's growth and level of development (Liu, Buck and Shu, 2005).

5. REVIEW OF THE EMPIRICAL LITERATURE

The IDP theory is supported by a number of country experiences, but deviations have been observed. Some countries have shown significant departures from the predicted path, with little sign of returning to it. India, for instance, witnessed inefficient government interventions with a long period of restrictive policies aimed at controlling large private firms, and hence keeping out inward FDI. OFDI boomed only in the early 1980s when companies undertook promotion of their exports and overseas investment of capital goods and know-how to escape the constrictions of the domestic economy. However, further interventions retarded the fuller development of their

potential, resulting in low rates of growth of industry, exports and FDI (Lall, 1998). It is therefore necessary to extend and modify the IDP theory to take into account such country-specific patterns. Some of the empirical work on both the conventional IDP and augmented IDP is summarised below.

Barry et al. (2003) studied the bilateral position of Ireland-US to test consistency with the IDP. They estimated the quadratic specification to allow for non-linearity in the relationship between net outward investment and economic development. The results provide an evidence of a U-shaped relationship between Irish GDP and the country's net outward investment position with US; in line with the IDP concept. Fonseca et al. (2007) empirically estimated the hypothesis for Portugal and 25 other countries in different stages of development, and found support for IDP paradigm.

Duran & Ubeda (2001) suggested a new empirical approach to assess the IDP. They postulated that it is necessary to include variables associated with the structural dimensions of countries in the usual quadratic equation used to formulate IDP. Their study hypothesises the need to supplement the information provided by GDP with other yardsticks of development such as improvement in physical and human capital, percentage of exports in national output, and access to technology. Also, factors that influence the type of investment, classified as presence of natural resources, geographical distances etc, are taken into account. Their main aim was to analyse a country's behaviour during each sequence of IDP.

Liu, Buck & Shu (2005) used the GMM estimation method, suggesting that the level of economic development, proxied by GDP per capita, is still the main factor explaining China's OFDI position. Their results show a consistency with the IDP hypothesis, though with certain refinements in terms of including other explanatory factors affecting OFDI. On the other hand, the Austrian experience, analysed by Bellak (2001), does not support the expectation that Austria follows the stylised IDP on the macro level. The paper emphasises that a low net outward investment position is a sign of weakness of a host location. The study calls for a need to replace the single variable approach of the macro level analysis with a model with multiple independent

variables. The latter should reflect industry, firm and location specific factors, along with government policies.

Finally, Buckley & Castro (1998) developed the idea of IDP, relating Portugal's OFDI to per capita income. Their findings suggest that Portugal's position does not follow the previously assumed quadratic equation and they postulate some weaknesses of the paradigm. For example, institutional factors could be more important for the evolution of inward and outward FDI than the economic factors encompassed by IDP theory. Still, despite such shortcomings, IDP theory represents a major contribution towards explaining the evolution of international direct investment.

6. HYPOTHESIS

As mentioned in the empirical section, country-specific studies propose various refinements to the IDP hypothesis, taking on board the fact that the way FDI activity and development interact is unique to each country. Moreover, the pattern of OFDI from Emerging Economies' MNEs differs from that of Developed Countries' MNEs. These studies also suggest that there are other important aspects affecting outward investment which are not captured by the GDP of a country, necessitating modifications to the basic IDP theory. With these considerations in mind, our paper tests the following hypotheses:

1. OFDI is positively influenced by a country's level of development, measured in terms of GDP per capita – as established by the IDP theory (Dunning, 1981, 1986, 1988).
2. OFDI is positively associated with a country's Exports – as proposed by Dunning et. al. (2001). Furthermore, there is an interaction between the IDP and Trade Development Path (TDP). The knowledge gained from foreign exporting can contribute to O-advantages and OFDI. Also, exports and OFDI exhibit a complementary nature in case of vertical FDI, and are expected to be substitutes if FDI is horizontal (Amiti and Wakelin, 2003). This factor may also be characterised as an institutional variable – greater openness and liberalisation allows local companies to learn about foreign markets and operations internationally (Das, 2013).

3. OFDI is positively associated with IFDI – as seen in different stages of IDP. IFDI ultimately leads to the accumulation of O-advantages, which are then exploited by domestic firms. This points towards the spillover effects from foreign to local firms (Duran & Ubeda, 2001).
4. OFDI is positively associated with Human Capital stock, which captures the O-advantages in terms of resources capable of influencing the value of OFDI (Duran & Ubeda, 2001; Dunning & Narula, 1996). GDP per person is used as a proxy here, reflecting the productivity of labour[1]; as greater the productivity of employees, higher is the suitability for internationalisation.
5. OFDI is positively associated with expenditure on R&D – the rate of investment increases as the rate of acquisition of ownership-specific advantages increases, and the latter is the outcome of innovations, R&D in particular. A number of studies support this link (Cantwell, 1987; Dunning, 1993; Kogut & Chang, 1991).

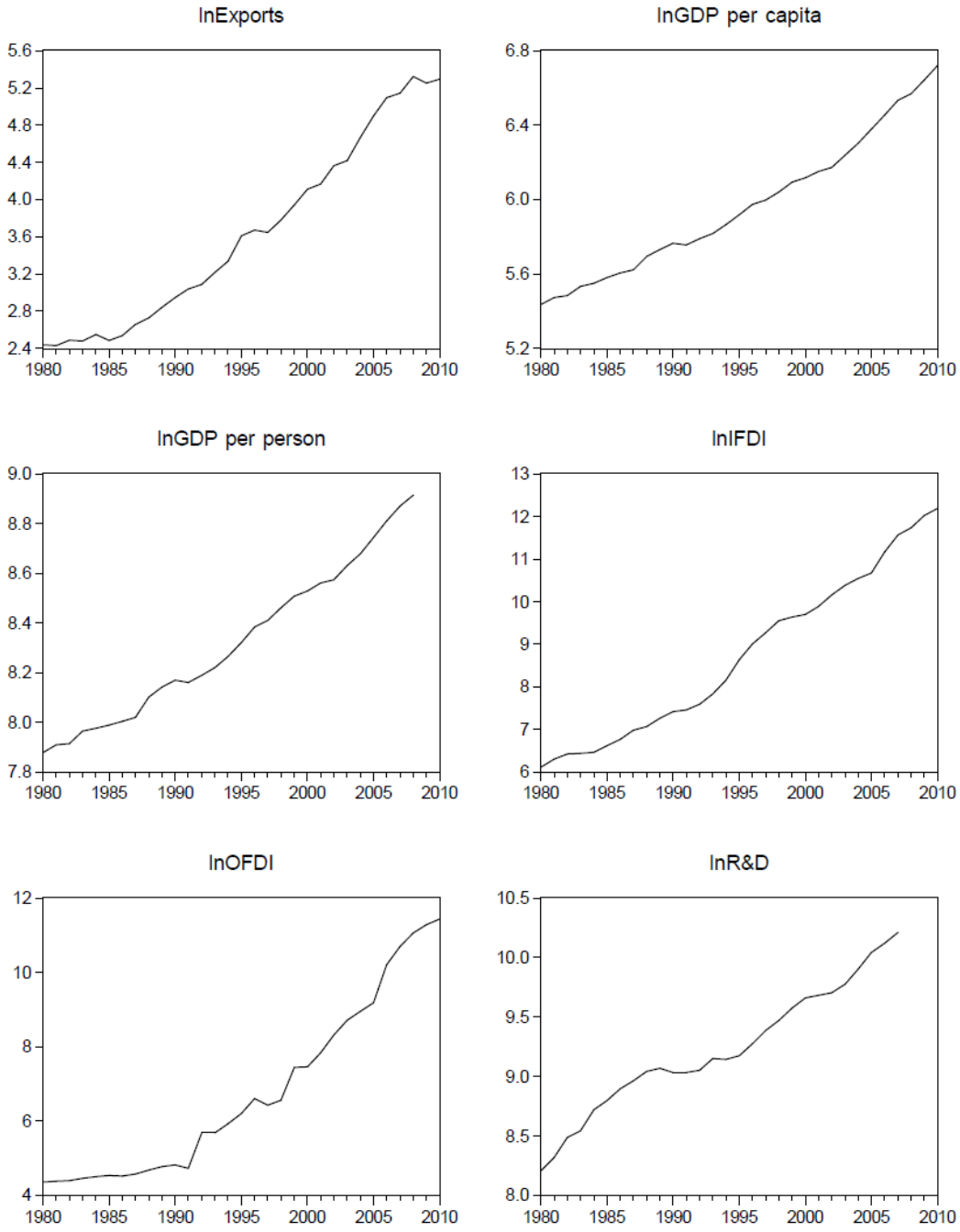
7. MATERIAL AND METHODS

In this study we modify the IDP hypothesis and specify the OFDI position of a country as a linear function of GDP per capita, Exports, IFDI, GDP per person and R&D. The analysis includes time series data for India over the period 1980-2010. The variables of interest are: OFDI stock, IFDI stock, Exports, GDP per capita, GDP per person, and national expenditure on R&D. The source of data for FDI position is UNCTAD statistics (unctadstat.unctad.org). Data on Exports, GDP per capita and GDP per person were drawn from World Bank (www.databank.worldbank.org), and data on R&D was collected from the Department of Science and Technology (Govt. of India). All the data series are expressed in natural logarithms. Figure 4 gives a glimpse of the trends for these variables over time. For the time series analysis, a standard regression may produce spurious result if the variables under consideration contain unit roots or are non-stationary. In spurious regression there is statistical significance with a very

[1] GDP per person is defined as Gross Domestic Product divided by total employment in the economy. Hence it reflects the value added by labour – its productivity.

high R^2, but actually there might be no causal relationship between the variables. It is therefore important to test whether the variables are cointegrated and have a long run relationship.

Figure 4: Yearly Data Trend: 1980-2010



Source: Authors' compilation

We start the analysis with the Augmented Dickey-Fuller (ADF) test for unit root. The procedure is to reject the null hypothesis of a unit root against the one-sided alternative if the ADF statistic is less than the critical value, and conclude that the series is stationary. Next we test for cointegration using the 'Engle-Granger' approach, involving the following steps:

1. Pre-test the variables for their order of integration. By definition, cointegration necessitates that two variables be integrated of the same order. The ADF test is used to infer the number of unit roots (if any) in each variable, hence determine the order of integration of each variable. There are three cases:
   a. if all variables are stationary then it is not necessary to proceed further as the standard time series methods can be applied
   b. if all variables are integrated of different order, then we could conclude that they are not cointegrated in the usual sense of the term
   c. if all variables are integrated of the same order then we proceed to step 2

2. If the results of Step 1 indicate that both the dependent and independent variables are integrated of order 1, i.e. I(1), the next step is to estimate the long run relationship[2]:

$$\ln OFDI_t = \beta_1 + \beta_2 \ln IFDI_t + \beta_3 \ln Exports_t + \beta_4 \ln GDP\ PC_t + \beta_5 \ln GDP\ PP_t + \beta_6 \ln R\&D_t + e_t \quad \text{(i)}$$

   In order to determine that variables are actually cointegrated, we obtain the residual series from the above equation. The residuals are basically the estimated values of the deviations from the long run relationship.

[2] Use of OFDI as the dependent variable, instead of NOI, also overcomes the loss of observations associated with using net investment position when we take log transformation.

3. Check for the presence of unit root in the residual series obtained in Step 2. If the residual series is stationary and is integrated of order zero, (I(0)), then we conclude that the variables are cointegrated of order 1 and have a long run relationship.

4. Estimate the Error Correction Model (ECM). If Step 3 shows that the variables are cointegrated, then the residuals obtained from the equilibrium regression in Step 2 can be used to estimate the ECM as follows:

$$\Delta \ln OFDI_t = \alpha_1 + \alpha_2[\ln OFDI_{t-1} - (\beta_2 \ln IFDI_{t-1} + \beta_3 \ln Exports_{t-1} + \beta_4 \ln GDP\ PC_{t-1} + \beta_5 \ln GDP\ PP_{t-1} + \beta_6 \ln R\&D_{t-1})] + \alpha_3 \Delta \ln OFDI_{t-1} + \alpha_4 \Delta \ln IFDI_t + \alpha_5 \Delta \ln Exports_t + \alpha_6 \Delta \ln GDP\ PC_t + \alpha_7 \Delta \ln GDP\ PP_t + \alpha_8 \Delta \ln R\&D_t + \varepsilon_t \quad \text{(ii)}$$

where β_i = the parameters of the cointegrating equation (i)

ε_t = white-noise disturbances

α_i = parameters

Note that the magnitude of the residual e_{t-1} is the deviation from the long run equilibrium in period (t-1). Hence, we could use the saved residuals obtained from equation (i) as an instrument for the expression $[\ln OFDI_{t-1} - (\beta_2 \ln IFDI_{t-1} + \beta_3 \ln Exports_{t-1} + \beta_4 \ln GDP\ PC_{t-1} + \beta_5 \ln GDP\ PP_{t-1} + \beta_6 \ln R\&D_{t-1})]$ in equation (ii). Thus the ECM can be written as:

$$\Delta \ln OFDI_t = \alpha_1 + \alpha_2 e_{t-1} + \alpha_3 \Delta \ln OFDI_{t-1} + \alpha_4 \Delta \ln IFDI_t + \alpha_5 \Delta \ln Exports_t + \alpha_6 \Delta \ln GDP\ PC_t + \alpha_7 \Delta \ln GDP\ PP_t + \alpha_8 \Delta \ln R\&D_t + \varepsilon_t \quad \text{(iii)}$$

where e_{t-1} = the error correction term

The ECM is particularly powerful since it allows estimating both short and long run effects of explanatory time series variables in a single statistical model. For example, in equation (iii), α_4 captures any immediate effect IFDI has on OFDI, described as the short-term effect, and the long term effect occurs at the rate dictated by value of α_2. Often in case of time series data, a change

in independent variables may affect the dependent variable either immediately (contemporaneous effect) or the effect may be delayed. ECM allows us to analyse all types of effects.

5. The final step is to assess the model. Here the 'speed of adjustment' coefficient α_2 is of particular interest. It is clear from equation (iii) that for any given value of e_{t-1}, a large value of α_2 is associated with a large value of $\Delta OFDI_t$. If α_2 is zero, the change in $OFDI_t$ does not at all respond to the deviation from long-run equilibrium in (t-1). Hence α_2 should be significantly different from zero if the variables are cointegrated.

To complete the analysis we also carry out the Granger Causality Test for exogeneity to find whether there is a two-way causal relationship between OFDI and its explanatory variables.

8. RESULTS

The ADF[3] test was conducted to determine whether the variables are stationary. The results for non-differenced level series of each variable are given in Table 4, indicating that the null hypothesis of a unit root in the level series is not rejected for any of the variables, i.e. all variables are non-stationary. After testing for the level series, the ADF test is performed for the 1st difference of each of the variable. The results (also given in Table 4) for the 1st difference series indicate stationarity, implying that all the variables are integrated of order 1.

As all the variables are I(1), we proceed to estimating the long run relationship for 3 sets of equations, the difference between the 3 equations is in terms of the explanatory variables included.

[3] An alternative test for stationarity was also performed, called Phillips-Perron Test, and similar results were obtained. All the variables were found to be I(1). See Appendix A.

Table 4: t-statistics for Augmented Dickey Fuller (ADF) Tests for Stationarity (Null Hypothesis: Series contains a unit root)

Variables	Level Series			1st Difference Series		
	ADF	ADF (including constant)	ADF (including constant & trend)	ADF	ADF (including constant)	ADF (including constant & trend)
lnOFDI	5.07	2.01	-1.59	-3.42*	-5.19*	-6.59*
lnGDP per capita	11.04	3.87	0.51	-1.13	-3.50*	-5.17*
lnExports	6.29	1.28	-2.69	-2.52*	-4.62*	-4.81*
lnIFDI	2.82	0.94	-2.82	-1.46	-3.06*	-3.39
lnGDP per person	9.28	2.39	-1.03	-1.58	-3.87*	-4.67*
lnR&D	2.72	-0.24	-1.98	-1.81**	-3.43*	-3.34*

Notes: [a] *Denotes significance at 5 percent level
[b] **Denotes significance at 10 percent level
[c] All variables are non-stationary in level and stationary in 1st difference, i.e. the variables are I(1).

In all the equations (Table 5), Exports positively and significantly influence OFDI from India as hypothesised. A 1 percentage point increase in Exports increases OFDI by 2.03 (equation 1), 2.99 (equation 2) and 2.40 (equation 3) percentage points in the long run. The other significant and positive contributor in determining the OFDI from India is GDP per capita; a 1 percentage point increase in GDP per capita increases OFDI by 3.58 (equation 1), 8.34 (equation 2) and 10.73 (equation 3) percentage points in the long run. The latter result is consistent with the IDP theory and confirms that India's OFDI is influenced by the level of development. Inward FDI is also found to be a positive factor (equation 2 and 3), though insignificant.

Table 5: Long Run Relationship

Variables	Equation 1 $\ln OFDI_t$	Equation 2 $\ln OFDI_t$	Equation 3 $\ln OFDI_t$
$\ln Exports_t$	2.03 (3.27)*	2.99 (4.98)*	2.40 (3.27)*
$\ln IFDI_t$	-0.53 (-1.47)	0.31 (0.68)	0.35 (0.81)
$\ln GDP\ PC_t$	3.58 (2.09)*	8.34 (1.87)**	10.73 (1.97)**
$\ln GDP\ PP_t$	——	-12.88 (-2.09)*	-12.53 (-2.08)*
$\ln R\&D_t$	——	——	-0.88 (-1.11)
Constant	-17.27 (-2.28)*	51.11 (1.98)**	43.84 (1.74)**
R^2	0.98	0.98	0.98
Adjusted R^2	0.97	0.98	0.98

Notes: [a] *Denotes significance at 5 percent level
[b] **Denotes significance at 10 percent level
[c] Figures in parentheses represent the t-statistics

On the other hand, GDP per person has a negative and significant coefficient. This effect may be due to the tendency of an increase in domestic productivity in turn increasing the firm's incentive to invest in its home country. A 1 percentage point increase in GDP per person reduces OFDI by 12.88 (equation 2) and 12.53 (equation 3) percentage points in the long run. Also R&D has a negative effect (equation 3), though insignificant. Regarding the latter, once the R&D expenditure has been undertaken, the marginal cost of replication is less. As a result when a country transfers its technology via OFDI it in turn reduces its competitive advantage to invest further – implying the "public good" nature of R&D. Moreover OFDI could be asset seeking and

therefore may not rely on R&D, as supported by studies such as Stoian (2013) and Andreff (2002) that suggested that technological development per se does not enhance OFDI[4].

We also performed the Johansen's Cointegration test to check for the presence and the number of cointegrating vectors among the non-stationary series using the Trace Statistic and Maximum Eigen Statistic. For all 3 equations results (Table 6) indicate the presence of at least 1 cointegrating vector at 5 percent significance level, suggesting the existence of a long run relationship between the variables.

The residual series are then obtained from the equilibrium regressions for each of the 3 equations to check for stationary. As the residuals are stationary in level (Table 7), i.e. I(0), it confirms that the variables are cointegrated of order 1 and there exists an ECM that brings together the long run relationship.

[4] As a test for robustness, Equation 3 was also estimated using AYS: Average years of Total Schooling (Age 25+) and PA: Number of Patent Applications filed by Residents (an output based measure), instead of GDP per person and R&D Expenditure respectively. The results do not change:

$$\ln ODFI = -27.84 + 1.37 \ln Exports_t - 0.10 \ln IFDI_t + 6.36 \ln GDP\ PC_t - 4.41 \ln AYS_t - 0.31 \ln PA_t$$

(-5.29)* (3.01)* (-0.43) (3.83)* (-3.49)* (-0.49)

The error correction term for the new estimated equation (-0.7214) is significant at 5 percent level and has the expected negative sign. All the stationarity tests hold.

Table 6: Jonhansen's Cointegration Test

I. Variables: lnOFDI, lnExports, lnIFDI & lnGDP per capita					
Hypothesised No. of CEs	EigenValue	Trace Statistic	Prob	Maximum Eigen Stat	Prob
None	0.63	52.17	0.02*	27.84	0.04*
Atmost 1	0.48	24.33	0.19	18.45	0.11
Trace test indicates 1 cointegrating equation at 0.05 level Maximum Eigen value test indicates 1 cointegrating equation at 0.05 level					
II. Variables: lnOFDI, lnExports, lnIFDI, lnGDP per capita & lnGDP per person					
Hypothesised No. of CEs	EigenValue	Trace Statistic	Prob	Maximum Eigen Stat	Prob
None	0.97	144.99	0.00*	90.25	0.00*
Atmost 1	0.73	54.74	0.01*	33.99	0.01*
Atmost 2	0.39	20.75	0.37	13.18	0.43
Trace test indicates 2 cointegrating equation at 0.05 level Maximum Eigen value test indicates 2 cointegrating equation at 0.05 level					
III. Variables: lnOFDI, lnExports, lnIFDI, lnGDP per capita, lnGDP per person & lnR&D					
Hypothesised No. of CEs	EigenValue	Trace Statistic	Prob	Maximum Eigen Stat	Prob
None	0.80	125.35	0.00*	43.67	0.02*
Atmost 1	0.72	81.68	0.00*	34.43	0.04*
Atmost 2	0.55	47.25	0.06	21.88	0.23
Trace test indicates 2 cointegrating equation at 0.05 level Maximum Eigen value test indicates 2 cointegrating equation at 0.05 level					

Table 7: t-statistics for Augmented Dickey Fuller (ADF) Tests for Stationarity (Null Hypothesis: Residual Series contains a unit root)

Residual Series (Level)	ADF	ADF (including constant)	ADF (including constant & trend)
Equation 1	-2.55*	-2.51	-2.32
Equation 2	-3.89*	-3.81*	-3.67*
Equation 3	-3.46*	-3.39*	-3.27**

Notes: [a] *Denotes significance at 5 percent level
[b] **Denotes significance at 10 percent level

The ECM results are summarised in Table 8. The lagged error correction terms for all 3 equations are statistically significant at 5 percent level and have the expected negative sign, indicating that the 'speed of adjustment' coefficient is in accordance with convergence toward the long run equilibrium. For example, in the 1st equation, in response to a one unit deviation from long run equilibrium, OFDI tends to decrease by 0.4243 units, hence eliminating the positive discrepancy from long run equilibrium present in period t-1; i.e. in the absence of other intervention the dependent variable of OFDI converges fast to its long run equilibrium. Hence, there is a cointegrating relationship between the dependent and independent variables.

Table 8: Error Correction Model

Variables	Equation 1 $\Delta lnOFDI_t$	Equation 2 $\Delta lnOFDI_t$	Equation 3 $\Delta lnOFDI_t$
ECM_{t-1}	-0.4243 (-2.8929)*	-0.6201 (-2.8871)*	-0.7489 (-3.5045)*
$\Delta lnExports_t$	0.3989 (0.7301)	0.9436 (1.5345)	0.6755 (1.1761)
$\Delta lnIFDI_t$	0.0578 (0.1348)	0.0652 (0.1491)	0.0806 (0.1949)
$\Delta lnGDP\ PC_t$	5.6669 (2.6832)*	14.7842 (2.4784)*	23.5035 (3.7162)*
$\Delta lnGDP\ PP_t$	——	-12.3782 (-2.0122)*	-19.9496 (-3.0842)*
$\Delta lnR\&D_t$	——	——	-0.3246 (-0.3554)
$\Delta lnOFDI_{t-1}$	-0.0391 (-0.2448)	0.0294 (0.1684)	-0.0066 (-0.0405)
Constant	-0.0565 (-0.5149)	-0.0277 (-0.2440)	-0.0535 (-0.4461)
R^2	0.49	0.55	0.65
Adjusted R^2	0.38	0.41	0.51
F-Stat	4.42*	4.04*	4.69*

Notes: [a] *Denotes significance at 5 percent level
[b] Figures in parentheses represent the t-statistics

In the above model we implicitly assume that all variables are exogenously determined. However, there is a possibility that OFDI influences the explanatory factors. For instance, OFDI may facilitate exports by establishing export-platform production facilities. Therefore we perform the Granger Causality Test to investigate possible endogeneity or a two-way causation between OFDI and its explanatory variables (Table 9). The result confirms exogeneity with

respect to Exports, IFDI, GDP per capita and GDP per person, pointing that reverse causation does not exist[5]. But the peculiar outcome is the direction of causality between R&D and OFDI.

Table 9: Granger Causality Test for Exogeneity

	1 Lag		2 Lag	
	F Statistic	**P-value**	**F Statistic**	**P-value**
Exports → OFDI	17.14	0.00*	7.63	0.00*
OFDI → Exports	2.47	0.13	1.40	0.26
Exports granger cause OFDI, but OFDI do not granger cause Exports.				
IFDI → OFDI	4.79	0.04*	2.06	0.15
OFDI → IFDI	0.00	0.94	0.01	0.99
IFDI granger cause OFDI, but OFDI do not granger cause IFDI.				
GDP per capita → OFDI	5.21	0.03*	2.76	0.08**
OFDI → GDP per capita	1.43	0.24	0.79	0.47
GDP per capita granger causes OFDI, but OFDI do not granger cause GDP per capita.				
GDP per person → OFDI	3.92	0.06**	1.86	0.18
OFDI → GDP per person	0.35	0.56	0.40	0.67
GDP per person granger causes OFDI, but OFDI do not granger cause GDP per person.				
R&D → OFDI	1.91	0.18	0.94	0.40
OFDI → R&D	16.57	0.00*	7.01	0.00*
R&D does not granger cause OFDI, but OFDI granger causes R&D.				

Notes: [a] *Denotes significance at 5 percent level
[b] **Denotes significance at 10 percent level
[c] → indicates the direction of causality. Akaike Information Criterion (AIC) suggests Lag order 2, and Schwarz Information Criterion (SC) suggests Lag order 1.

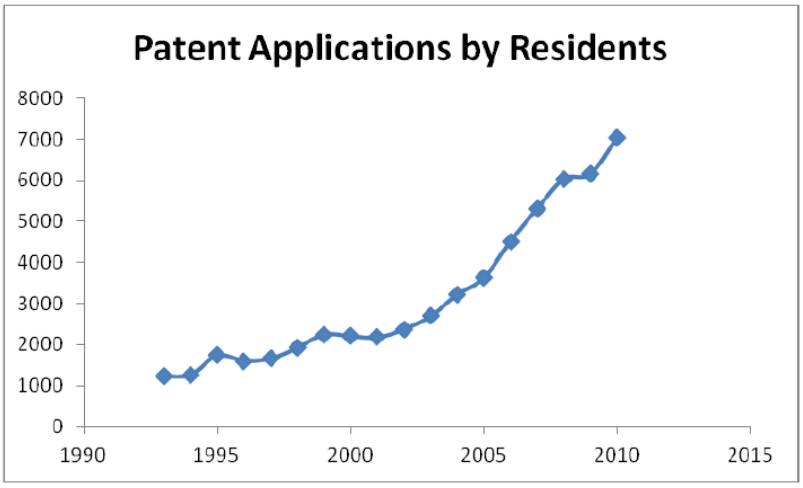
The finding, that OFDI Granger causes R&D, suggests the possibility of OFDI bringing in a reverse technology spillover effect. In fact, there are a number of mechanisms through which

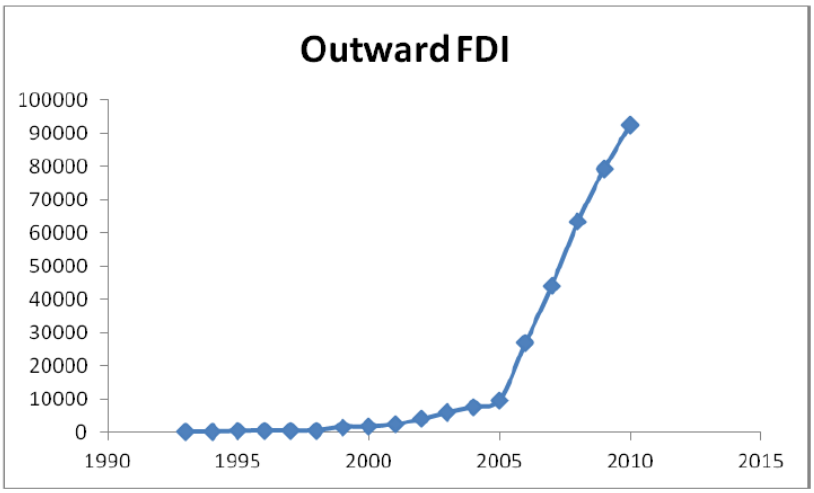
[5] This result is similar to Tolentino (2010) that suggests that OFDI from India is exogenous to macroeconomic factors such as trade, using Impulse Response Functions to study the extent to which OFDI responds to a shock in macroeconomic variables, and to estimate the direction of such a response.

OFDI influences home country's technology. One of the ways is resource sharing, wherein the host and home country firms jointly undertake technological research. Another mechanism is particularly effective when firms carry out asset seeking FDI through mergers and acquisitions, obtaining advanced technologies and enhancing their core competitiveness. Also, OFDI facilitates the access to technology in foreign markets, and stimulates the firms to strengthen their R&D base when they face competitors worldwide (Huang & Wang, 2009). For instance, Taiwanese firms' outward investment has stimulated their R&D base, implying that OFDI and domestic R&D are complementary (Chen & Yang, 2013).

Looking particularly at the Indian case, companies are aspiring to buy technology, processes, managerial know-how, and marketing networks. The pharmaceutical companies are looking to expand their R&D base as a part of their strategic asset seeking investment (Hattari & Rajan, 2010). Automotive companies such as Tata and Amtek Groups are seeking external complementary technical and value-added manufacturing assets. When these companies undertake greenfield investments and strategic acquisitions, they not only form a source but also a recipient of cross-border knowledge flows (Pradhan & Singh, 2009). Moreover, if we look at the number of patent applications by Indian residents as the measure of the technology outcome of spillover effect of OFDI, there appears a linear rising trend between 1990 and 2010 (Figure 5). Meanwhile, the pace of internationalisation of Indian firms has also been increasing. Especially from 2005 onwards, both the number of patent applications and OFDI have shown a growing trend, though the increase in latter may be because of policy liberalisation. Nonetheless, it would be interesting to test the relationship between the two by establishing a model to analyse whether there exists a positive cointegration in the long run – a subject of further research.

Figure 5: Trends in Patent Application by Indian Residents & OFDI





Source: Compiled from the Annual Reports of Office of the Controller General of Patents, Designs, Trade Marks and Registrar of Geographical Indications, GoI (Ministry of Commerce & Industry) & UNCTAD Stats.

9. CONCLUSION

The present study proposes the necessity for certain refinements to the IDP hypothesis, implying a country-specific approach, and also calls for a theoretical need to accommodate interdependence between the variables under consideration. The main research question addressed in this paper is whether OFDI from India could be explained in terms of India's stage

of development only, as postulated by the IDP hypothesis, or whether it requires an extension of the conventional theory – augmenting IDP to include the impact of institutional reforms, trade liberalisation and inflows of foreign investment. This question is examined through an extensive use Time Series analysis, thus adding further to the literature.

The importance of the central question, whether India's OFDI position is consistent with the IDP sequence, is raised by earlier studies, suggesting that the IDP theory needs to be tailored according to country-specific patterns. Moreover, the IDP itself cannot explain India's surge in OFDI despite being in stage 2 (or stage 3). Similar to previous empirical studies, such as Tolentino (1993), this paper supports a significant and positive relation between India's GDP per capita and its OFDI position. However, the paper has demonstrated that additional variables are important long run explanatory factors, which help to capture the distinct features of policy reforms affecting India's OFDI, not incorporated in the original IDP hypothesis. Another important observation is that OFDI causes a reverse technology spillover effect, as indicated by direction of causality between OFDI and R&D.

Finally, certain policy implications of the study may be highlighted. First of all, it might be suggestive that as OFDI follows economic development, the policy makers should encourage growth. Secondly, the augmented IDP hypothesis postulates that policies directed towards promoting exports and inflows of foreign investment are unlikely to deter OFDI, and such policies should be prioritised. This follows from the evidence that OFDI is jointly determined by the level of development, the export position, IFDI and human capital in the long run. Lastly, it needs to be ensured that overseas investment by Indian companies does not crowd out domestic investment. The potential implications of a rising trend in OFDI for domestic investment, growth and employment needs to be examined against the benefits that domestic companies derive elsewhere in terms of an expanded market base, backward and forward vertical integration, and cheap skilled labour.

Appendix A: Phillips Perron Test

Table: **Z(t)-statistics for Phillips Perron Test for Stationarity (Null Hypothesis: Series contains a unit root)**

Variables	Level Series		1st Difference Series	
	Including Constant	Including Constant & Trend	Including Constant	Including Constant & Trend
lnOFDI	2.78	-1.54	-5.21*	-7.22*
lnGDP per capita	4.39	0.79	-3.57*	-5.17*
lnExports	1.19	-2.73	-4.63*	-4.79*
lnIFDI	1.62	-1.89	-3.05*	-3.37**
lnGDP per person	2.65	-1.01	-3.90*	-4.67*
lnR&D	-0.56	-1.99	-3.42*	-3.33**

Notes: [a] *Denotes significance at 5 percent
[b] ** Denotes significance at 10 percent

The above table indicates that all the variables are integrated of order 1.

Appendix B: Long Run Regression: A Sub-Classification (1990-2010)

Equation 1: $\ln OFDI_t = -27.01 + 1.13 \ln Exports_t - 0.23 \ln IFDI_t + 5.28 \ln GDP\ PC_t$

(-4.58)* (2.40)* (-0.94) (3.98)*

Equation 2: $\ln ODFI = 9.36 + 0.89 \ln Exports_t + 0.31 \ln IFDI_t + 12.08 \ln GDP\ PC_t - 9.66 \ln GDP\ PP_t$

(0.25) (1.06) (0.55) (2.13)* (-1.17)

Equation 3: $\ln ODFI = 8.65 + 0.99 \ln Exports_t + 0.29 \ln IFDI_t + 11.34 \ln GDP\ PC_t$

(0.15) (1.09) (0.35) (1.72)

$- 8.90 \ln GDP\ PP_t - 0.15 \ln R\&D_t$

(-0.67) (-0.07)

(*Denotes significance at 5 percent level)

We consider a sub-classification from 1990-2010 that categorises India's i) Liberalisation (1992-95) – introduction of 'Automatic Route' for overseas investment in 1992 and a comprehensive policy framework in 1995; ii) Creation of a Fast Track Route (1995-2000) - raising the limits from US$ 2 million to US$ 4 million; and iii) Introduction of FEMA (2000s) (Khan, 2012). The results are similar to those obtained for the overall 1980-2010 period, except that only Exports and GDP per capita are significant variables.

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