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Outward FDI by Indian Manufacturing MNEs: Impacts and Implications

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Abstract

Outward foreign direct investment (OFDI) by Indian firms has increased significantly in recent years. Such investments by Indian firms have gone to more than 100 host countries. However, little is known about the effects of such OFDI on domestic activity of Indian multinational enterprises (MNEs). The paper investigates the home-country effects of OFDI by Indian manufacturing firms during 2008/09 to 2011/12 using a quasi-experimental technique. A priori, the relationship between firm's OFDI and domestic activity is ambiguous as both complementary and substitution effects could be induced by such investment activities. The propensity score matching technique is used, to construct treatment and control groups, for examining the effect of engaging in OFDI on domestic activities of Indian manufacturing MNEs. The empirical evidence suggests that OFDI by Indian MNEs has positive impact on export intensity and research and development (R&D). On the other hand, no significant impact could be found on domestic investments, output, employment, import of raw materials, and import of capital goods. Overall, no significant negative (or substitution) effect of OFDI on domestic activity could be discerned in this study. Nevertheless, to derive desired complementary benefits of OFDI by the manufacturing firms, policies may be directed to enhance the country's international supply chain connectivity for greater participation in global value chain and production network.

JEL Classification: F13, F14, F21, F23, O31

Keywords: Outward FDI, Multinational Enterprises, Manufacturing, Propensity Score Matching, Production Network

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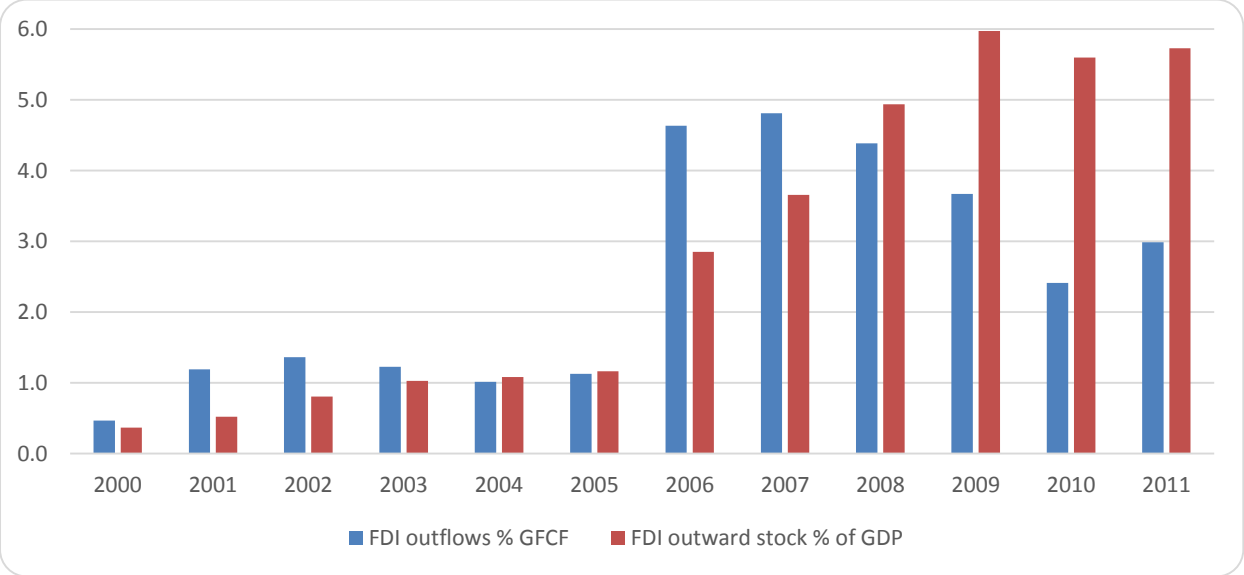
1. Introduction

Over the past decade, there has been a substantial increase in outward foreign direct investment (OFDI) from developing countries (see Al-Sadig, 2013; Das 2013; UNCTAD, 2011). India has been one of the forerunners from developing countries in investing abroad. This is particularly true since the beginning of the last decade, which was assisted by gradual liberalization of capital account. The volume of OFDI increased from (in US dollars) 0.51 billion in 2000 (2.96 billion in 2005) to 14.63 billion in 2010 (World Investment Report, 2011; annex table 2). This accounted for 0.04 percent (0.34 percent in 2005) and 1.11 percent of total world OFDI flows in 2000 and 2010 respectively. Similarly, India's share in developing country OFDI flows (excluding South-East Europe and CIS) increased from 0.38 percent in 2000, to 2.44 percent in 2005, to 4.47 percent in 2010. OFDI has registered an increase even in relation to gross domestic product (GDP) and gross fixed capital formation (GFCF) as shown in figure 1. The OFDI stock as a percentage of GDP increased from 0.37 percent in 2000 to 1.16 percent in 2005 to 5.59 percent in 2010 and to 5.73 percent in 2011. OFDI flows as percent of GFCF also have also increased although at a lesser pace. Such increase in OFDI has been driven by large merger and acquisition (M&A) deals as well as greenfield investments by Indian MNEs.

Figure 1: India's OFDI as a percentage of GFCF and GDP



Source: Author's compilation from World Investment Report 2012, UNCTAD

Given the scarcity of capital in developing countries such as India, there is a need to evaluate FDI outflows in relation to the home country activities of the MNEs. Although there are studies that examine the firm level determinants of OFDI (see Pradhan, 2004 for manufacturing firms; and Demirbas et al., 2010 for firms belonging to various industries; Bhattacharya et al., 2012 for service firms), to our knowledge, there are a limited number of studies on the effect of such investments on domestic activities at the firm level for the manufacturing sector.[1] This paper empirically examines the effect of OFDI by Indian manufacturing MNEs on their economic activity and performance at home.

The empirical literature on the effect of OFDI on home country is sparse, particularly in the context of developing countries. Although there are studies in the context of OFDI by developed countries, many of these studies have given greater emphasis on the employment effect of OFDI due to the job loss concern in advanced countries.[2] On the other hand, in the case of capital scarce developing country, empirical research concerning the effect of OFDI in home country has so far received limited attention. Nevertheless, a few recent attempts can be found in the context of developing countries (Al-Sadig, 2013; Chen and Yang, 2013; Herzer, 2011; Debaere et al., 2010; Zhao et al., 2010; Huang and Wang, 2009; Pradhan and Singh, 2009; Masso et al., 2008; Pradhan, 2007; Kim, 2000). These studies have limited coverage as they have examined the effect of OFDI on a particular (set of) variable e.g. technology and R&D (Huang and Wang, 2009; Pradhan and Singh, 2009; Chen and Yang, 2013), exports or trade (Kim, 2000; Pradhan, 2007; Goh et al., 2013), domestic employment (Debaere et al., 2010; Masso et al., 2008), domestic investments (Al-Sadig, 2013), domestic output (Herzer, 2011) and total factor productivity (Zhao et al., 2010).

In particular, Huang and Wang (2009) examined the relationship between OFDI and Chinese patent application and found the existence of reverse technology spillover from such investments. Pradhan and Singh (2009) studied OFDI in auto industry and found that OFDI had significant impact on Indian automotive firms' R&D intensity. Chen and Yang (2013) examined Taiwanese manufacturing firms and found that OFDI is positively related to its domestic R&D spending, particularly in R&D-intensive industries during the study period 1992-2005. The employment effect is examined in the case of Korea (Debaere et al., 2010) and

[1] See Pradhan (2007), Pradhan and Singh (2009) for prior empirical evidence.

[2] A few studies in the developed country context include: for Canadian multinational company (Globerman, 2012; Hejazi and Pauly, 2003), France firms (Hijzen et al., 2011), 14 industrialised countries (Herzer, 2008), 17 OECD countries at sectoral level (Bitzer and Görg, 2009), US MNEs (Desai et al., 2005, 2009), Italian firms (Navaretti and Castellani, 2004; Falzoni and Grasseni, 2005; Imbriani et al., 2011; Herzer, 2008b at the macroeconomic level), French and Italian firms (Navaretti et al., 2010), Japan (Kimura and Kiyota, 2006; Hijzen et al., 2007; Lee, 2010), Japanese firms (Obashi et al., 2010; Ayumu, 2012), Spain (Alguacil and Orts, 2002), Sweden (Braconier et al., 2001), Finland (Sauramo, 2008), Simpson (2012) for UK; Wagner (2011) for German firms; Herzer (2012) for Germany.

Estonia (Masso et al., 2008). Debaere et al. (2010) have found that moving to less-advanced countries decreases a company's employment growth rate whereas moving to more-advanced countries does not consistently effect employment growth in any significant way. Masso et al. (2008) indicated that the logic of outward investments from low cost transition and developing economies differs from that of high-income countries. They also reported that in general, OFDI positively affects home country employment growth. Zhao et al. (2010) looked at the effects of China's outward direct investment in eight developed countries on growth in its own productivity. They reported beneficial spillover effects of OFDI in improving total factor productivity (TFP) growth over the study period. Herzer (2011) have examined the effect of OFDI on domestic output (GDP being the measure of output) in developing countries and reported positive long-run effect for a sample of 43 countries. Kim (2000) reported positive effect of OFDI on Korean exports at the industry-level, and domestic investment using aggregate trend analysis. Pradhan (2007) observed export improving role of OFDI in the case of Indian manufacturing firms during 1990/91-2000/01. However, Goh et al. (2013) reported limited impact of Malaysian OFDI on trade.

However, the complementary effect at home in many of these studies could be attributed to the fact that OFDI has been in its early stage. The question arises of whether complementary effects still hold good at a time when more and more firms are increasingly venturing abroad using complex FDI strategies. Meanwhile, one recent cross-country study reported negative impact of FDI outflows on aggregate domestic investment for a sample of developing and transition countries (Al-Sadig, 2013). No firm-level evidence could be found on the impact of OFDI on domestic investment, domestic output etc. Therefore, there is a need to further analyse the above mentioned effects in view of the evolving nature of OFDI from developing countries. There is also scope for examining additional effects such as on import of intermediate and raw material and capital goods among others, which are not investigated so far to the best of our knowledge. It is worthwhile to examine whether OFDI makes any difference to import of raw material and capital goods in the context of the observation by Goldberg et al. (2010) that increased access of firms to new imported intermediate inputs has enabled, in large part, the expansion in domestic product scope (production of new outputs) after the trade liberalization in India.

At a time when more and more firms from developing countries are increasingly venturing abroad, and keeping in cognizance that the effects observed in many of the previous studies pertaining to developing country could reflect the fact that OFDI is in its infancy, our study contributes to the emerging discussion on the effect of OFDI on developing home country in three different ways. First, besides using unique firm-level dataset, we examine the impact of

OFDI on more than one outcome variable. Second, we provide (micro) evidence from Indian manufacturing sector for the most recent period of OFDI drive by firms, which has not been comprehensively examined in any previous studies. Third, we analyse the impact of OFDI on home activities of Indian MNEs using a quasi-experimental method.

We examine the impact of OFDI on domestic activities of Indian manufacturing firms using propensity score matching technique, i.e. benchmarking it to comparable domestic firms, which discerns treatment and control group of firms with similar probability of investing abroad *ex ante*. The treatment group (firms) invests abroad *ex post*, whereas control group (firms) does not, even though *ex ante* they were expected to engage in OFDI. The differences in *ex post* performance of the two groups is attributed to outward investment, since firms in treatment and control groups do not differ *ex ante*. The differences in outcomes are obtained using regression analysis that is followed in impact evaluation literature.

The results suggest that OFDI has a positive impact on export intensity and R&D of Indian manufacturing MNEs. We do not find any significant impact on domestic investment, output, employment, import of raw materials, and import of capital goods. The insignificant impact on these variables could have been driven by greater access to global financial markets by Indian firms, and their low involvement in international production network and value chain. Nevertheless, for the complementary effects of OFDI on domestic activities to manifest, Indian manufacturing firms would need to increase their participation in international production network and global value chain. Therefore, policies may be directed to enhance the country's international supply chain connectivity that would help the manufacturing firms to derive complementary benefits of internationalization.

The remainder of the paper is organised as follows. In section 2, we discuss the theoretical and empirical literature on the relationship between OFDI and domestic economic activity. The methodology for estimating the effects of OFDI on domestic economic activity, and data related issues are elucidated in Section 3. Empirical results are presented in section 4 followed by the concluding section.

2. Relationship between OFDI and domestic activity

2.1 Theoretical considerations

How does OFDI impact activities at home? The impact is likely to differ depending on the nature and motive of outward investment. FDI outflows can be horizontal (market-seeking motive) or vertical (factor-seeking) in nature. In case of horizontal FDI, firms would relocate closer to the foreign customer and produce the same goods that they used to produce at home thereby substituting arm's length exports and domestic employment in the short-run (though the long-term effects could be ambiguous). On the other hand, vertical FDI leads to fragmentation of production across national borders that take advantage of production network and cheaper factor cost in host countries. A priori, it is hard to delineate the effects at home. The effect could also be influenced by product market integration and financial market imperfections, among others.

Recent theories of MNE activity have moved beyond the dichotomous classification of horizontal-vertical FDI and focused on the complex FDI strategies besides emphasizing on the role of firm heterogeneity and self-selection in the outward investment process (Helpman et al., 2004; Yeaple, 2003, 2009). It has also been argued that the MNEs from emerging countries invest abroad to obtain valuable technologies.[3]

What conditions allow the home country to benefit from outward MNE activity? For outward MNE activity to influence the home economy, a) substantial links must exist between subsidiary and host source of knowledge, b) MNEs must have integrated structure, and possess ownership advantages to manage complex cross-border R&D structure, c) strong links with domestic innovation system in home country need to exist (see Narula, 2010; Criscuolo, 2009). Nevertheless, the effect of MNE activity on home country has been mixed (as we shall see below) especially in the developed home country context. The empirical evidence on the effect of MNE activity has so far been limited in the context of developing home country, as indicated in the previous section. What follows is a summary of the mixed empirical evidence of home country effects of OFDI by MNEs.

[3] In international business literature, this is popularly known as the *springboard perspective* (Luo and Tung, 2007).

2.2 Empirical literature

2.2.1 OFDI and a substitute for domestic activity

There are a few studies which have reported negative impact of OFDI on domestic activity of firms. Imbriani et al. (2011) analysed the effect of OFDI on employment and productivity growth in the home country using firm-level data for Italy for the period 2003-2006. They reported negative effects of OFDI on employment, two years after investment, in the services sector. However, they have found that OFDI strengthens both productivity and, to less extent, employment in the manufacturing sector. Wagner (2011) also found a negative (though only small) causal impact of off-shoring on employment in German firms.

Lee et al. (2009) have examined home country effects of FDI outflows (to China, large developing country) for six major investors in China (i.e. small economies included in the Four Tigers and 2 large economies: Japan and the US) using aggregate data. They found that FDI outflows to China lead to the relative income between source country and China to decrease and raise the source country's unemployment rate. In addition, they found that FDI outflows to China decrease the exports to GDP ratio (only) for small source countries (four Tiger Countries: Hong Kong, Singapore, Taiwan, and Korea), even though a higher investment in China raises the share of their exports-to-China to China's total imports.

Sauramo (2008) reported that OFDI substitute domestic investment activity in Finland. The negative impact of OFDI on domestic investment was also reported in the case of developing countries in a recent study (Al-Sadig, 2013). Nevertheless, both these studies are aggregative in nature. The use of firm-level data is expected to give further insights. It could be that the reduction in domestic investment at the macro level may be due to slow growth in investment by domestic firms even though MNEs' domestic investment remains unaltered. The specific question to be addressed is whether OFDI reduces the domestic investment of the outward investing firm. This can be answered better using firm level analysis.

2.2.2 OFDI complements domestic activity

Complementary effects have been reported, either at aggregate or firm-level, in a number of studies that investigated the effect of investing abroad at home in the context of developed country. These studies include Hejazi and Pauly (2003) and Globerman (2012) for Canada; Desai et al. (2005, 2009) for US MNEs; Navaretti and Castellani (2004) for Italian firms; Hijzen et al. (2011) for France firms; Navaretti et al. (2010) for French and Italian firms; Herzer (2008) for 14 industrialised countries; Hijzen et al. (2007) and Ayumu (2012) for Japanese firms; Lee (2010), Kimura and Kiyota (2006) for Japan; Simpson (2012) for UK (high-skill sector); Alguacil

and Orts (2002) for Spain; Herzer (2010) for 50 countries (using cross country regression) and the USA (time series estimation); Herzer (2012) for Germany.[4]

A few studies have examined the case of developing country's OFDI and reported complementary effects at home. These include Zhao et al. (2010) and Huang and Wang (2009) for China; Pradhan and Singh (2009) for Indian automotive sector; Kim (2000) for Korea; Chen and Yang (2013) for Taiwan; Herzer (2011) for a sample of developing countries; Masso et al. (2008) for Estonia.[5]

2.2.3 OFDI and mixed effects on domestic activity

Falzoni and Grasseni (2005) analysed Italian firms investing abroad and obtained mixed results. The impact of international expansion on parents' performance (measured in terms of total factor productivity, labour productivity and employment) was shown to vary across firms in different quintiles of the performance distribution and across foreign affiliates' geographical locations. They observe that firms throughout the productivity distribution do not benefit from FDI in less developed county. On the contrary, parent firms in the upper quintile of productivity seem to be positively affected by foreign expansion in developed countries. This could be due to different motive of FDI in developed and developing countries. Bitzer and Görg (2009) examining 10 manufacturing sectors from 17 OECD countries reported negative relationship, on average, of OFDI and domestic productivity with heterogeneity in the effects across countries.

Debaere et al. (2010) differentiating investment by destination found similar impact of OFDI on employment growth at home of the Korean MNEs. The impact differs by the level of development of the destination country. Moving to less advanced countries had led to decreases in a company's employment growth rate. On the other hand, moving to more advanced countries did not affect employment growth in any significant way.

Herzer (2008) provided empirical evidence for Italy using macroeconomic time series, which suggests that in the short-run OFDI substitutes foreign for domestic activities and thus domestic investments. In the long-run, however, OFDI has positive effects on domestic investment. For Swedish MNEs, Braconier et al. (2001) did not find any evidence of R&D spillovers transmitted through OFDI. Similarly, Goh et al. (2013) found insignificant OFDI-trade linkages in the case of Malaysia.

[4] See Kokko (2006) for a survey on the effects of OFDI on developed home countries of MNEs.
[5] See Amighini et al. (2010) for a review of literature on the complementary effect of OFDI on developing home country.

The above review is indicative that the home country effect of OFDI varies in different settings. Given the paucity of studies in the developing country context, the current study is expected to provide further insights. The empirical analysis is done using a sample of Indian manufacturing firms. The following section elaborates the methodology and the dataset used in this paper.

3. Methodology and data

To analyse the impact of OFDI on Indian firms' domestic outcome indicators, we resort to the impact evaluation methodology. Many of the previous studies have used some variant of this methodology, matching techniques and the average treatment effect on the treated (ATT) regression, to assess the impact of outward investment on domestic performance (Debaere et al., 2010; Masso et al., 2008; Imbriani et al., 2011; Obashi et al., 2010; Hijzen et al., 2011; Hijzen et al., 2007; Navaretti and Castellani, 2004; Navaretti et al., 2010; Wagner, 2011; Ayumu, 2012; Chen and Yang, 2013).[6] This is one of the suitable methods for evaluating the causal effect of OFDI in view of the self-selection problem i.e. firms with higher productivity can overcome the plant-level fixed cost of investing abroad and become multinationals (Helpman et al., 2004; Yeaple, 2009). We need to control for this selection bias by adopting a matching technique to construct an appropriate counterfactual (control group) of the outward investing firms (the treatment group).[7]

Matching involves reconstituting the missing data *ex post* for the treated outcomes had they not been treated when a randomised control group is not available (Hijzen et al., 2011). The matching is done such that both the treatment and control groups have similar pre-investment characteristics. In doing so, we determine the probability (propensity score) of becoming MNE for a set of manufacturing firms using a Probit model based on observed characteristics prior to investing abroad. The methodological approach used in this analysis is not different from literature (e.g. Hijzen et al., 2011; Obashi et al., 2010). However, the empirical strategy has been tailored to suit data and keeping in view the constraints. It may be noted that the matching has been performed a few years prior to the outward investment, which in the literature is usually one year prior to investing abroad. The tailoring is essential in the Indian context to account for incomplete information on firms' past outward investment, among others. Firms

[6] The impact evaluation methodology is popular in development economics literature e.g. see Thomas et al. (2003), Schultz (2004), Banerjee et al. (2009), Muralidharan and Sundararaman (2011), Muralidharan and Prakash (2013).

[7] Previous studies have also used other techniques to assess the impact of OFDI on domestic activities of MNEs e.g. cointegration and Granger causality (Huang and Wang, 2009), panel tobit (Pradhan and Singh, 2009), panel system GMM (Al-Sadig, 2013), OLS regression (Kim, 2000), time series analysis, VAR and Granger causality (Zhao et al., 2010), quantile regression (Falzoni and Grasseni, 2005), dynamic OLS (Herzer, 2008) etc.

that have actually made outward investment in the study period is put in the treatment group whereas the firms with probability closer to those of the outward investing ones a few years before the investment constitute the control group. In essence, each firm in the treatment group has a comparable firm in the control group in terms of similarity in probability of becoming MNE based on characteristics observed a few years prior to the outward investment.[8]

The matching is achieved using the propensity score (predicted probability) obtained from a Probit model specified in equation 1

(1) …… $E(MNE_i \mid X_{it-k}) = P(MNE_i = 1 \mid X_{it-k})$

The indicator variable $MNE_i = 1$, if the firm has invested abroad during the period, 0 otherwise. X_{it-k} is a vector of explanatory variables k years prior to the investment period. These are common firm level determinants of outward investment that include firm size, total factor productivity (TFP), export intensity, R&D intensity, age if the firm, profitability ratio etc. We also include industry dummy as an additional control variable. It is to be noted that TFP is estimated using Levinsohn and Petrin (2003) methodology. The TFP estimated separately for each NIC (National Industrial Classification) 2-digit industry. Firm size is proxied by natural log of number of employees, export intensity by export percentage of sales, R&D intensity by research and development expenditure percentage of sales, profitability by profit after tax percentage of total income, and age of the firm by the number of years since incorporation of the firm. The aim of the matching procedure is to minimise the pre-investment differences in observables (and unobservables) between the treatment and control group of firms.

The mean difference in the performance between treated and the control group due to OFDI is obtained through a regression of the following form

(2) …… $y_i = \alpha + \beta \times Treat_i + \varepsilon_i$

Where, $Treat_i$ is an indicator for outward investment, β is the intent to treat (ITT) or average treatment effect on the treated (ATT) effect. A statistically significant coefficient value of β will indicate by how much the outcome in the treatment group (on average) is higher (lower) than the control group.

[8] We have used exact (one-to-one) matching to avoid small sample bias (as the number of firms available for matching is limited). Inexact (more than one closest neighbour) matching may be suitable for a large sample.

3.1 Data description

Reserve Bank of India (RBI), India's central bank, has made available the information on OFDI by Indian firms in its website in June 2011 and the data is available since July 2007.[9] The list of firms investing abroad during financial year 2008/09 to 2011/12 is compiled from RBI. However, the firm level characteristics and outcome variables required for impact evaluation need to be obtained from an alternative dataset as it is not available from RBI. Therefore, a major task of our analysis is to match the list of outward investing firms obtained from RBI in a corporate database, to obtain firm level characteristics and outcome variables for impact evaluation. In India, Centre for Monitoring Indian Economy (CMIE) maintains a database of sample of Indian companies, namely PROWESS. The database covers both (stock exchange) listed and non-listed companies and contains time-series data from 1989-90 to the latest. The database has been widely used by researchers for studying economic, financial and other aspects of Indian firms (e.g. Goldberg et al., 2010, 2010; Marin and Sasidharan, 2010). Out of 2,537 firms in the RBI list that have invested abroad during 2008/09 to 2011/12, we could match 892 (35.16%) firms (across all the sectors) in PROWESS.[10] Out of 892 matched firms, 439 of them belong to the manufacturing sector.[11] These 439 manufacturing firms have invested abroad during the study period and thus we consider them as Indian manufacturing MNE in the context of our study.[12]

The control group is obtained from a universe of 10,992 manufacturing firms that were available in PROWESS. However, missing data on number of employees (due to non-reporting) reduces the number of firms further. We could estimate TFP (at 2-digit NIC level) for those firms, belonging to various industries, which have data on number of employees. Next we proceed to perform the matching procedure through a Probit regression. We perform the Probit regression on 243 firms i.e. after leaving out the firms with missing observation on

[9] Besides the name of the Indian party/company, it also contain information on amount invested in US dollar million, destination of investment, type of investment i.e. whether joint venture or wholly owned subsidiary, among others.

[10] As of April 2013, there are 27,305 companies in PROWESS. For evaluating the impact of OFDI on various economic indicators, we have used data for standalone firms i.e. not consolidated for subsidiaries.

[11] The remaining 453 firms belong to primary or the service sector, which will be analysed in future research.

[12] It is possible that some of the firms, belonging to both (treatment and control) groups, may have invested abroad even before 2008/09. This is one of the reasons why we go 4 years back, instead of just one or two years as in previous studies, for determining the probability of MNE. It is expected that such bias will be minimal. The proportion of firms investing abroad (or the amount invested) is also expected to be minimal till 2004/05, as more number of firms seem to have considered investing abroad after relaxation of investment limit subsequent to the year 2004/05, also indicative from figure 1. The comparison is thus between firms that invested abroad during 2008/09 to 2011/12 with firms that did not invest abroad in the same period.

firm level characteristics (e.g. export intensity). Finally, we have 67 MNEs in the treatment group. Thereafter, we have created a control group of firms by matching each of the firms in the treatment group to a firm with similar predicted probability of investing abroad (one-to-one matching) based on observed characteristics a few years prior to the outward investment. It is to be noted that for matching purpose, we determine the probability of becoming multinational using firm characteristics observed in the year 2004-05 (4^{th} years prior to outward investment, k = 4), the year when firms were allowed to invest 100 percent of their new worth (under automatic route) in overseas JV/WOS.

4. Results and discussion

In order to minimise the observed heterogeneity between treatment and control group *ex ante*, we have computed the propensity score of becoming MNE using Probit regression (as specified in equation 1). The results of the Probit regression are reported in table 1. The dependent variable MNE = 1 if the firm has invested abroad during the study period 2008/09 to 2011/12, 0 otherwise. The control variables are for the year 2004/05, 4 years before the investment, the year in which firms were allowed to invest 100 per cent of their new worth (under automatic route) in overseas JV/WOS. The explanatory variables include firm size (captured by log of number of employees), TFP, export intensity, R&D intensity, profitability ratio, among others. The result indicates that firm size, export intensity, R&D intensity, profitability ratio significantly affect the choice of investing abroad. TFP in model 1 (obtained by Levinsohn and Petrin, 2003 method) has expected sign although it did not turn out to be significant. These estimates are used to predict the probability of becoming MNE (the propensity score) based on which the matching is performed. We have matched each of the outward investing firms (in treatment group) to a comparable firm in terms of propensity score which did not invest abroad *ex post* (and obtain the control group).[13]

[13] Given the number of firms available at hand, the matching is done for the manufacturing sector as a whole and not at 2-digit NIC level.

Table 1: Probit model for predicting the probability of becoming MNE

Dependent variable, MNE (manufacturing sector)

Explanatory variables	Model 1	Model 2
Log of Number of Employees $_{t-k}$	0.284*	0.284***
	(0.089)	(0.090)
TFP $_{t-k}$	3.96e-06	-0.049
	(8.04e-06)	(0.196)
Export/Sales $_{t-k}$	0.014**	0.014**
	(0.006)	(0.006)
R&D / Sales $_{t-k}$	0.180*	0.177*
	(0.1066)	(0.106)
PAT / Total Income $_{t-k}$	0.054***	0.054***
	(0.017)	(0.017)
Age of the Firm $_{t-k}$	-0.009*	-0.009
	(0.006)	(0.006)
Constant	-8.671***	-8.868***
	(1.225)	(1.065)
Industry Dummies	Yes	Yes
No of Observations	242	243
Pseudo R-Squared	0.23	0.23

Note: ***<0.01, **<0.05, *<0.10. Standard errors in the parentheses.

TFP is estimated industry-wise (at 2-digit NIC level). TFP used in Model 1 is estimated by Levinsohn and Petrin (2003) methodology (also see Petrin et al., 2004 for estimation details). The results presented in rest of the paper are based on propensity score matching that uses the estimates from Model 1. Model 2 is reported for comparative purpose, which uses TFP (as the residual) estimated using a Cobb-Douglas form of production function.

Industry (dummies) include: manufacture of food products (NIC-10), manufacture of beverages (NIC-11), manufacture of tobacco products (NIC-12), manufacture of textiles (NIC-13), manufacture of wearing apparel (NIC-14), manufacture of leather and related products (NIC-15), manufacture of wood and products of wood and cork, except furniture; manufacture of articles of straw and plaiting material (NIC-16), manufacture of paper and paper products (NIC-17), printing and reproduction of recorded media (NIC-18), manufacture of coke and refined petroleum products (NIC-19), manufacture of chemical and chemical products (NIC-20), manufacture of pharmaceuticals, medicinal chemical and botanical products (NIC-21), manufacture of rubber and plastic products (NIC-22), manufacture of non-metallic mineral products (NIC-23), manufacture of basic metals (NIC-24), manufacture of fabricated metal products, except machinery and equipment (NIC-25), manufacture of computer, electronic and optical products (NIC-26), manufacture of electrical equipment (NIC-27), manufacture of machinery and equipment n.e.c. (NIC-28), manufacture of motor vehicles, trailers and semi-trailers (NIC-29), manufacture of other transport equipment (NIC-30), manufacture of furniture (NIC-31), other manufacturing (NIC-32), repair and installation of machinery and equipment (NIC-33).

To test whether the matching is effective, we test for equality of means in the treatment and control group (using t-test, unpaired) for selected variables in the year of matching (i.e. 2004/05). The results are reported in table 2. The equality of means of the treatment and control group holds good for our sample of matched firms. Thus, both the groups are similar in terms of propensity to invest abroad *ex ante*. This enables us to evaluate any difference in outcome between the two groups of firms, in the later years, in terms of the outward investment decision. In the impact evaluation literature, this is also referred to as the causal effect of outward investment.

Table 2: Test of equality of means for treatment and control

Variable	Treated group	Control group	Difference (treated – control)	Test of Equality of Means (t-stat)	Number of observations
Export / Sales (%)	23.43	17.39	6.04	1.57	67 + 67 =134
R&D % of Sales	1.20	0.73	0.47	1.70	67 + 67 =134
TFP	6.076	2.074	4.002	0.85	67 + 67 =134
No of employees	5063	6709	-1646	-0.69	67 + 67 =134
Sales (Rs. Million)	51213.56	30349.15	20864.42	0.75	67 + 67 =134
Import of raw (Rs. Million)	15088.28	3766.72	11321.56	1.14	63 + 59 =122
Import of capital good (Rs. Million)	455.72	162.89	292.84	1.71	62 + 54 =116
GFA (change over previous year)	1642.12	692.24	949.88	1.35	67 + 66 =133

Note: Difference between treatment and control group is not significant at 5%

The impact of outward investment on outcome (y) variables such as export intensity, R&D intensity, and domestic investment etc. is evaluated using ATT regression equation (as specified in equation 2). The results are reported in table 3, table 4, table 5, and table 6. We find a significant effect of outward investment on export intensity and R&D intensity (the dummy is significant). The two findings are consistent with Pradhan (2007) and Pradhan and Singh (2009) respectively, however, under different methodological settings and sample period. After the outward investment, the export intensity of the treatment group is 12.01 percent higher than the domestic firms in 2008/09 (table 3). Note that such differences were insignificant a few years before the outward investment as reported in table 2. Similarly, the R&D intensity of the treatment group is 0.49 percent higher than the domestic firms in 2008/09 (table 4). The effect remains significant over the four years of the study, except for R&D intensity in 2009/10.

Apart from R&D intensity (which is an input-based measure), we have also used an output-based measure of research and development to assess the difference between MNEs and domestic firms. Data on patents granted have been retrieved from the website of the Office of the Controller General of Patents, Designs and Trademarks (http://www.ipindia.nic.in/). The results are robust to the use of output-based measure of research and development. Outward investing firms (treatment group) successfully received three times higher number of patents than the domestic (control group) firms (34 against 11 in number) during 2008/09-2011/12. Thus, complementary effects of outward investment are observed in case of export and research and development (which are needed to reinforce ownership advantages over time).

On the other hand, we find no significant effect on domestic investment (captured by change in GFA and change in capital work-in-progress) due to investment abroad (table 5 and table 6). This indicates that outward investment has not substituted domestic investment in the case of Indian manufacturing firms. This could be due to availability of alternative instruments of financing outward as well as domestic investment for Indian firms such as external commercial borrowing, ADR/GDR, FCCB etc. (i.e. greater access to global finance) rather than relying merely on domestic resources. It may be observed that despite the global financial crisis, the gross (net) external commercial borrowing to India increased from USD 13.2 (6.6) billion in 2008-09 to USD 28.9 (9.1) billion in 2011-12, notwithstanding the relatively small decline in ADR/GDR receipt in India from USD 1.16 billion in 2008-09 to USD 0.60 billion in 2011-12.[14]

We also tested if there was any significant impact (difference between Indian manufacturing MNE and domestic firms) on sales (output), employment (measured in terms of no of employees) import of raw materials, and import of capital goods. The effects were insignificant for all these variables (see table 7 for panel results, cross-section results are not reported). The insignificant difference *vis a vis* domestic firms could be because of low participation of Indian manufacturing MNEs in regional/international production network.[15] However, the results should be interpreted with caution as the time period for analysis is shorter. The impact of OFDI on many of the outcome variables is expected to be significant in the longer term.

As robustness check we used a panel regression model (2008/09-2011/12), which enabled us to control for firm-specific unobserved factors. Results are similar even in a panel framework i.e. positive and statistically significant impact on export and R&D intensity but insignificant impact on other variables (see table 7).[16]

Overall, there is no evidence of negative effect of outward investment on various outcome variables considered in this study. In a few cases, export intensity and R&D, there is complementary effect and in the remaining cases the effect is neutral. As a product of OFDI, export-intensity improves as the former widens firms' access to global sales and distribution network; whereas R&D intensity gets augmented during the internationalisation phase as firms face intense pressure to remain dynamically competitive in global market, to buttress

[14] Handbook of Statistics on Indian Economy, September 2014, Reserve Bank of India.
[15] The evidence on India's low level of participation in the international production network can be found in Athukorala and Nasir (2012), Athukorala (2011, 2008), Anukoonwattaka (2011), Sen and Srivastava (2011), Mohanty (2013). The share of parts and components in India's manufacturing exports was 10.4 percent in the year 2006-07 compared to 34.0 percent for developing Asia (Athukorala, 2011, see table 9, p. 17). Further, in 2009-2010, India accounted for a mere 0.4 per cent of (world) parts and component exports compared to 27.2 per cent for developing Asia (Athukorala and Nasir, 2012, see table I, p. 178).
[16] The difference-in-difference estimator was also tried. Though not statistically significant, the impacts were positive in most cases (and the ATT coefficients do not substantially attenuate).

ownership advantages through innovation, to assimilate technology spillover that arises from overseas investments and due to enhanced linkages with foreign R&D and innovation centres (this also supports the *springboard perspective*, see Luo and Tung, 2007). MNEs from emerging markets also pursue their own low-cost innovation strategies that form an important basis of firm capability (Celly et al., 2013; Williamson and Zeng, 2009). The findings are in line with the experience of some of the other developing countries in which OFDI has a complementary impact on domestic activity or performance (see Chen and Yang, 2013; Herzer, 2011; Zhao et al. 2010; Huang and Wang, 2009; Masso et al. 2008; Kim, 2000).

Thus, outward investment could be beneficial for Indian firms in a number of ways. Besides achieving higher exports and technological capacity through OFDI these MNEs could also integrate India to the global production and innovation network and further strengthen the Indian manufacturing sector. In this context, it is worth mentioning that in recent times approximately a quarter of India's total OFDI is directed to ASEAN and China (see table 8), which is considered to be one of the dynamic regions with production network. This is expected to enhance India's participation in regional production network involving ASEAN and China provided complementary policies are put in place. For instance, there is a need to improve supply chain connectivity (internal and external) in general and particularly with the region as India fares poorly with most of the ASEAN countries in International Supply Chain Connectivity Index (see figure 2).[17] Further, given the slower growth of manufacturing sector in India during the past decade, focus on increasing value added growth in Indian manufacturing is expected to generate additional complementary effects that are currently neutral.

Table 3: Difference in export intensity between MNE and domestic firms

	2008/09	2009/10	2010/11	2011/12
ATT	12.01***	9.86**	8.52*	10.98**
	(2.89)	(2.37)	(1.98)	(2.46)
Constant	16.56***	16.56***	18.76***	18.34***
	(2.99)	(5.55)	(6.08)	(5.67)
No of observations	127	127	124	122

Note: t-stat in parenthesis. ***<0.01, **<0.05, *<0.10

[17] See De (2011a, 2011b) for a discussion on trade facilitation in India and her connectivity with ASEAN countries. The need for improving internal connectivity (in India) can also be inferred from the finding of Duval and Utoktham (2011) that intraregional trade costs in SAARC are not significantly lower than its extra-subregional trade costs.

Table 4: Difference in R&D intensity between MNE and domestic firms

	2008/09	2009/10	2010/11	2011/12
ATT	0.49*	0.27	0.58*	0.36**
	(1.70)	(1.09)	(1.81)	(2.11)
Constant	0.32	0.30	0.23	0.20
	(1.49)	(1.65)	(0.94)	1.53
No of observations	91	90	90	97

Note: t-stat in parenthesis. ***<0.01, **<0.05, *<0.10

Table 5: Difference in investment between MNE and domestic firms

	2008/09	2009/10	2010/11	2011/12
ATT	8700.49	9761.02	4553.22	-3066.97
	(1.22)	(0.92)	(1.17)	(-1.03)
Constant	2176.58	2565.86	2962.17	3692.70*
	(0.42)	(0.34)	(1.06)	(1.73)
No of observations	129	128	126	124

Note: t-stat in parenthesis.

The difference represents change in GFA. Similar (insignificant) results were found with change in NFA.

Table 6: Difference in investment in capital work-in-progress between MNE and domestic firms

	2008/09	2009/10	2010/11	2011/12
ATT	4863.43	-7451.08	-2732.19	2828.92
	(0.92)	(-1.09)	(-1.21)	(1.00)
Constant	1355.99	1495.63	1015.61	665.43
	(0.37)	(0.30)	(0.62)	(0.33)
No of observations	125	124	121	121

Note: t-stat in parenthesis.

Table 7: Impact of OFDI in panel regression

	Export intensity	R&D intensity	Δ gfa	ΔCap-wip	Employ-ment	Output	Imp-raw	Imp-cap
ATT	10.31**	0.44*	5038	-710	-3161	51868	33951	196
	(2.59)	(1.86)	(1.18)	(-0.3)	(-1.18)	(0.79)	(1.03)	(0.35)
Constant	16.87***	0.31*	2818	1138	8809***	66379	14368	939**
	(5.93)	(1.79)	(0.92)	(0.67)	(4.52)	(1.41)	(0.61)	(2.32)
No. of observations	639	472	507	491	524	639	600	558

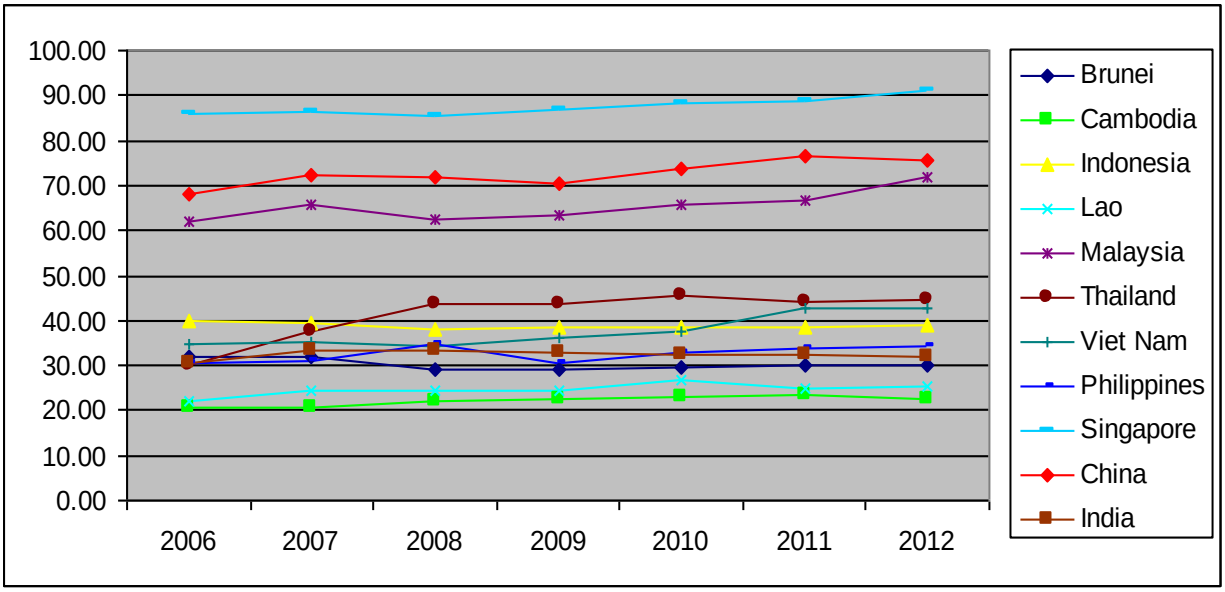
Note: t-stat in the parenthesis. ***<0.01, **<0.05, *<0.10

Table 8: India's OFDI in ASEAN and China

	2008/09		2009/10		2010/11		2011/12	
	US$ million	% of total	US$ million	% of total	US$ million	% of total	US$ million	% of total
Singapore	4137.20	24.13	6787.42	37.73	11856.27	26.99	5945.78	19.27
Malaysia	8.83	0.05	7.12	0.04	75.05	0.17	400.64	1.30
Indonesia	62.47	0.36	266.01	1.48	29.49	0.07	113.28	0.37
Thailand	121.53	0.71	59.59	0.33	9.63	0.02	33.32	0.11
Philippines	12.51	0.07	31.52	0.18	34.45	0.08	56.06	0.18
Viet Nam	50.05	0.29	2.70	0.02	76.11	0.17	3.14	0.01
Lao PDR	2.03	0.01	2.00	0.01	2.00	0.00	2.06	0.01
Myanmar	48.75	0.28	1.65	0.01	45.25	0.10	9.72	0.03
Brunei Darussalam	-		-		-		0.90	0.00
Cambodia	-		-		-		0.44	0.00
China	52.50	0.31	30.58	0.17	40.42	0.09	52.46	0.17

Source: Author's compilation from RBI

Figure 2. International supply chain connectivity index



Source: Author's compilation from ISCC Database, ESCAP

5. Summary and conclusion

In this paper, we have investigated the causal impact of investing abroad on domestic activity of Indian manufacturing MNEs during 2008/09 through 2011/12. In doing so, we have obtained a suitable control group consisting of domestic firms (using the propensity matching technique) that *ex post* did not invest abroad even though *ex ante* they were equally likely to do so. Since firms in treatment and control groups do not differ *ex ante*, the differences in *ex post* performance of the two groups could be directly related to outward investment. Such difference in outcome is studied using ATT regression.

Results from the sample of Indian manufacturing firms suggest that OFDI is likely to produce a number of complementary outcomes for the Indian economy through exports and R&D channels. Thus, OFDI promotion policy is not without any good. Nevertheless, OFDI has not made significant impact in some of the indicators e.g. domestic investment, sales (output), employment, the import of raw materials and import of capital goods. The insignificant impact on domestic investment could be attributed to mobilisation of financial resources by Indian firms from the global financial markets, whereas the insignificant impact of OFDI on domestic output, employment, import of raw materials, and capital goods could be due to low involvement of Indian manufacturing firms in international production network and global value chain, which could be vital for generating desired complementary effects of OFDI on domestic activities. It would be worthwhile to investigate the neutrality aspects in further detail, with a longer term perspective, in all those cases where OFDI does not make any significant

difference to the domestic outcome. This is expected to better shape the OFDI promotion policy pertaining to the manufacturing sector in India. Nevertheless, policy measures to enhance India's international supply chain connectivity, through better internal and external connectivity would help to derive complementary benefits of OFDI by the manufacturing sector.

The findings are in line with existing studies that report complimentary impact of outward investment on domestic activities. The Indian experience could also provide valid guidance for MNEs from other developing countries, particularly the ones that operate in a competitive market environment. Nevertheless, further research could be undertaken to improve the understanding of impact by distinguishing outward investment by type (horizontal or vertical), destination (high-income or low-income location), and motivation. The analysis could also be extended to cover the services sector, which is expected to be insightful in view of the fact that services sector accounts for a sizable portion of outward investments by Indian firms.

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