FDI and Firm Competitiveness: Evidence from Indian Manufacturing Sector,(2000-01 to 2006-07)

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I. INTRODUCTION

One of the major changes in the international arena in the last two decades or so has been the increasing importance of Foreign Direct investment (FDI) for developing countries. Two main factors have accounted for this. Firstly, the decline in flow of aids in terms of Official Development Assistance to developing countries and its replacement by flows of portfolio investment and FDI. Generally developing countries have preferred FDI rather than portfolio flows as this is considered more stable and related to growth considerations (Haddad and Harrison 1993; World Investment Report 1999). As a consequence, the competition among developing countries for wooing FDI has increased considerably. In the 1990s, for example, of all changes to bilateral investment treaties; about 95 percent have been in favour of further liberalizing entry norms for FDI (World Investment Report 1999). Second, FDI is now viewed as a major source of technology for developing countries in particular (World Investment Report 1999; Aitken and Harrison 1999). India too has been wooing foreign technology via FDI since 1980s.

India's foreign investment policy in the 1980s was laid out in the Technology Policy statement of 1982. The policy discouraged direct equity ownership by foreign firms and promoted purchase of foreign technology via technical collaborations with Indian firms. The general idea was that technical collaborations would induce technology transfer via purchase of drawings and designs by Indian firms. This policy was in fact shown to be a failure as most Indian firms tended to import outdated technology (see, Pant 1995). The first major change in India's policy towards FDI came after the Industrial Licensing Policy of 1993. For the first time, it was recognized that FDI was the preferred mode of foreign investment compared to the traditional inflows of loans and portfolio investment.

In general, direct technology transfer via purchase of drawings and designs etc. tend to be limited by patent laws. However, in this context; it is now increasingly seen that indirect transfers via spillover benefits may be more important. It has been argued that if transnational corporations (TNCs) introduce new products or processes in the host country, technology diffuses to the domestic firms which are competitors in production or suppliers of inputs to the foreign companies (see, for example, Aitken and Harrison 1999; Kathuria 2000). Therefore, FDI has been seen as a major source of technology and other firm specific benefits (networks, organizational skills etc.).

The early literature on FDI in developing countries had concentrated on direct benefits of FDI in the form of employment, exports etc. (World Investment Report 1999; Aaron and Andaya 1998). However, particularly for developing countries, the literature on the indirect benefits of FDI to the host economy is now the focus of empirical studies. While the Indian policy on FDI has been liberalised remarkably in recent years, the focus on FDI as a source of international competitiveness has now gained even political acceptance. In this paper we will look specifically at the factors that determine the competitive gain via spillover benefits to local firms.

This paper is organized as follows. The second section presents a brief overview of the literature on concept of competitiveness and sources of competitiveness. In Section III, we present a discussion of the methodology used in our empirical analysis and definitions of variables used. This is followed by a discussion of the data and a brief comparison of foreign and domestic firms in the Indian manufacturing sector in Section IV. The main results of our estimation are presented in Section V; while some concluding observations are given in Section VI.

II. COMPETITIVENESS AND SOURCES OF COMPETITIVENESS

At the new ages of globalisation, nations are torn between the allure of better access to foreign markets and the fear of new competition in existing markets. In this context, competitive edge has become a new aim for the nations. Competitiveness generally identified as the relative efficiency in producing tradable goods. But the concept of competitiveness has been highly debated and often controversial in recent years. There seems to be no consensus regarding what the concept really means, especially at the national level. For instance, we often see that competitiveness and comparative advantage are used interchangeably. Although both are related, there are certain distinct features between them. Comparative advantage is driven by differences in the cost of inputs such as labour or capital. But competitive advantage, on the other hand is driven by differences in the capacity to transform these inputs into goods and services at maximum profits (Kogut, (1985). According to Siggel (2006) the distinction between competitive advantage and comparative advantage depends upon the measurement of costs. But these two concepts are closely related because competitive advantage is built to some extent upon the factors that determines comparative advantage and how we manage to maintain this advantage.

Another major reason behind this controversy is that competitiveness is often identified at different levels. Generally, competitiveness is applied at three levels, national, industry and firm level. At the national level the most common acceptable definitions of competitiveness is the "ability of a country to produce goods and services that meet the test of international markets and simultaneously to maintain and expand the real income of its citizens" (OECD, 1992). . Another definition of competitiveness at the national level is synonymous with absolute or relative productivity advantage in producing a particular commodity by a nation. Productivity is assumed to capture quality and product feature as well as production efficiency (Chaudhuri and Ray, 1997). According to Haque (1995) an economy is competitive 'if it is able to grow without being constrained by balance of payment difficulties and market share is maintained'.

One of the leading critiques of the usage of competitiveness term at national level is Krugman (1996), who argues that it is firms that compete for market share, not countries. According to him national economies simply do not compete with each other as corporation do, and that increases in productivity rather than international competitiveness are all that matter for increasing the standard of living of a nation. Krugman (1994) argued that the notion of competitiveness at the national level makes no sense, and claimed that the term was becoming, in fact, a "*dangerous obsession*". Instead of competitiveness, he preferred to use productivity as the major indicator of performance by nations.

On the other hand, the issue of competitiveness is less controversial at the industry and firm level. Firm level competitiveness can be defined as the ability of firm to design, produce and/or market products superior to those offered by competitors, considering the price and non-price qualities (D'Cruz, 1992). The definition of competitiveness "the ability to compete in markets for goods or services" fits the most with firms (Musik and Murillo, 2003). According to Chesnais (1986), the international competitiveness and national economies is built on the competitiveness of the firms which operate within the national borders. It is an expression of dynamism of domestic firms and their capacity to invest and to innovate by using own R&D and appreciating technology developed elsewhere. Porter (1998) says, "It is the firms, not nations, which compete in the international markets". Nations can compete only if firms are competitive (Ambastha and Momaya, 2004). Firm level competitiveness generally focuses on the capacity of a company to increase profit and grow on a sustainable basis (Onyemenam, 2004).

Apart from the controversy in defining the concept of competitiveness and the debate at which level competitiveness should be assessed, another important issue is the measure of competitiveness at the firm level. Profitability, cost, productivity and market share are all indicators of competitiveness at the firm level. Ramasamy (1995) perceives competitiveness as the ability of a firm to segment market share, profit and growth in value added to remain competitive in the long run. Kumar and Chadee (2002) stress export profitability and market share as the main indicators of competitiveness. In another study by Gorynia (2001), the basic measure of competitive position of a firm is its market share and financial condition. It shows that competitiveness is the ultimate concern for long term performance. Some authors view competitiveness with the competency approach. They emphasis the role of factors internal to the firms such as firm strategy, structures, competencies, capabilities to innovate, and other tangible and intangible resources for their competitive success (Bartlett and Ghoshal, 1989;Hamel and Prahalad, 1989). This view is particularly among the resource-based approach towards competitiveness (Prahalad and Hamel, 1990; Grant, 1991; Barney 2001, 1991). Ability to develop and deploy capabilities and talents affect far more effectively than competitors can help in achieving world-class competitiveness (Smith, 1995).

In the recent productivity literature it has been a main argument that monitoring the level of the productivity within the firm is very important to keep the firm competitive in today's market place. Productivity is the measure which might be termed as "revealed competitiveness" (Gardiner, Martin and Tyler, 2004, Roshli, 2004). Porter (1994) defined competitiveness at the organizational level as the productivity growth that is reflected either by lower cost or by differentiated products that command premium prices. Productivity depends on the value of a nation's products and services, measured by the prices they can command in the open market, and the efficiency with which they can be produced (Porter and Ketels,2003). Therefore, true competitiveness is measured by productivity. Higher productivity means improved competitiveness. Krugman (1994) said, if competitiveness has any meaning, then it's another way of saying productivity, that growth in the national living standards is essentially determined by the growth rate of productivity. The company, industry or the nation with highest productivity could be seen as the most competitive (McKee and Sessions- Robinson, 1989).

The competitiveness of firms in developing countries is severely constrained by poor and inadequate economic infrastructure. The lack of technological infrastructure, in terms of knowledge-creating institutions and business development services, and problems with access to technology are major obstacles to firms' ability to innovate. Acquiring technological capabilities is not an automatic process in response to market signals. It is a costly and invariably time-consuming process very much dependent on country-specific factors. FDI is one means by which developing countries may cover shortfalls in domestic capital accumulation and gain access to technology, skills and managerial know-how (Smeets 2008). Some of the positive benefits of inward FDI to developing countries like India are briefly discussed below.

FDI can have positive benefits in terms of increasing the contestability of host markets, improving the performance of local industry and lowering prices. It may contribute directly to the competitiveness of local firms by being the vehicle by which they penetrate international production and marketing networks. Technology transfer from FDI reduces the X-inefficiency of the domestic firms and improves productivity of the local firms (See Gorg and Greenway 2004; Smeets 2008). Competition from foreign firms also improves allocative efficiency of resources (Caves, 1974). On the other hand, competition from foreign firms may force the inefficient domestic firms to leave the market leading to lower competitiveness among the local firms (Aitken and Harrison, 1999). Linkages with the foreign and domestic firms enhance productivity of the domestic firms (Javorcik, B. S. 2004). The evidence suggests that efficiency-seeking FDI rather than market-seeking or natural-resource-seeking FDI yields the greatest improvements in local firm competitiveness and market shares (Sashidharan, 2010).

However, the realization of the potential benefits of FDI depends critically on the initial conditions in the local market. FDI cannot substitute for domestic effort. If there are no local firms with which TNCs can interact, there can be no transfer of knowledge and technology and there are unlikely to be any changes to the host economy's dynamic competitive advantages. This suggests that achieving a more widespread diffusion of TNCs' technologies and creating interlinkages with local firms requires specific interventions (like, skills development, support for R&D, competitive environment and the provision and upgrading of economic infrastructure) to promote local capacity development. There is a growing body of literature which shows that FDI has become an important source of higher

productivity and in turn competitiveness (for example, see, Bhattacharya *et.al*. ,2008 for India; Gorg and Strobl,2000 for Ireland; Chuang and Lin,1999 for Tiwan, among others)

Apart from FDI, institutional and firm level factors can also improve firm level competitiveness. These factors not only augment firm competitiveness but also facilitate spillover from FDI. Some of the major factors are discussed below:

1) **Use of inputs:** use of power and the capital has been the major indicator to productivity and thus competitiveness (Onyemenam, 2004).

2) **Innovation capability (R&D) and Imported Technology:** Innovation can be understood as the process of introducing and exploiting a new technological advancement, designing and engineering differentiated products (Grupp, 2007). Hence, R&D can be considered as the heart of innovation, which is the key source of dynamic competitiveness. Moreover, *imported technology* as an intellectual property becomes a primary asset of the firm and plays a major role in competitive strategy (Kumar and chadee, 2002, Roshli, 2004). In this context, we have to note that the ability of the domestic firm to absorb new technology depends on the level of R&D and the quality of human capital available to the firms (see, for example, Girma 2005).

3) **Competitive environment of the market:** In a market economy, firms compete with each other to win consumers. Competition provides an incentive for firms to perform the best, producing high quality goods and services at the cheapest price. Competition encourages entrepreneurial activity and market entry by new firms by rewarding efficient firms and eliminating inefficient firms. In ideal market conditions firms react flexibly and quickly to changing market demands and entry of the new firms. The entry of new firms provides the necessary stimulus for adjustment, while ability of the firm to adjust and the speed at which they do so is the measure of their efficiency or in other words, competitiveness. Thus, we can see that competition and competitive pressure is the key driver of competitiveness (UNCTAD, 1999).

This discussion has highlighted several potential effects of FDI on firm competitiveness. Therefore, in the next section, we will spell out the empirical methodology for assessing the role of FDI and other potential factors on the competitive performance of Indian manufacturing firms.

III. METHODOLOGY

We have proxied firm competitiveness by its total factor productivity (TFP). In order to derive firm productivity, we have to estimate firm level production function. The key issue in the estimation of production function is the potential correlation between unobservable productivity shocks and input levels of firms. In the case of positive productivity shocks, we know that profit maximising firms responds by expanding output which requires additional inputs. The correlation between the input level and productivity shock leads to simultaneity problem of the production estimation. Ordinary Least square (OLS) estimates ignore this correlation between inputs and this unobservable factor. Therefore, OLS estimates of production function will produce biased and inconsistent results. To solve this problem Olley and Pakes (1996) developed an estimator that uses Investment as proxy for unobservable shocks. However, the method is valid only when firms report "Non-Zero" Investment. Investment is a costly state variable, therefore, costs for adjustment sometime generates problem for estimation (Levinsohn and petrin, 2003).

We use Levinsohn and Petrin (LP) "intermediate input proxy" method to estimate productivity for the firms. LP use panel data using the entire time series of observations for that firm in the bootstrapped sample. The sample is complete when the number of firm year observations equals the number of the firm year observation in the original sample. This process has few benefits over other processes: 1) Firms at least always report positive use of electricity or material (In our case we use power and fuel expenses as the intermediate input); 2) Use of intermediate simply links the economic theory and estimation strategy, because intermediate inputs are not typical state variables.

Production Function Estimation using inputs to control for unobservables Production technology is assumed to be Cobb-Douglas:

$$v_t = \beta_0 + \beta_l\, l_t + \beta_k\, k_t + \beta_m\, m_t + \omega_t + \eta_t$$

v_t = *logarith of firm's gross value added*

l_t, k_t, m_t = *logarithm of free variable labour , sate variable capital and intermediate input .*

ω_t = *the transmitted productivity component related to the state variable*

η_t = *error term uncorrelated with input choices*

The key difference between these two error terms is that the former is a state variable and hence impacts firm's decision rules.

Letting v_t represent value added, we can write the production function as:

$$v_t = \beta_0 + \beta_l\, l_t + \beta_k\, k_t + \beta_m\, m_t + \omega_t + \eta_t$$

$$= \beta_l\, l_t + \varphi\,(k_t\,,\, m_t\,) + \eta_t$$

Where, $\varphi\,(k_t\,,\, m_t\,) = \beta_0 + \beta_k\, k_t + \omega_t\,(k_t\,,\, m_t\,)$

Productivity can be represented as:

$$\widehat{\omega}_t = \exp(v_t - \widehat{\beta}_l l_t - \widehat{\beta}_k k_t)$$

For detailed methodology see, Levinsohn and Petrin, (2003).

Measure of Relative Productive Inefficiency.

It is assumed that the firm which has the highest level of productivity is the most efficient (and competitive) firm. The other firms which have not yet reached the frontier (the highest level of productivity) are considered to be the laggard firms. Now, if the firms become competitive, the gap between the most efficient firm and the other laggard firms would decrease over time.

The level of the TFP of a firm can be examined relative to the productivity level as achieved by the most efficient firm in each industry j. For N no. of firms, there would be N estimates of productivity within each industry j, given by $a_{1jt,}$ $a_{2jt,\ldots\ldots\ldots,}a_{Njt.}$ From here, we can get $a_{jt} = \max(a_{ijt})$, as the productivity of the most efficient firm in the industry j for the year t. Then, the dispersion from the most efficient firm or the relative inefficiency of each firm can be calculated as:

$$Z_{ijt} = a_{jt} - a_{ijt}.(\ i = 1,\ldots.,N;\ j=1,\ldots,5;\ t= 2001,\ldots.,2007).$$

A high value of Z_{ijt} implies that the firm i is very inefficient relative to the most efficient firm in the industry j at the time t. The relative deviation of the firm level productivity from the best practice frontier can be measured by $P_{ijt} = Z_{ijt} / a_{jt}$ where, P_{ijt} denotes the relative productivity deviation of the firm from the best practice firm in the industry. This variable i.e. P_{ijt} has been used as the dependant variable for our estimation.

For the most efficient (most competitive) firm P_{ijt} should be zero and equals 1 for the most inefficient (least competitive) firm. Hence, P_{ijt} actually measures the competitiveness of the firms. In the rest of the paper, we have used efficiency, competitiveness and inefficiency to represent firms' competitiveness.

The Model:

As we have already mentioned before, competitiveness is affected by FDI and competition in the industry; R&D, input use, and imported technology by the firm, we can write:

$$P_{ijt} = F\,(\text{FDI, K/L, CONC, R\&D, TECH, MAT}) \text{ - - - - - - - - } (1)$$

Where, FDI represents foreign presence variable, K/L represents the capital–labour ratio of the firm, CONC represents the concentration (inverse of competition) in the industry, R&D represents the R&D expenditure, TECH represents imported technology and MAT is the material expenditure of the firms.

However, as argued by Tong and Hu (2003), Kathuria (2000, 2002) and Wang and Blomstrom (1992), indirect benefit from FDI can be internalized if the institutional and firm level activities mutually support each other. As most of FDI impacts are indirect in nature, competitive nature of the industry and R&D of the firm helps to acquire more benefit from FDI. Same happens for the imported technology. As all the firms do not import technology, therefore "learning effect" works if other firms also incur R&D and the industry is competitive. Therefore, interaction of R&D and Competition with FDI and imported technology can be regarded as important factors of productivity enhancement or in turn competitiveness. However, till now impact of interaction between competition and FDI or imported technology on competitiveness has been hardly addressed empirically. In our model, we included this interaction terms as well.

Therefore, our final model (with expected signs) is:

$$\begin{aligned} P_{ijt} = \mu &+ \underset{(-)}{\gamma_1 FDI_{jt-1}} + \underset{(-)}{\gamma_2 TECH_{ijt-1}} + \underset{(-)}{\gamma_3 (K/L)_{ijt}} + \underset{(-)}{\gamma_4 MAT_{ijt}} + \underset{(+)}{\gamma_5 CONC_{jt-1}} + \underset{(-)}{\gamma_6 R\&D_{ijt-1}} \\ &+ \underset{(+)}{\gamma_7 (FDI_{jt-1} * R\&D_{ijt-1})} + \underset{(+)}{\gamma_8 (TECH_{ijt-1} * R\&D_{ijt-1})} + \underset{(+)}{\gamma_9 (FDI_{jt-1} * CONC_{jt-1})} \\ &+ \underset{(+)}{\gamma_{10} (TECH_{ijt-1} * CONC_{jt-1})} + \delta_{ijt} \quad \text{- } \mathbf{(2)} \end{aligned}$$

Where,

(FDI_{jt-1} * $R\&D_{ijt-1}$) = the interaction term between the foreign presence in the jth industry at time period t-1 and R&D of the ith firm in jth industry at time period t-1.

($TECH_{ijt-1}$ * $R\&D_{ijt-1}$) = the interaction term between the technology import by the ith firm in jth industry at time t-1 and R&D of the ith firm in jth industry at time t-1.

(FDI_{jt-1} * $CONC_{jt-1}$) = the interaction term between the foreign presence in the jth industry at time period t-1 and concentration in the jth industry at time period t-1.

($TECH_{ijt-1}$ * $CONC_{jt-1}$) = the interaction term between the technology import by the ith firm in the jth industry at time period t-1 and concentration in the jth industry at time period t-1.

δ_{ijt} = Normally distributed random error term which captures other Influences on P_{ijt}

The expected signs in parenthesis on the right hand side of (2) are given keeping in mind that P_{ijt} represents the level of inefficiency and not efficiency. We have introduced a time lag in the variables for FDI, TECH in CONC and R&D. This reflects the presumption that these variables are likely to impact productivity with a time lag. Moreover, lag is important to correct for any endogeneity problem. We will test this model in our empirical estimation given in Section V. However, we will estimate the model without interaction terms (Model 1 and 2) and with interaction terms (Model 3 and 4).

From Equation (2) it is clear that $\boldsymbol{\gamma_1}$, $\boldsymbol{\gamma_2}$, $\boldsymbol{\gamma_7}$, $\boldsymbol{\gamma_8}$, $\boldsymbol{\gamma_9}$ and $\boldsymbol{\gamma_{10}}$ are of particular importance to us. For example, $\eth P_{ijt} / \eth FDI_{ijt-1} = \gamma_1 + \gamma_7 R\&D_{ijt-1} + \gamma_9 CONC_{jt-1}$ measures the impact of foreign presence on relative inefficiency when the interaction between CONC, R&D and the foreign presence variable (FDI) is also considered. Statistically significant values of γ_7 and γ_9 would indicate that the impact of foreign presence in the industry on dispersion of productivity would depend on the R&D expenditures by firms and the market concentration of the industry. In other words, even if γ_1 is significant, the overall impact of FDI on productivity may be limited because of the level of R&D and CONC. We will discuss this in more detail later on.

Construction of the Explanatory Variables

$(K/L)_{ijt}$: Capital–Labour Ratio of the ith firm in the jth industry at the time period t.

MAT_{ijt} : Share of ith firm's expenditure on raw material and power and fuel in total sales turnover of the ith firm in jth industry for the year t. (see, Aitken and Harrison 1999).

$R\&D_{ijt-1:}$ R&D intensity measured as ratio of total Research and Development expenditure (Current and Capital) to the total sales turnover of the ith firm which belongs to jth industry for the year t-1.

Foreign Firm: A foreign firm has been defined as the firm where the foreign equity participation is more than or equal to 10% (see Pant and Pattanayak 2005). This is used to define the various explanatory variables relating to foreign firms and shown below.

FDI_{jt-1} : This variable is measured as the share of foreign firms' sales in total sales of a particular industry for a particular year. It is a measure of the foreign presence in any industry.

$TECH_{ijt-1}$: This variable captures technology imports. It is measured as the ratio of the royalties, technical fees and licensing fees to total sales turnover of the ith firm in the jth industry for each year t-1 (Kathuria 2000 and 2002).

$CONC_{jt-1}$: The HHI is measured as: $\sum^{n}_{i=1} (p_i)^2$ where $p_i = q_i / Q$ where q_i is the sales of the ith firm, Q is the total sales of the industry and n is the no. of the firms in the industry. CR4 is the share in sales of the top four firms in the industry.

Before implementing model in Equation (2) it is useful to look at some features of our data base and a comparison of the domestic and foreign firms. This is done in Section IV below

IV. DATA SOURCE AND DESCRIPTION

The data has been retrieved from PROWESS database provided by the Centre for Monitoring the Indian Economy (CMIE). The data consists of five two digit industries of the manufacturing sector which account for most of the FDI in India. These industries are: Electrical Goods Industry, Power and Fuel Industry, Industrial Machinery Industry, Transport Equipments Industry and Chemical Industry. Our initial sample consisted of 3779 firms. Most of the firms were dropped from the initial sample because of the discontinuity of data for several years for important variables like gross fixed assets, sales etc or due to the

negative values of gross value added. A total of 2611 firms were thus dropped from the initial sample. The final sample consisted of 1168 firms from the five industries: Power and Fuel (37 firms), Chemical Industry (505 firms), Industrial Machinery (231 firms), Electrical Equipment (176 firms) and Transport Equipment (219 firms). The study period covers the years from 2000-01 to 2006-07. This time period was chosen as FDI surged during 2002 and India fully liberalized FDI. Moreover, data adequacy was more than previous years. Therefore, our sample used for the estimation constituted a balanced panel. A brief comparison of domestic and foreign firms reveals some interesting insights. For this we have here used the full set of 3779 firms. Since this includes firms that may have exited or entered during the sample period, we feel this may give additional insights not available in the balanced panel used for the econometric estimation. Table 1 below gives a comparison of the number of foreign and domestic firms.

Table 1: Number of Foreign and Domestic Firms, 2001 to 2007

Industry name and code	Total firms	no of the foreign firms (2001)	no of the foreign firms (2007)	% of foreign firms (2001)	% of foreign firms (2007)
chemical (24)	1165	56	55	4.81	4.72
electrical and non electrical (31&32)	603	27	25	4.48	4.15
industrial machinery (29&30)	693	33	33	4.76	4.76
transport equipment (34&35)	520	24	26	4.62	5.00
Power and fuel (23)	107	6	6	5.61	5.61

Source: CMIE database

Inspection of table 1 clearly reveals that the largest numbers of foreign firms are in Chemicals Industry and the least in the Power and Fuel Industry. This is probably due to the high capital requirements in the Power and Fuel segment so that entry into this sector is not easy. This sector is also quite tightly controlled by the government. It is also interesting to note that the percentage of foreign firms has remained more or less constant over the sample period. It is also instructive to compare some of the variable we are interested in for the two sets of firm, domestic and foreign. Of interest is the importance of the foreign owned firms in our groups of industries. This is shown in Table 2. It gives the ratios of foreign firm sales to total industry sales over our study period. We can note that the relative sales of foreign firms have increased over the period except for the Industrial Machinery sector. It may also be noted that the increase has been highest for the Transport Equipment and Chemicals industries. However, domestic firms still account for the largest part of domestic sales.

Table 2: Shares of Foreign Firms in Total Industry Sales, 2001-2007:

Year	2001	2002	2003	2004	2005	2006	2007	Average over the period (2001-2007)
Industry								
1)Industrial machinery	0.18	0.18	0.17	0.16	0.13	0.12	0.12	0.15
2) Power and fuel	0.04	0.04	0.04	0.03	0.04	0.06	0.06	0.04
3)Transport Equipment	0.22	0.2	0.21	0.3	0.3	0.3	0.31	0.26
4) Chemical Industry	0.2	0.2	0.18	0.22	0.24	0.26	0.28	0.23
5) Electrical Goods	0.22	0.24	0.21	0.2	0.19	0.19	0.24	0.21

Source: Calculated from the data collected from CMIE

V. ESTIMATION RESULTS

As we have noted, implementation of the model requires us to first generate residuals from production function estimates and then generate our dependent variable. P_{ijt} . We have used panel estimation techniques for this and our main estimating equation (2). The results of our estimation are shown in Table 4 below. It is clear that the overall significance is fairly high. The usual Hausman tests indicated the relative efficacy of the fixed effects model and the results are shown in the tables below. The explanatory variables did not exhibit any multicollinearity.

Inspection of table 4 shows that our model performs fairly well in that most of the coefficient signs are as discussed in Section III. The results are also statistically significant. Thus high levels of R&D correlated with low inefficiency which gives some credence to the usual hypothesis that R&D expenditure probably enables domestic absorption of technology and hence increase firm competitiveness. Our hypothesis that lack of competition inhibits entrepreneurial activities of the firms is established from the above estimation. This holds true for both the definitions of competitiveness used, namely, CR4 and HHI. The negative coefficients for the K/L variable indicate that firms with low K/L ratio are also those with relatively low levels of productive efficiency. This may indicate the relatively lower efficiency of labour in Indian manufacturing firms. The variable MAT is not understandable. This variable has shown a surprising result.

However our main focus in this paper is the impact of FDI and imported technology on competitiveness. Our results clearly indicate that foreign presence has strong positive

impacts on competitiveness. Our results are important given that in the empirical literature this conclusion is not supported by any of the studies for India. In fact most studies find that foreign presence has either insignificant or negative impact on firms' productivity. We think this is probably due to the small volume of FDI in the pre-2002 period.

Table 4: Fixed Effects Panel estimation results with lag 1: (Dependant variable: P_{ijt}), ALL FIRMS

variables	Model 1 (HHI)	Model 2 (CR4)	Model 3 (HHI)	Model 4 (CR4)
FDI	-.0037271 (-5.24)***	-0.003463 (-4.82)***	-0.014624 (-9.27)***	-0.011017 (-4.8)***
TECH	.0416768 (2.29)**	0.03991 (2.05)**	0.03554 (1.72)*	0.03749 (1.68)*
R&D	-.1570293 (-2.27)**	-0.15422 (-2.24)**	-1.145602 (-2.72)***	-1.15245 (-2.84)***
CONC	3.524551 (7.27)***	1.65408 (9.72)***	1.78844 (3.07)***	1.27433 (5.84)***
K/L	-.0003778 (-10.37)***	-0.000375 (-10.33)***	-0.000377 (-10.67)***	-0.000375 (-10.49)***
MAT	0.0828445 (7.38)***	0.08331 (7.36)***	0.07954 (7.05)***	0.08133 (7.12)***
FDI*R&D	-	-	-0.085205 (-2.94)***	-0.075956 (-3.08)***
TECH*R&D	-	-	0.14128 (0.11)	0.01696 (0.12)
FDI*CONC	-	-	0.14003 (7.15)***	0.0226 (3.17)***
TECH*CONC	-	-	-4.672436 (-0.89)	-3.176201 (-0.72)
Constant	0.786003 (34.36)***	0.48356 (10.39)***	0.90147 (30.48)***	0.61434 (9.71)***

Note: In Table (4), Column 2 and 3 we present the results without the interaction terms while these terms are included in columns 4 and 5. Models 1 and 3 define concentration as HHI while models 2 and 4 employ the CR4 definition. ***, ** and * represent 1%, 5% and 10% significance levels respectively.

Second, the usual presumption that licensing of technology will induce learning by doing for Indian firms is not supported by our results. Our results indicate the opposite. A similar result was obtained in Kathuria (2002, op.cit.). The coefficient of TECH is statistically significant and positive indicating that import of technology tends to increase inefficiency. This result is important given the policy focus in the 1980s to promote technical collaborations in preference to FDI in India. Our results indicate that imported designs and

drawings did not contribute to productivity increase probably because the technology was either obsolete or inappropriate. This is also supported by some other empirical evidence (see, Pant 1995, op.cit.) Hence, our results indicate that competitiveness seems to come more from the general presence of foreign firms rather than from purchase of imported technology.

One issue which has received some attention in the literature on India is the impact that the absorptive capacity of firms has on their ability to benefit from foreign presence. This has important implications for the general issue of the absorptive capacity of Indian firms. We measure this effect as the interaction of the FDI and R&D variables. From table 4 we can see that the coefficient of FDI*R&D is negative and statistically significant. This indicates that while FDI by itself has a positive spillover impact via reducing the productive inefficiency, this impact is larger for firms with higher R&D expenditure. This indicates that higher the absorptive capacity of the Indian firms the higher the ability of firms to benefit from foreign presence. Similar conclusions were reached in Kathuria (2010), and Basant and Fikkert (1996). The first study measures absorptive capacity by the technology gap whereas we argue that the absorptive capacity depends on the R&D expenditure. We may also note that R&D does not seem to affect the ability of domestic firms to benefit positively from imported technology. In our estimation the coefficients of the variables TECH*R&D is statistically insignificant. Once again, the statistical insignificance of the TECH*R&D variable indicates that even higher absorptive capacity does not imply that domestic firms can benefit from imported technology probably because the technology is either obsolete or inappropriate.

Another focus of our study has been the role of institutional factors in interacting with variables like foreign presence and technology import. The positive and statistically significant coefficients of the variable FDI*CONC indicates that measures that reduce market concentration (HHI) also lead to a higher impact of foreign presence on dispersion of productivity. This is true whichever definition of market concentration is used. We interpret this to imply that higher competitiveness in an industry also enhances the competitiveness of the firms from foreign presence in that industry. This role of institutions has so far not been studied in the Indian context. However, it is particularly important today after the passage of Indian Competition Act, 2002. From May 2011 the Indian regulator, the Competition Commission of India, has been fully empowered to regulate competition. Our results indicate that it can significantly influence the competitiveness of domestic

companies. It is possible that our results are dominated by the presence on foreign firms in our sample. In other words, spillover impacts apply mainly to foreign firms and this is driving the overall results. To test this we implemented our model for the set of only domestic firms. The results are shown in Table 5.

An inspection of Table 5 indicates that none of our earlier results are altered when the model is implemented for the set of only Indian firms. The significance of foreign presence remains the same and so does the interaction of this variable with R&D and CONC.

Table 5: Fixed Effect Panel estimation results with lag 1: (Dependant variable: P_{ijt}) DOMESTIC FIRMS

variables	**Model 1 (HHI)**	**Model 2 (CR4)**	**Model 3 (HHI)**	**Model 4 (CR4)**
FDI	-0.002862 (-3.53)***	-0.002556 (-3.13)***	-0.015138 (-8.97)***	-0.011753 (-4.68)***
TECH	0.04318 (2.4)**	0.04149 (2.21)**	0.03629 (1.78)*	0.03835 (1.72)*
R&D	-0.182041 (-2.47)**	-0.1791 (-2.46)**	-1.453117 (-2.99)***	-1.405596 (-2.95)***
CONC	3.26596 (5.98)***	1.69715 (8.75)***	1.37921 (2.14)**	1.23685 (5.07)***
K/L	-0.000376 (-10.21)***	-0.000373 (-10.15)***	-0.000375 (-10.54)***	-0.000374 (-10.34)***
MAT	0.09526 (7.42)***	0.09576 (7.42)***	0.09107 (7.08)***	0.09317 (7.16)***
FDI*R&D			-0.194704 (-3.22)***	-0.092296 (-3.12)***
TECH*R&D			0.25521 (0.14)	0.2698 (0.15)
FDI*CONC			0.22032 (7.17)***	0.02758 (3.49)***
TECH*CONC			-4.320478 (-0.70)	-3.489759 (-0.57)
Constant	0.77164 (29.64)***	0.44907 (8.53)***	0.90122 (27.59)***	0.60786 (8.71)***

Note: In Table (5), Column 2 and 3 we present the results without the interaction terms while these terms are included in columns 4 and 5. Models 1 and 3 define concentration as HHI while models 2 and 4 employ the CR4 definition. ***, ** and *represent 1%, 5% and 10% significance levels respectively.

V. CONCLUSION

In this article we have argued that the concern about competitiveness in the host country firms has moved away from traditional channels to spillover impacts. In the light of strengthening patent regimes, this issue is of particular importance to developing countries which have been opening up to FDI in a big way in recent decades. It is thus imperative to see what factors determine firm's competitiveness. In this study we have concentrated on Indian manufacturing firms, for which there is a dearth of empirical studies probably because of the insignificant volume of FDI prior to 2002.

Our results support the view that foreign presence and associated demonstration effects are more likely to lead to higher efficiency than attempts to buy foreign technology. It may be noted that in India the policy towards foreign collaborations in the decade of the 'eighties was biased towards purchase of foreign technology. Our results thus indicate that the abandoning of this policy in the 'nineties was a right move. Second, our results also support the view that productivity enhancement is highly dependent on the absorptive capacity of the firms. This absorptive capacity is reflected in our model in the R&D expenditure of firms. Unfortunately, the spending on R&D by India firms has been fairly low with the possible exception of the pharmaceutical sector.

None of the previous studies on India have looked at the enabling role of institutional factors which can facilitate the impact of variables like foreign investment and research and development on relative firm efficiency. In our study we have looked in particular at the role that a competitive environment plays. It is seen that the more competitive the industry the greater the extent of competitiveness. In addition, our study indicates that while foreign presence does positively impact efficiency, this impact is positively affected by a competitive environment and the absorptive capacity of firms. In other words, the government has an important enabling role in determining competitiveness of local firms.

Finally, we see that attempts at importing drawings and designs to boost the domestic technology base are futile. This is probably because imported technology is either obsolete or inappropriate to local conditions.

NOTES

1. Capital is proxied by the gross fixed assets of the firm. Employment data is not available in the PROWESS data base and, therefore, wages and salaries paid by a firm are used as a proxy for the labour.

2. This definition corresponds to the definition used in Direct Tax Treaties to distinguish FDI flows from portfolio flows.

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