DOI: 10.20472/EFC.2016.005.022

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FOREIGN DIRECT INVESTMENT, PRODUCTIVITY AND CROWDING-OUT: DYNAMIC PANEL EVIDENCE ON VIETNAMESE FIRMS

Abstract:

This paper investigates whether firms with foreign capital participation are more productive than domestically-owned firms in Vietnam; and whether the presence of firms with foreign capital has a crowding-out effect on domestically-owned firms. We utilize a rich dataset compiled by the Vietnamese General Statistical Office (GSO) from 2001–2010 and a dynamic panel data approach proposed by Arellano and Bond (1991) and Blundell and Bond (1998) to address the issue of endogeneity. We report that the share of foreign capital in firm equity has a positive and significant effect on productivity of foreign-owned firms in Vietnam. With respect to crowding-out effects, we identify opposing dynamics at work. On the one hand, we observe a firm-level crowding-out effect due to higher shares in turnover as the level of foreign capital increases. On the other hand, we observe an industry-level crowding-in effect as the share of both domestic and foreign-owned firms in turnover is higher when the industry-level of foreign capital intensity increases. Finally, we report that the crowding-in and crowding-out effects do not differ as the level of foreign capital share differs between firms and industries. The findings indicate that domestically-owned Vietnamese firms tend to lose market share to their foreign-owned competitors when they compete head to head; but they also tend to benefit from higher levels of foreign capital invested in their industry.

Keywords:

dynamic panel, foreign direct investment, market-stealing effect, productivity, Vietnamese enterprises

JEL Classification: A10, C13, D20

1. INTRODUCTION

Foreign Direct Investment (FDI) has long been seen as a driver that fosters competition and facilitates the transfer of new technologies (Griffith, *et al*, 2004). Many countries have made efforts to attract foreign direct investment (FDI) as part of their industrialization and technological development policies. Moreover, it is well recognized that economic growth depends not only on the use of factors of production such as labor and capital but also on the efficiency in resource use and technical progress. The efficiency-driven productivity gains have captured a great deal of interest and have been used as benchmarks for ranking firms and countries (Biesebroeck, 2003).

When multinational enterprises (MNEs) launch their subsidiaries overseas, they encounter some disadvantages in terms of access to production resources and domestic demand compared to local enterprises as domestic firms are more experienced in serving the home markets and hold more information on product types, consumer tastes and distributional networks relative to multinational enterprises. With a view to competing successfully with domestic counterparts, MNEs need to posses “superior knowledge” (Cave, 1971) that helps to compensate for those disadvantages. Hymer (1976) defines superior knowledge as a set of “intangible productive assets” such as specialized know-how about production, superior management and marketing capabilities, export contacts and coordinated, quality-orientated relationships with suppliers and customers, which provide MNEs with a competitive advantage over indigenous firms. Those intangible assets are internalized within the MNEs, which are expected to do ‘better’ than domestically-owned firms that lack access to such assets.

The traditional theory of multinational enterprises (MNEs) suggests that a larger presence of MNEs may play an important role in increasing productivity levels of host country (Dunning & Lundan, 2008). The entry of MNEs may affect overall productivity levels of host country by bringing in new ideas, advanced technology, better managerial skills that may improve the allocation of resources in the host country (Kindleberger, 1969). Furthermore, to compete with the foreign affiliates, the indigenous firms are forced to be more competitive, hence the level of competition is increased in the local market.

Nevertheless, host country may incur costs in technology dispersion from the entrance of MNEs. MNEs may induce inappropriate or out of date technology that work against the interest of host countries (Lall and Streeten, 1977; Winters, 1991; Moosa, 2002). Moreover, the entry of foreign investors might raise the level of concentration in local market of host country as their presence might exert pressure for mergers among domestic firms, or even exit of indigenous firms in the market (Reuber *et al*., 1973; Lall and Streeten, 1977; Newfarmer and Mueller, 1975). Besides, MNEs may do harm to the environment of host country through over exploiting of resources (OECD, 1999).

Although we note the early debate on the relationship between FDI and macro-level productivity, our aim here is to investigate the direct and market-stealing effects at the micro level. To be specific, we aim to investigate the effects of FDI on the productivity of host-country firms (firms with and without foreign partnership) using firm-level data collected by the General Statistical Office (GSO) of Vietnam. The micro-level focus is informed by increased availability of firm-level data and the scope for augmenting the Cobb-Douglas production function with measures of FDI presence and a range of firm or industry covariates that allow for estimating the effects of moderating factors. As unit of analysis, the firm in the host country can be either a firm with foreign capital (thereafter, foreign-owned firm or FDI-firm) or a firm without foreign capital (thereafter, non-FDI firm or domestically-owned firm).

The effect of FDI on firm productivity can be either direct or indirect. The direct effect applies to FDI-firms and allows for inference about whether the foreign capital invested (or a proxy thereof) is conducive to higher levels of productivity among FDI-firms relative to domestically-owned firms. It also allows for inference about the rate of increase in the productivity of FDI-firms when the level of foreign capital invested (or proxies thereof) increases by one unit. Hence, one aim of this paper is to establish whether higher levels of FDI are associated with higher productivity. The second aim is complementary and addresses the question: are the effects of FDI on the productivity of foreign-owned firms at the expense of domestically-owned firms in terms of their market shares? Stated differently, the second aim of this paper is to investigate whether FDI is conducive to crowding-out or crowding-in effects on domestically-owned firms; and whether the effects differ at the firm and industry levels.

We think this analysis should be conducted before one examines the indirect (spill-over) effects of FDI on domestically-owned firms. In this strand of the literature, the within-industry effect is due to horizontal spillovers (externalities), which occur as a result of skill or technology diffusion from FDI-firms to non-FDI firms. The inter-industry effects, on the other hand, occurs as a result of skill or technology spillovers (externalities) from FDI-firms to non-FID firms that act suppliers of the FDI-firms (i.e., through forward linkages) or as a result of spillovers (externalities) from FDI-firms to non-FDI firms that act as users of intermediates produced by FDI-firms (i.e., through backward linkages). Although the spill-over effects of FDI constitute interesting research questions, this paper aims to bridge the evidence gap on the crowding-out and crowding-in effects that have remained below the radar of many studies on developed and developing countries. The paper also aims to enhance the knowledge base by addressing the problem of endogeneity in the estimation of production functions, in the context of an under-researched country (Vietnam) for which rich firm-level data exists.

The paper is organized as follows: section 2 provides theoretical underpinnings of FDI and productivity, especially the direct effects of FDI and productivity nexus and FDI and

the market-stealing effects nexus. Section 3 reviews empirical evidence on direct effects and market-stealing effects of FDI. In the fourth section, the dataset and the model used as well as the estimation issues are explained. The fifth section is devoted to the analysis of econometric findings while the last section recapitulates and suggests some further research avenues.

2. THEORETICAL UNDERPINNINGS OF FDI AND PRODUCTIVITY

2.1. Direct effects of FDI and Productivity

Conventional wisdom suggests that FDI can increase host countries' productivity, both directly by inducing new technologies and indirectly through technology spillovers. The concepts of direct effects and indirect effects of FDI share some similarities and differences. Both are means by which foreign direct investment affects the performance of firms in host country. The difference between the two lies in the ownership structure of the firm under investigation. Effects which occur within FDI-firms are considered as direct effects (often also referred to as own-firm effect). In contrast, indirect effects relate to the effects of FDI (in terms of incidence or level) on non-FDI firms in the host country; and occur as a result of interaction between FDI- and Non-FDI-firms. Therefore, indirect effects are often referred to as spillover effects.

Direct and indirect effects have been studied widely and over a long period (Caves, 1974; Globerman, 1979; Aitken and Harrison, 1999) to the more recent researches (Vahter, 2004; Benfratello & Sembenelli, 2006; Taymaz & Yilmaz, 2008; Batool *et al,* 2009). The approach remains fairly similar since the contributions by pioneering studies (Caves, 1974; Aitken and Harrison, 1999; Javorcik, 2004). The approach involves relating foreign ownership at firm-level (in the case of direct effects) or foreign concentration at sectoral-level (in the case of indirect effects) to productivity of two firm types: FDI-firms and domestically-owned firms. If a positive/negative difference in productivity of FDI firms is obtained, this offers evidence of positive/negative direct effects of FDI on productivity of firms with foreign ownership. Similarly, an increased/decreased change in productivity of non-FDI firms in response to foreign concentration in the industry provides proof for positive/negative spillover effects of FDI on productivity of domestically-owned firms.

Traditional theories of MNEs regard FDI as a mean of conveying tangible and intangible assets from home to host countries. An extensive theoretical background suggests that MNEs are more productive than local firms thank to advantages in technology and managerial resources (Dunning 1988; Caves 1996; Hanousek *et al*, 2011). Besides, foreign presence of MNEs may also have impacts on overall productivity levels of host country by bringing new ideas or increasing the level of competition in the market, forcing domestic firms to be more productivity (Caves, 1971, 1974). By the same token, Aitken and Harrison (1999) put forward the most two important reasons why economists usually assume that FDI firms outperform non-FDI ones. The first reason is superior (and

possibly newer) production equipment can be transferred from the parent company in home country to its FDI affiliate operating in host country. The second is the foreign affiliate may also receive an inflow of non-tangible assets from its parent—in the form of technological know-how, management and marketing capabilities, trade contracts, coordinated network of relationships with suppliers and customers abroad etc. Assuming that the local affiliate has sufficient absorptive capabilities to use the production equipment and follow this know-how, they can possess significant competitive advantages over non-FDI enterprises.

Nevertheless, some arguments propose why foreign invested firms may sometimes have even lower productivity level have been discussed in the literature. According to Harris & Robinson (2003), the nature and type of activity undertaken in the foreign-owned plant may affect the direction of relationship between foreign ownership and productivity (for example, while examining firms with foreign ownership in UK, the authors confirm that US-owned plants perform better than UK-owned plants, however, some major exceptions found in the refrigerating machinery and preparation of milk products sectors). In other cases, foreign affiliates might keep most of their high value-added operations at home, concentrating only on lower value-added assembly operations in host country as they are aware of cost and labour quality differences. As a result, the use of lower-skilled workers and possibly older technology will lower productivity of foreign-owned firms in a host country. Hence, the foreign-owned firms underperform the domestic counterparts.

2.2. Beyond productivity: FDI and market-stealing effect

When MNEs enter the host-country market, their advanced technologies and know-how may attract demand away from domestic enterprises, particularly in the short-run (Aitken and Harrison, 1999). This is called the “market-stealing effect” or “crowding out effect”. The market-stealing effect implies relatively higher (lower) output by FDI-firms (compared to domestically-owned firms). Hence, in the presence of market-stealing effect domestically-owned firms have lower levels of productivity as their fixed costs are spread over a smaller scale of production. Putting in different way, the market-stealing effect is the reallocation of market share from less productive (domestic firms) to more productive (foreign firms). If foreign presence brings about market-stealing effect, the presence is also called as “crowding-out effect” of FDI on productivity of domestic firms. Aitken and Harrison depicted the market-stealing effect in the figure below.

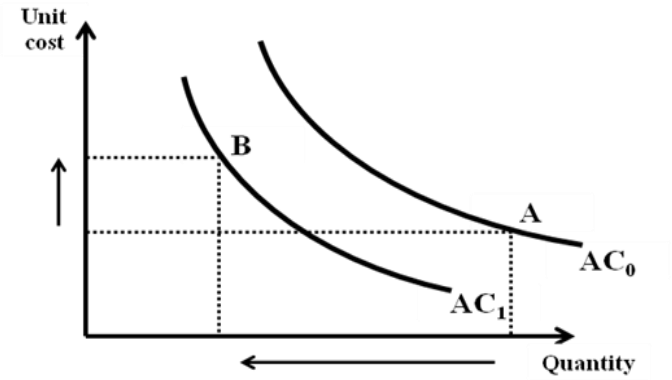

Figure 1: Output response of domestic firms to foreign entrants

(Source: Aitken and Harrison, p607, 1999)

Initially, a domestically-owned firm operates along the average cost curve depicted with AC_0. The entry of foreign-owned firms generates positive spillover effects on domestic firms, leading to a downward shift the in the latter's average cost curve form AC_0 to AC_1. However, foreign firms enter the market with firm-specific advantages in terms of tangible and intangible assets and may be operating at lower marginal costs compared to domestic firms. To the extent that this is the case, and if the existing market is only imperfectly competitive, the foreign firm with lower marginal costs will increase production at the expense of its domestically-owned competitor. As the latter spreads its fixed costs over a smaller market, it moves up along the new average cost curve (AC_1), with the consequence of lower market share (or smaller turnover).

Caves (1996) and Blomstrom, Kokko and Zejen (2000) argue that the possibility that MNEs will crowd out local firms in host country is more evident in developing than developed countries because of a higher technology gap between indigenous firms and foreign affiliates in the developing countries. From a policy perspective, these arguments alarm a concern whether the attempt to attract FDI is justified, especially in developing or transitional countries, where shortage of capital to modernize the countries usually induces the temptation of FDI. Dawar and Frost (1999) discuss that foreign presence may represent a "sentence death" for local firms in emerging markets as the indigenous usually cannot compete successfully with MNEs that possess financial and technological advantages. Another concern is about the domination of foreign firms that might complicate the restructuring process in many transitional countries as the case of the restructuring of banking sector in Russia (Cordonnier, 2002)

3. REVIEW OF EMPIRICAL EVIDENCE ON DIRECT EFFECTS AND MARKET-STEALING EFFECTS OF FDI ON PRODUCTIVITY

3.1. Review of empirical evidence on direct effect of FDI

The summary of empirical findings on direct effect of FDI would be found in Table 1 of the Appendices. In the table, we present summary information on author(s)' name(s), studied country; studied period; data type; level of data aggregation; size of sampling; measure of productivity; measure of foreign presence; econometric method used; and main result obtained for direct effect. In this section, we will summarize the findings and discuss the extent of similarity/variation, with a view to take stock of the existing evidence and inform the estimations that will be conducted in part 4 of this paper.

Brief review on measurements of productivity and foreign ownership in empirical studies

Direct effects of FDI are estimated by regressing a measure of productivity on a variable that depicts foreign ownership (FO) in a given firm. The general form used for estimation can be stated as follows:

$$Y = \alpha_0 + \alpha_1 K + \alpha_2 L + \alpha_3 FO + \varepsilon \qquad (1)$$

The dependent variable (*Y*) in equation (1) is usually measured by output, sales or value added in levels or as ratios per employee; or as total factor productivity of all firms. Researchers commonly use a dummy variable to observe foreign ownership (*FO*). The variable *FO* takes the value 1 if the company is foreign-owned in partly or fully and 0 if purely domestically-owned. Direct effects of FDI are productivity differences in firms with and without foreign participation. A positive coefficient α_3 would indicate that firms with foreign ownership have higher productivity compared to purely domestically –owned firms, implying that foreign ownership has positive direct effects on productivity of foreign invested firms. Reversely, a negative coefficient α_3 would imply lower productivity of firms with foreign ownership compared to pure domestic firms, reflecting negative direct effects of FDI on productivity of FDI firms.

Some researchers use equity share, sales share or asset share of foreign invested firms as measure of foreign ownership. In this case, positive/negative coefficient α_3 would indicate that firms with foreign capital have a higher/lower productivity level than average firms in the economy. It suggests positive/negative effects of FDI on productivity of firms with foreign capital.

Main findings from empirical studies

Compared to number of studies on indirect effects, studies on direct effects of FDI are small in number. Most papers on the topic employ firm-level panel data to analyze the effects (17 out of 19 studies in this literature review). The pattern of the empirical

evidence on direct effects seems to be clear: most papers present the positive effect of foreign ownership on productivity of firms with foreign capital in host country while several papers find no or negative evidence.

The majority of papers on direct effects of FDI report that foreign ownership is associated with higher productivity of FDI firms (more specifically, in this literature review, 13/19 studies on confirm the positive direct effects.). Aitken and Harrison (1999) measured the direct impact of FDI in Venezuela by employing a large firm-level panel data of more than 43,000 firms from 1976-1989. After controlling for differences in the labour force, materials, capital and industry differences, the scholars found a 10.5 per cent productivity advantage of foreign owned plants over domestic plants. Konings (2001) replicates Aitken and Harrison (1999) to investigate the direct impact of foreign direct investment on firms in Poland, Bulgaria and Romania. Using a panel data of 2,321 Bulgarian firms; 3,844 firms Romanian firms and 262 firms in Poland in the period of 1993-97, the author reveals no statistically significant effect of foreign ownership on productivity of Bulgaria and Romania while the results for Poland confirm that foreign invested firms perform better than firms without foreign participation. Konings attributes his finding by a justification about Poland as the country was further down the path of transition at that time. Sgard (2001) utilizes firm-level data in Hungary with more than 33,000 observations, reporting that the productivity is larger in foreign-owned firms compared to firms in the rest of the economy. Vahter (2004) use fixed effects and random effects to obtain the effects of foreign ownership on the ration of sales per employee in Estonia (1996-2001) and Slovenia (1994-2000). His main finding indicates that both foreign-invested firms in Estonia and Slovenia are more productivity than domestic firms in both countries. With the sample of 2026 firms in Italy from 1992-1999, Benfratello & Sembenelli (2006) apply System-GMM estimator. After controlling for unobserved heterogeneity, input simultaneity and measurement errors, foreign ownership by no means has effect on productivity. More recently, Taymaz & Yilmaz (2008); Batool *et al,* (2009) corroborates their findings with previous empirical evidence analyzed above whilst confirms for the result that firms with foreign ownership outperform domestic firms both in Turkey and Pakistan.

However, there are some papers that cast doubt on the positive relationship between foreign ownership and productivity of FDI firms. Globerman *et al* (1994) examined the relative economic performance of foreign affiliates in 21 Canadian industries and domestic counterparts. The authors found that, having controlled specifically for capital intensity and size of foreign partners, there was no significant difference in labour productivity (measured by value added per worker) between foreign-owned firms and domestic firms. Using firm-level panel data of firms in Morocco from 1985-89, Haddad and Harrison (1993) conclude that foreign firms lag behind domestic firms in productivity growth in protected market.

To summarize, a positive relationship between foreign ownership and productivity of FDI firms is documented in a large proportion of number of papers on direct effects of FDI. However, negative results may be obtained as ownership structures of and type of activity undertaken by MNEs may differentiate the results. Moreover, the use of lower-skilled workers and possibly older technology from MNEs will decrease productivity of foreign-owned firms in a host country as suggested by Harris & Robinson (2001).

3.2. Review of empirical evidence on market-stealing effect and FDI

Empirical study for market-stealing effect or crowding-out effect from foreign entrance to domestic firms tends to be scant.

The ground-breaking study of Aitken and Harrison (1999) on the topic confirms a temporal negative impact on domestic firm's productivity through a market-stealing effect, and positive FDI spillover dominates in the long-run. Followed Aitken and Harrison, Hu and Jefferson (2002) corroborate the finding of market-stealing effects in Chinese textile industry in the five year period, from 1995 to 1999. By utilizing a unique firm-level data from the Chinese Annual Survey of Industries conducted annually by China's National Bureau of Statistics from 1998 through 2004, Hsieh (2006) estimates that a 10 percent increase in foreign ownership share decrease the output of domestic firms by 3.5 percent, suggesting that foreign presence force domestic firms to contract. Using 1994-2001 firm-level Czech data, Kosova (2010) reinforce the finding of crowding-out effect from FDI to domestic firms in the country. Moreover, the author also analyzes whether the crowding-out effect is dynamic, that is, domestic firms are taken demand over time as foreign firms grow, or a static effect only. Kosova witnesses that market-stealing effect appear only in short-term, and after initial entry shakeout, growing foreign sales increase domestic firm growth and survival, indicating domestic demand creation effect.

Obviously, the common theme of above studies on market-stealing effect is all of them dedicated to developing or transitional countries as discussed in theoretical framework of FDI and market-stealing effect in section 2.2 above.

4. DATA, MODEL, AND ESTIMATION ISSUES

4.1. Overview of Vietnam Annual Enterprises Survey Dataset

This research employs firm-level panel data in Vietnam from 2001-2010. The dataset is compiled from the Annual Enterprises Survey (AES) conducted by GSO. The surveys collect comprehensive data on Vietnamese enterprises, including industry and ownership type of enterprises, output, assets and liabilities, capital stock, investment, employment, location, wages, sales, obligations of firms to the government, etc. Our sample, which consists of all surveyed firms in 28 industries, is an unbalanced panel consisting of 168,493 firms over a period of 10 years from 2001 to 2010 with a total of 504,643 observations. The included firms are from four main clusters, consisting of Manufacturing,

Utilities, Construction, Science & Technology Activities and Computer & Related Activities. The dataset also contains two-digit Vietnamese Standard Industrial Classification 1993 (VSIC 1993) codes for all firms. Although the dataset lacks data on intermediate inputs, working hours, and employee skills, it contains value-added data and a wide range of variables needed for conducting productivity analysis. More specific information on the dataset can be found on Table 2 of the Appendices.

Throughout the research, we refer to firms with a foreign partner as “foreign firm” or “foreign owned firm” or “FDI-firm” or “foreign entrants” and firms without a foreign partner as “domestic firms” or “incumbent firms” or “indigenous firms” or “local firms”. Also, in this research, domestic firms are defined to include State-owned firms, domestic private firms and Non-state Collective establishments. Foreign firms are defined as all establishments with foreign investors (joint ventures with at least 49% of foreign ownership or 100% foreign-owned firms) as regulated in Vietnamese Investment Law 2005.

This study focuses only on firms in the five industrial groups of Manufacturing, Utility (Electricity, Gas and Water Supply); Construction; Science & Technology Activities; Computer & Related Activities including 28 industries totally (23 industries in Manufacturing, 2 industries in Utility; 1 industry each in Construction, Science & Technology Activities and Computer & Related Activities) based on the sectoral classification of enterprises at the two digit level of Vietnamese Standard Industrial Classification 1993 (VSIC 1993) with a long dataset from 2001–2010. The dataset comprises 168,493 firms over the studied period. Table 4 below compares domestically-owned firms and foreign-invested firms in 28 studied industries in terms of number of firms; sales; employment; capital-labor ratio; value-added per worker and profitability, in the two selected years 2005 and 2010.

Table 1: A comparison between Domestically-owned and Foreign-invested Firms in 28 studied industries in 2005 and 2010

	Domestically-owned		Foreign-invested	
	2005	2010	2005	2010
Number of units	37,852	89,309	2,878	5,269
Sales (million VND)	569,972,146	2,076,101,123	321,509,391	1,124,063,501
Employment	2,891,749	3,946,703	976,345	1,784,275
Capital-labor ratio	64.78	205.57	115.08	194.23
Value added per worker	0.119	0.087	0.159	0.108
Profitability (profit/sales)	0.028	0.034	0.041	0.048

Source: Author's calculation from the database

As can be seen from the table, the number of foreign-invested firms reaches only small proportions, 1/13th and 1/17th of number of domestically-owned firms in 2005 and 2010, respectively; however, sales of foreign-invested firms are a half of those of domestically-owned counterparts. More interesting, domestic firms hire a three time larger in number of employees compared to foreign invested firms, however, the value added per worker in foreign invested sectors are outnumbered than that in domestic sector. Also, the profitability rates of foreign invested firms are higher than of indigenous firms.

4.2. Model & Estimation Issues

Model

With a view to examining the direct effect, we follow the approach that has been used extensively in the literature (see Aitken and Harrison, 1999; Javorcik, 2004). The method follows the seminal paper by Griliches (1992), who postulates a Cobb-Douglas augmented production function including both internal and external factors of production. The presence of such external influences on the firm is the consequence of externalities in production, due to formal or informal linkages between firms. In the case of FDI spillovers, technology, managerial skills as well as new products and processes associated with foreign presence in host country could be seen as an input in the

production of a firm, augmenting the productivity of all other factors (Liu, 2008). Hence, the traditional production function is extended through introducing FDI as a source of capital accumulation as well as a generator of knowledge.

We therefore build an empirical model as bellows:

$$y_{ijt} = \alpha_0 + \alpha_1 k_{ijt} + \alpha_2 l_{ijt} + \alpha_3 FDI\_firm_{ijt} + \delta_i + \gamma_j + \varphi_t + \varepsilon_{ijt} \quad (2)$$

In which subscript *i* denotes firms; *j* denotes industry and *t* denotes year.

The dependent variable y_{ijt} is the real value added output of firm *i* operating in industry *j* at the end of each year of study. We follow Nickell (1996) and Griffith et al (2006) to calculate value added output as the sum of total employment cost, operating profit before tax, accumulated depreciation and interest payment. Then real value added output is obtained by deflated value added output with Producer Price Index (PPI). The PPI is supplied by Vietnam General Statistic Office by industry over years.

k_{ijt} is the real values of fixed assets of firm *i* operating in industry *j* at the beginning of each year of study;

l_{ijt} is total employees of firm *i* operating in industry *j* at the beginning of each year of study;

y_{ijt}, k_{ijt} and l_{ijt} are all in natural logs

FDI_firm_{ijt} is the firm-level FDI, measured by the foreign share of a firm's equity. It presents the foreign ownership participation in total equity of a firm

The three set of dummy variables $\delta_i; \gamma_j; \varphi_t$ are made use of to control for the firm-; industry-, and time-specific effects, respectively. Firms and industry dummy variables used in the regression model in order to capture firm and industry specific effects and year dummy variables are included with a view to accounting for trend effects.

The direct effect of FDI on productivity is captured from α_3 in equation (2). A positive and significant α_3 suggests that foreign-invested firms are more productive than domestic firms, meaning foreign presence enhance the productivity of foreign-invested firms; signalizing a positive direct effect of FDI on productivity.

When multinational enterprises (MNEs) invest in the host-country market, their subsidiaries or joint ventures may attract demand away from domestically-owned enterprises due to superior technological, marketing and branding capabilities. This is the "market-stealing effect" (Aitken and Harrison, 1999). It is measured by the turnover size of the FDI firms relative to domestically-owned firms. As domestic firms reduce production, they may experience a higher average cost as fixed costs are spread over a smaller scale of production, therefore leading to less productivity of those firms.

In this research, we replicate Aitken and Harrison (1999) test of the "market-stealing effect" by estimating turnover equation, which omits the input factors of production. The input factors are excluded with a view to examining the effect of foreign presence on the production scale of domestic firms, rather than productivity as shown in equation (3)

$$y_{ijt} = \beta_0 + \beta_1 FDI\_firm_{ijt} + \beta_2 FDI\_industry_{jt} + \beta_3 (FDI\_firm_{ijt} * FDI\_industry_{jt}) + \delta_i + \gamma_j + \varphi_t + \varepsilon_{ijt} \quad (3)$$

In which subscript *i* denotes firms; *j* denotes industry and *t* denotes year.

The dependent variable y_{ijt} is the real turnover of firm *i* operating in industry *j* at the end of each year of study. y_{ijt} is deflated by Producer Price Index and measured in Vietnamese *Dong*. It is then taken in natural log.

FDI_firm_{ijt} is the firm-level FDI, measured by the foreign share of a firm's equity. It presents the foreign ownership participation in total equity of a firm.

$FDI\_industry_{jt}$ measures the extent of foreign presence in industry j at time t, is computed as the tunover weighted average of firm-level FDI at the two digit industry level of Vietnamese Standard Industrial Classification 1993 (VSIC 1993).

The coefficient on the interaction between firm level and industry level of FDI is captured through FDI_firm_{ijt}* $FDI\_industry_{jt}$. It allows us to determine whether the effects of foreign presence on other foreign firms differ from the effects on domestic firms.

The three set of dummy variables $\delta_i; \gamma_j; \varphi_t$ are also used to control for the firm-; industry-, and time-specific effects, respectively

The market-stealing effect is captured through β_1 and β_2 in equation (3). A positive and significant β_1 suggests that firms with foreign capital tend to have relatively larger turnover compared to domestically-owned firms, hence indicating the presence of market stealing effect at firm level. A negative and significant β_2 indicates evidence of market-stealing effect (crowding-out effect) at industry level, vice versa, a positively significant proposes evidence of crowding-in effect. Moreover, if β_3 is found positively significant, firms with foreign capital tend to capture even larger market shares when they are located within industries that have higher levels of FDI.

This study focuses only on firms in the five industrial groups of Manufacturing, Utility (Electricity, Gas and Water Supply); Construction; Science & Technology Activities; Computer & Related Activities including 28 industries totally, based on the sectoral classification of enterprises at the two digit level of Vietnamese Standard Industrial Classification 1993 (VSIC 1993) with study period from 2001–2010. Firms in the top and bottom one percentiles of log of real value added of output are excluded from the sample to detect outliers.

Table 2 below shows descriptive statistics of main variables used in this empirical estimation.

Table 2: Data Descriptive Statistics

No	Variable	Description	Obs	Mean	Std Dev.	Min	Max
1	Real_VA_ouput	Real value added of output	930,00	7157.045	79947.86	-1505331	12000000
2	Ln_real_VA_ouput	Log of real value added of output	86,707	6.416943	2.09561	-14.16212	16.29798
3	Real_turnover	Real turnover	502,306	19450.11	260688.8	-251483	56000000
4	Ln_real_turnover	Log of real turnover	482,089	7.31317	2.146829	-1.061602	17.8414
5	Ln_net_fa	Log of net value of fixed asset	260,572	0.6848566	1.793865	-5.669881	12.24165
6	Ln_Id11	Log of number of employees	463,298	2.97092	1.440226	0	11.30159
7	FDI_firm	Firm level of FDI	501,227	0.547951	0.2235094	0	1
8	FDI_industry	Industry level of FDI	504,643	0.1925949	0.1887001	0	99.37131

Source: Author's calculation from the database

Estimation Issues

With a view to obtaining consistent results from estimating the production function, *endogeneity or simultaneity bias* needs to be tackled. Griliches and Mairesse (1998), Nickell (1996) propose that inputs should be treated as endogenous variables since producers choose the level or usage rate based on cost and productivity considerations. These considerations are observed by producers but not by econometrician. Simultaneity bias occurs because productivity is known to firms when they make their inputs choices but unobservable to the econometricians (Marschak and Andrews, 1944). Putting in a technical way, most of the estimation issues arise from the nature of the equation error ε_{it}. If the error term is independently and identically distributed and therefore uncorrelated with input choices, the OLS estimator will be consistent but inefficient, while the fixed effects and random effects are both consistent and efficient. Under this circumstance, the Hausman test is employed to choose between Fixed and Random effects. Conversely, if input choices are correlated with unobservable factors, which are known to a firm's manager but unknown to econometricians, both OLS and Fixed effects/Random effects will be inconsistent. According to Bwalya (2006),

unobservable factors emerge from difficulties in observing and quantifying differences in the quality of human capital, capital intensity and productivity shock across firms and industries. Because the differences are hardly captured by the survey method, thus, they accumulate in random term, causing input variables to be correlated with error term. Moreover, researchers cannot directly observe how firms react to firm-specific productivity shock. For instance, a firm might respond to a positive productivity shock by enlarging its inputs used and vice verse (which the researchers have no chances to obtain). With impacts from positive productivity shocks, firms will enlarge their use of inputs and vice verse. As a result, estimating production functions by employing OLS will lead to bias results as OLS takes no account for the unobserved productivity shocks. It should be noted that the fixed effect method may solve the simultaneity problem only when the unobserved, firm-specific productivity is assumed time-invariant. Hence, the necessity of employing other methods, including instrumental variable or system generalized method of movements, to detect this endogeneity problem while estimating the parameters of production functions is adequate.

Input endogeneity or simultaneity bias is solved by two ways: first, by employing semi-parametric method, and second is by implementing an instrumental variable method, in which lagged levels are used as instruments in the production function. Semi-parametric methods which allow for firm-specific productivity differences to exhibit idiosyncratic changes over time are often used in recent literature. This method can address the simultaneity bias between productivity shocks and input choices. The aim of the semi-parametric methods is to find a proxy variable that monotonically replicates productivity dynamics. The two popular Semi-parametric methods are Olley & Pakes (1996) using investment and Levinsohn & Petrin (2003) employing the intermediate input cost as proxies to quantify the change in total factor productivity. Olley & Pakes (1996) estimate productivity effects of restructuring in the telecommunications equipment industry in the US. The two assumptions are used in this approach. Firstly, productivity, which is a state variable in the firm's dynamic problem, is supposed to follow a Markov process that unaffected by the firm's control variables. Secondly, one of the firm's control variables, which is investment in this approach, grows to be part of the capital stock with a one period lag. According to Biesebroeck (2007), the pros of Olley & Pakes (1996) study originates from its flexibility of characterization of productivity when assuming to follow the Markov process. Apart from that, the demerit is the requirement for non-zero investment observations which many dataset fail in building a large number of observations. This weakness is overcome by Levinsohn & Petrin (2003) while employing material input as an alternative for productivity proxy.

According to Arelleno and Bond (1991), if the error term ε_{it} is found to be non-persistent, a standard generalized method of moments estimator (GMM) will be both consistent and efficient. If, however, the dynamic error processes are highly persistent, lagged levels

supposed to be poor instruments for contemporaneous differences and result in finite sample biased (Blundell and Bond, 1998; Blundell *et al*., 2000). As Blundell and Bond (1998) point out, both lagged levels and lagged differences are used as instruments in estimating parameters of the production function. Besides, the resulting system GMM estimator is both consistent and efficient.

In this paper, we employ the general method of movements (GMM) approach proposed by Arellano and Bond (1991) and Blundell and Bond (1998) to deal with the problematic simultaneity bias. As an empirical matter, specification tests proposed by Arellano and Bover (1995) are applied to test the validity of the instruments in our GMM estimation. First, the Arellano–Bond test for the serial correlation is adapted to test whether there is a second-order serial correlation in the first-differenced residuals. The null hypothesis is that the residuals are serially uncorrelated. If the null hypothesis cannot be rejected, it provides the evidence that there is no second-order serial correlation and the GMM estimator is consistent. Second, the Hansen J-test and the Diff-in-Hansen test are applied to test the null hypothesis of instrument validity and the validity of the additional moment restriction necessary for system GMM, respectively. Failure to reject this null hypothesis means that the instruments are valid. Furthermore, we adopt some approaches to improve the efficiency of system GMM estimation. Firstly, according to Roodman (2009), we collapse the instrument sets and take orthogonal option. Secondly, industry-specific and time-specific effects are included in our regression equations in order to capture industry specific effects and trend effects. We also run the OLS levels, Fixed Effects estimator and First Difference levels in order to make a justification for the GMM results obtained. The econometrics package used is Stata 13.

5. ESTIMATION RESULTS

5.1. Empirical evidence on direct effects of FDI

The panel estimation results are reported in Table 3. The first three columns of Table 3 report the results using the OLS levels, Fixed Effects and First Difference levels (FD) estimators, respectively. The fourth column presents the results using System GMM.

As mentioned by Bond et al. (2001), omitting variables (i.e. unobserved firm-specific effects) will give an estimate of the coefficient on lagged real value added which is biased upward. The FE will cause an estimate of this coefficient to be seriously downward biased. However, the OLS levels will produce upward bias. Thus, the estimated coefficient on lagged real value added from OLS and FE can be regarded as an approximate upper bound and lower bound, respectively. A consistent estimate of the coefficient can be expected to lie in these two bounds.

Table 3: Direct effects of FDI on productivity in Vietnam (2001-2010)

	OLS	FE	FD	SYS GMM
Ln lagged real value added	.612***	.141***	-.179***	.536***
	(.006)	(.009)	(.009)	(.098)
Ln fixed asset	.123***	.092***	.086***	.162***
	(.003)	(.008)	(.008)	(.058)
Ln employment	.285***	.296***	.237***	.335***
	(.006)	(.009)	(.009)	(.037)
FDI_firm	.002***	.0002	-.001	.002**
	(.000)	(.0007)	(.001)	(.001)
Constant	.994***	4.582***	.119***	2.099***
	(0.25)	(.112)	(.014)	(.696)
Instrument				95
Hansen J-test				[0.810]
Diff-in-Hansen test				[0.893]
AR(1)				[0.000]
AR(2)				[0.344]

Notes:
Dependent variable is log of real value added of firm. All industry and time dummies are included but not reported to save space.
Standard Errors are in parenthesis; p-values in brackets.
GMM regression uses robust standard errors and treats the lagged real value added measure as predetermined. The values reported for the Hansen J-test and the Diff-in-Hansen test are the p-values for the null hypothesis of instrument validity and the p-values for the validity of the additional moment restriction necessary for system GMM, respectively. The values reported for AR(1) and AR(2) are the p-values for first-and second-order auto-correlated disturbances in the first differences equations.
*,** and *** denote significance at the 10%, 5% and 1% level, respectively.

Beginning with OLS results, the estimated coefficients on lagged real value added, capital, employment, foreign presence are statistically significant and with the expected sign. Then when a FE estimator is employed, the coefficient on foreign presence becomes insignificant. The estimated coefficients on lagged real value added, capital and employment are significant with the expected sign. In FD estimation, the estimated coefficients on lagged value added and foreign presence are both negative, and only coefficient on lagged real value added is statistically significant. The results produced by FD estimator provide evidence on more downward bias compared to FE estimator.

The last column of Table 3 illustrates the system GMM estimate. The results of the Arellano-Bond tests indicate that there is no second-order serial correlation. We do not reject the null hypothesis of the Hansen J-test and the Diff-in-Hansen test which indicate the test statistics present a proper specification. The estimated coefficient on lagged real value added (0.536) is significant and lies above the corresponding FE estimate (0.141) and below the corresponding

OLS estimate (0.612). The estimated coefficient on foreign presence is significant and positive effect, indicating a positively significant role of direct effects on productivity of FDI firms in host countries.

5.2. Empirical evidence on market- stealing effect

The panel estimation results of market-stealing effect are reported in Table 4 using the OLS levels, Fixed Effects and First Difference levels (FD) estimators and System GMM, respectively.

Table 4: Market-stealing effects of FDI in Vietnam (2001-2010)

	OLS	FE	FD	SYS GMM
Ln real turnover				
L1	.856***	.277***	-.201***	.357 **
	(.011)	(.018)	(.017)	(.169)
L2	.096***	.023***	-.025***	.207***
	(.010)	(.008)	(.008)	(.082)
FDI_firm	.094***	.110	.104	.004**
	(.011)	(.116)	(.118)	(.002)
FDI_industry	.001*	-.0003	-.001*	.013***

	(.000)	(.0006898)	(.0005)	(.004)
FDI_firm* FDI_industry	-.0001	.0008	-.003	-.011
	(.002)	(.004)	(.003)	(.008)
Constant	.568***	6.070***	-.026	2.621***
	(.038)	(.204)	(.0193)	(.882)
Instrument				63
Hansen J-test				[0.056]
Diff-in-Hansen test				[0.383]
AR(1)				[0.086]
AR(2)				[0.103]

Notes:
Dependent variable is log of real turnover of firm. All industry and time dummies are included but not reported to save space.
Standard Errors are in parenthesis; p-values in brackets.
GMM regression uses robust standard errors and treats the lagged real turnover measure as predetermined. The values reported for the Hansen J-test and the Diff-in-Hansen test are the p-values for the null hypothesis of instrument validity and the p-values for the validity of the additional moment restriction necessary for system GMM, respectively. The values reported for AR(1) and AR(2) are the p-values for first-and second-order auto-correlated disturbances in the first differences equations.
*,** and *** denote significance at the 10%, 5% and 1% level, respectively.
As can be seen from Table 4, all estimated coefficients on lagged log of real turnover are significant while the reverse findings hold with the estimated coefficients of interaction between FDI_firm and FDI_industry. Besides, we can see the evidence of market-stealing effects at firm-level through positively significant coefficient of FDI_firm in OLS and GMM estimations. On average, firms with foreign capital tend to have relatively larger turnover compared to domestically-owned firms. OLS estimator indicates that 10% increase in foreign share enhances the turnover of FDI firms by 9.4% while GMM estimator confirms an increase of FDI firms by 0.4%. However, market-stealing effect at industry level is found only in FD estimation. Instead, OLS and GMM witness a crowding in effect, i.e. at the industry level, the foreign presence boost the turnover scale of domestically-owned firms. This may be because foreign presence improves competition

in the industries, hence generate incentives for domestic firms to compete and expand their turnover.

Regarding to GMM estimation, sum of in estimated coefficients on lagged log of real turnover in GMM (.357+.207=0.564) lies above the corresponding FE estimate (.277+.023=0.3) and below the corresponding OLS estimate (.856+0.096=0.952). The results of the Arellano-Bond tests indicate that there is no second-order serial correlation. The values in Hansen J-test and the Diff-in-Hansen test confirm that we do not reject the null that the additional moment conditions are valid. To sum up, our test statistics hint at a proper specification.

6. CONCLUSION

This paper investigates the direct and market-stealing effects of FDI in Vietnam from 2001-2010. An unbalanced panel consisting of 168,493 firms with a total of 504,643 observations in 28 industries is utilized in 4 different estimators: OLS, Fixed Effects, First Difference and GMM. The paper provides an ample evidence of direct effect of FDI on productivity of FDI firms which reaffirms the theoretical view that foreign presence can enhance productivity of FDI receiving firms. Moreover, the paper indicates the striking result that foreign presence forces the domestic firms in Vietnam to contract at firm level and boosts turnover of domestic firms at industry level. The findings confirm the role of FDI in economic development of Vietnam -the country in developing world.

Looking forward, we will verify if the results above are robust on firms in different industries, size classes, and geographical regions and with different types of ownership in future research.

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Table 1: Studies investigating the direct effects of foreign ownership on FDI-firm productivity

Authors	Country	Period	Data type	Level of aggregation	Sampling	Dependent variable	Foreign ownership measure	Estimation method	Direct effects
Haddad and Harrison (1993)	Morocco	1985-1989	Panel	Firm	n.a	Output per worker	Asset share	OLS	-
Globerman et al (1994)	Canada	1986	Cross section	Firm	n.a	Value added per worker	Dummy FDI	OLS	+ n.s while controlling for capital intensity and size of firms
Aitken and Harrison (1999)	Venezuela	1976-1989	Panel	Firm	43,010 obs	Output	Share of foreign equity at firm level	OLS	+
Konings (2001)	Bulgaria Romania Poland	1993-1997 1997 1994-1997	Panel Panel Panel	Firm Firm Firm	2,321 firms 3,844 firms 262 firms	Sales	Sales share	OLS GMM	n.s Bulgaria + Romania + Poland n.s Bulgaria n.s Romania + Poland
Sgard (2001)	Hungary	1992-1999	Panel	Firm	33,033 obs	Output	Share of foreign equity at firm level	OLS First difference Long difference	+ + +
Vahter (2004)	Estonia Slovenia	1996-2001 1994-2000	Panel Panel	Firm Firm	326 firms 982 firms	Sales per employee	Dummy variable FDI	FE RE	+ Estonia + Slovenia + Estonia + Slovenia
Benfratello & Sembenelli (2006)	Italy	1992-1999	Panel	Firm	2026 firms	Output	Dummy variable FDI	GMM	n.s
Taymaz & Yilmaz (2008)	Turkey	1990-1996	Panel	Firm	29,513 obs	Total factor productivity	Dummy variable FDI	OLS	+

Batool *et al*, (2009)	Pakistan	1994-2007 (Food & Tobacco)	Panel	Firm	12 firms	Output	Dummy variable FDI	RE	+
		1995-2007 (Financial Business)			32 firms				+

Source: Author's summary

Table 2: The major indicators of firms over years in the dataset

Principle Indicators	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
1. Total number of surveyed enterprises	**51680**	**62908**	**72012**	**91755**	**112950**	**131318**	**155771**	**205732**	**248842**	**291299**
By type of ownership (%)										
State owned enterprise	10.36	8.53	6.73	5.01	3.62	2.82	2.24	1.62	1.36	1.13
Non-state enterprise	85.75	87.80	89.60	91.55	93.11	93.97	94.57	95.65	96.01	96.38
Foreign investment enterprise	3.89	3.67	3.67	3.44	3.27	3.21	3.19	2.73	2.63	2.49
By kind of economic activity (%)										
Agriculture and forestry and fishing	6.65	5.37	3.34	2.58	2.15	1.83	1.57	4.14	3.52	3.05
Mining and quarrying	1.23	1.40	1.43	1.30	1.13	1.04	1.08	1.10	1.01	0.88
Manufacturing	23.90	23.52	23.49	22.38	21.26	20.46	19.41	18.30	17.69	16.00
Electricity, gas and water supply	0.26	0.29	0.35	1.60	2.13	1.94	2.42	2.03	1.22	0.95
Construction	11.02	12.47	13.49	13.42	13.50	13.54	13.48	13.73	14.29	14.86
Trade, repair of motor vehicles and household goods	40.10	39.41	39.43	39.32	39.54	39.98	39.09	39.10	39.00	38.90

Hotels and restaurants	4.65	4.52	4.56	4.31	4.19	3.90	3.90	3.44	3.58	3.52
Transport, storage and communications	4.92	5.15	5.52	5.83	5.98	5.86	5.35	3.76	4.05	5.23
Financial intermediation	2.00	1.66	1.46	1.23	1.01	1.33	1.22	1.01	0.86	0.92
Science and technology activities	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.06	0.05	0.07
Real estate activities	0.66	0.73	0.80	0.95	1.09	1.31	1.54	1.62	1.70	1.88
Training and education	0.17	0.20	0.26	0.32	0.35	0.60	0.63	0.67	0.72	0.79
Human health and social work activities	0.09	0.13	0.12	0.15	0.18	0.19	0.23	0.23	0.27	0.29
Other activities	4.30	3.59	4.40	5.48	6.52	7.17	7.99	9.13	11.21	12.05
By size of employee (%)										
Less than 5 persons	23.09	19.20	18.18	19.59	20.64	12.82	22.38	21.62	22.04	26.75
From 5 to 9	26.89	28.83	28.38	28.84	30.66	44.15	32.77	34.25	37.31	34.51
From 10 to 49	30.45	32.93	35.02	35.36	34.42	29.98	32.48	33.89	31.30	29.77
From 50 to 199	12.20	11.99	11.85	10.69	9.65	8.89	8.56	7.19	6.69	6.42
From 200 to 299	2.31	2.15	1.95	1.67	1.43	1.32	1.26	1.04	0.94	0.88
From 300 to 499	2.24	2.15	1.95	1.65	1.37	1.16	1.09	0.85	0.74	0.73
From 500 to 999	1.71	1.66	1.64	1.31	1.05	0.96	0.82	0.64	0.56	0.54
From 1000 to 4999	1.04	1.01	0.95	0.83	0.71	0.66	0.60	0.46	0.38	0.36
From 5000 and above	0.08	0.07	0.08	0.06	0.06	0.06	0.06	0.04	0.04	0.03

Principle Indicators	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
By regions (%)										
Red River Delta	22.60	25.43	27.02	27.44	26.92	27.4	28.05	29.7	29.21	29.89
Northern midlands and mountain areas	6.33	6.81	7.24	7.89	7.61	7.12	5.87	5.62	4.67	4.6
North Central and Central coastal areas	12.9	13.57	13.16	12.68	13.26	13.8	15.07	15.08	14.71	14.07
Central Highlands	3.75	3.40	3.21	3.14	3.14	3.07	2.95	3.19	2.93	2.62
Southeast	33.92	33.39	33.77	34.73	36.34	36.89	36.6	35.9	39.08	40.38

Mekong River Delta	20.08	17.33	15.32	13.90	12.58	11.67	11.32	10.41	9.33	8.38
2. Average employees per one enterprise	***76***	***74***	***72***	***63***	***55***	***52***	***48***	***41***	***36***	***35***
State enterprises	395	421	467	490	499	513	505	519	516	515
Non-state enterprises	30	31	32	29	28	28	27	24	23	23
Foreign enterprises	243	299	326	331	330	343	340	326	294	298
3. Average capital per enterprise (bill. VND)	***24***	***23***	***23.9***	***23.6***	***23.7***	***23.1***	***26.5***	***29.8***	***31.2***	***36.7***
State enterprises	153	167	210.2	264.7	355	425.2	554.9	824.2	892.3	1063.8
Non-state enterprises	4	4	5.2	5.9	6.7	6.9	9.8	12.2	14.9	19.7
Foreign enterprises	133	134	139.6	142.4	142.8	143.3	153	176.6	186.6	232.7
4. Profit rate (%) compared with capital	***3.8***	***4.3***	***4.5***	***4.9***	***4.4***	***4.94***	***4.62***	***3.40***	***3.64***	***2.94***
State enterprises	2.5	2.9	2.8	3.1	3.4	3.50	3.55	2.94	3.76	2.87
Non-state enterprises	2.3	2.3	2.1	1.6	1.4	2.0	2.57	1.32	1.8	1.86
Foreign enterprises	8.7	10	11.6	13	11.2	13.15	11.66	9.66	9.08	6.58
5. Profit rate (%) compared with turnover	***5***	***5.1***	***5.4***	***6***	***5.3***	***6.10***	***6.26***	***4.02***	***5.39***	***4.53***
State enterprises	4.2	4.2	4.2	5.3	5.7	6.12	6.75	5.13	7.89	5.31
Non-state enterprises	1.3	1.5	1.5	1.3	1.2	1.72	2.79	1.21	2.27	2.71
Foreign enterprises	13	13.6	14.6	15.4	11.8	14.19	13.11	10.57	10.96	8.84

Source: GSO, Statistical Yearbook (various years) & The situation of enterprises 2006-2011