

Effects of Foreign Direct Investment in Vietnam: An Empirical Analysis of Productivity Growth in Manufacturing Industries

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This study analyzes spillover effects of Foreign Direct Investment (FDI) on Vietnamese manufacturing productivity growth during 2000-2006. Focusing on different features of industries, we divide the sample into three groups (light, petro-chemical, and heavy industries) and perform a regression analysis. From the three groups we find the effect only in the light-industry group which is positively significant. Other two groups show not significant results. These results suggest that low technology industries benefit rapidly from spillover effects and higher technology industries need longer period to confirm the effects. In order to understand FDI effects, we should keep in mind that the technological level of invested industries acts as a factor of their absorptive capacity.

Keywords: Foreign Direct Investment (FDI), Productivity Growth, Industries, Vietnam.

I. Introduction

Foreign Direct Investment (FDI) and its effects on a host country have been attracting a great deal of academic attention in the field of international economic development. Economists have proved that FDI in developing countries involves a transfer of advanced production technology and management know-how. As a result of FDI, therefore, developing countries may improve their productivity level. This paper focuses on the important role of FDI in industrial development and economic growth of developing countries.

After the north-south unification in 1976, Vietnam made the development of

heavy industries its top priority. However, implementation of the program proved difficult in post-war Vietnam because the development of heavy industries required huge amounts of capital. To address this problem, the Vietnamese government abandoned the closed economic system in 1986 and replaced it with an open economic system under the “*Doimoi*” (or Renovation) policy. One of the key purposes of the *Doimoi* policy was to liberalize investment and attract FDI from abroad. The government’s expectation was that FDI would help foster and develop Vietnamese economic sectors, especially in manufacturing. Because of the change in industrial policy, the government decided to direct FDI to light

industries focused on the production of food and consumption goods. Accordingly, the government introduced a series of preferential policies to attract FDI with the first *Law on Foreign Investment* in 1987 and revisions in 1996 and 2000. Simultaneously, the government also encouraged domestic enterprises to take advantage of the open market economic system and FDI. In the twenty years since the implementation of the *Doimoi* policy, Vietnam has achieved high economic growth at an average annual rate of 7.5%, according to data from the General Statistics Office (GSO) of Vietnam. This economic growth demonstrates the effectiveness of the *Doimoi* policy as well as the government's economic growth stimulus methods.

In addition, a comparison of FDI inflow data between the early stages of that inflow in 1988 and more recently in 2008 shows that the number of registered investment projects has increased by a factor of 42, from 37 to 1,557 projects. Similarly, registered capital has increased by a factor of approximately 209, from 341.7 to 70,726 million USD and reaching a total amount of 194,429.5 million USD after 20 years of FDI inflows. Among all invested sectors during these 20 years, manufacturing industries captured the largest share with 59% of the total number of FDI projects (7,475 out of 12,575 projects) and 46% of the total FDI registered capital (88,579.5 out of 194,

429.5 million USD). Within our sample of manufacturing industries during the period of 2000-2006, the number of manufacturing enterprises increased 2.9 times in the foreign sector (1,043 to 3,032 enterprises) compared with an increase of 2.5 times in the domestic sector (9,356 to 23,831 enterprises).

In addition to the FDI inflow data, there are several useful main indicators of economic growth between 2000 and 2006 (the first and the last year of our sample). For example, the output value of all industries increased about three times. Employment in all manufacturing enterprises more than doubled between 2000 and 2006 (1,597,431 to 3,401,627 employees). The foreign sector alone created 3.8 times more jobs (356,117 to 1,339,654 employees) while the domestic sector created 1.7 times more jobs (1,241,314 to 2,061,973 employees). In the domestic sector after seven years, capital investments increased by 2.4 times in comparison with the foreign sector, which increased by 1.6 times. Sales in both the foreign sector and in all manufacturing industries increased approximately the same, by about 3 times. These facts provide informative insights for our analysis of FDI effects on productivity growth in Vietnam.

In this paper, we investigate the effects of foreign-invested enterprises presence (or foreign presence) on productivity growth (or the FDI indirect effects) in

Vietnamese manufacturing industries. Additionally, according to Dollar and Wolff (1994), productivity catch-up effects differ among industry groups depending on the characteristics of those industries. Therefore, in order to find clear evidence of FDI effects on productivity growth in Vietnam’s manufacturing industries, we divide our sample into three groups: light, petro-chemical, and heavy industries (as in Raut (1995)). Based on the methodology of Barrios and Strobl (2002), we investigate the role of foreign presence on industry-level productivity growth based on the production technology level. We hypothesize that productivity spillovers are proportional to foreign presence. A positive and significant coefficient on this variable implies that positive productivity spills over from foreign to domestic enterprises and increases the domestic sector’s productivity.

The structure of this paper is as follows: Section II summarizes previous literature in the field of FDI and its impact on productivity growth. Section III introduces the paper’s data, estimation model, and methodology. Section IV provides the empirical results. The conclusion of the paper is given in the last section, section V.

II. Literature Review

In this section, through related previous works we explain the mechanism by

which FDI derives its impact on host developing countries productivity when FDI is acting as a production factor in host country markets.

According to MacDougall (1960), who designed a pioneering theoretical framework for FDI, the host country can gain higher tax revenues from foreign profits. Such revenues are considered direct gains (or “direct effects of FDI”). Other gains may be achieved through economies of scale and external economies, especially when the host country enterprises acquire “know-how” or are forced by foreign competition to adopt more efficient methods.

Caves (1974) interprets “other gains” as the *indirect* effects of FDI on the value of productivity of resources owned by the host country. He explains that the host country’s private sector could not benefit directly either because foreign enterprises are efficient or because they bring skilled entrepreneurship or productive knowledge to the host country. Therefore, the host country’s gains depend on spillovers of productivity that occur when multinational corporations are unable to capture all economic rents of their productive activities or when the competitive pressure of foreign enterprises results in the removal of market distortions. Caves’s study about FDI effects on productivity in host country markets analyzes the Canadian and Australian manufacturing industries. He divides the potential

benefits from productivity spillovers on the host country into three sources: allocative efficiency, technical efficiency, and technology transfer. In addition to these three sources, Blomstrom and Persson (1983) mention another gain from FDI to the host country: the training of employees and management. This investment in human capital may then become available to the economy in general. Such trained employees may later become independent entrepreneurs who set up and manage their own enterprises, and/or they may be hired by other domestic enterprises after leaving the foreign enterprise.

Since the publication of the aforementioned economists in this field have been working to find empirical evidence of the beneficial relationship between FDI and host country productivity. The research shows that the effect of FDI on productivity growth in host countries may be negative (or unclear in some cases) or positive. On the one hand, we have two well-known papers by Haddad and Harrison (1993) and Aitken and Harrison (1999) that provide no support to the hypotheses of FDI productivity spillovers. These two papers focus on the method of estimating the total factor productivity (TFP) employing firm-level panel data for Morocco and Venezuela. The papers attribute TFP growth to the presence of foreign enterprises in host countries. Aitken and Harrison (1999) consider the

negative effects to be “market-stealing” effects of FDI. That is, if domestic enterprises cannot compete with foreign enterprises, they will lose their market share to foreign enterprises due to an increase in fixed costs as well as a reduction in production.

On the other hand, a series of studies on FDI effects on host country productivity as whole show positive support for the role of foreign presence on the invested industries. These studies include papers by Globerman (1979), Kokko (1994, 1996), Liu et al. (2000), Buckley et al. (2002), Wei and Liu (2006) and others. These papers focus on estimating labor productivity of the host country’s enterprises as a value-added per worker variable. Determinants of gains in labor productivity include a variable of capital labor ratio (capital per worker) and some other proxy variables such as labor quality as human capital, the host country’s market concentration and scale economy, the technology gap between foreign and domestic enterprises, and factors of foreign presence measured by the share of the foreign sector in the host country industries’ capital, employment, sales, or output.

There are also some empirical approaches about the FDI effects in Vietnam. Anwar and Nguyen (2010) focus on the impact of FDI-linked spillovers that take place through both horizontal and vertical linkages between domestic

and foreign enterprises. Their results suggest that FDI generated spillovers has made a significant contribution to manufacturing growth in Vietnam through vertical-backward linkages. Vu (2008) employs the feasible generalized least squares estimation to analyze FDI indirect effects on GDP through labor productivity. The results show that FDI has significant and positive effects on labor productivity and economic growth in Vietnam, however, the effects are not equally observed in each economic sector.

The main source for our analysis is Barrios and Strobl (2002). This paper employs large panel data of Spanish manufacturing enterprises during 1990-1998 and provides supportive empirical evidence of FDI spillover impact on Spanish manufacturing productivity growth. The paper estimates foreign presence impact on TFP growth at both firm-level and industry-level. The proxy for industry-level foreign presence is measured as sales shares of foreign enterprises in total sales of each industry. In this paper, we employ the basic methodology of Barrios and Strobl (2002) and investigate the role of foreign presence on industry-level productivity growth based on the production technology level.

III. Data, Empirical Model, and Estimation Methodology

III.1 Data

Our analysis of Vietnamese manufacturing industries during the period 2000-2006 employs a sample gathered from the following GSO publications:

- (1) *Statistical YearBook of Vietnam* (1999-2008 each)
- (2) *Enterprises in Vietnam during the first nine years of 21st century*
- (3) *Foreign Direct Investment in Vietnam 7 years at the beginning of century 21st*

The *Statistical YearBook of Vietnam* (1999-2008) shows the nominal industrial output value of 23 individual industries in the manufacturing sector. (Our analysis considers only 22 industries. The recycled products manufacturing industry is omitted due to the shortage of data for more than half of the sample time). The nominal output value is calculated and used as the dependent variable in the regression analysis in the paper. From *Enterprises in Vietnam during the first nine years of 21st century*, we take indicators of employment, capital, and sales for each individual manufacturing industry. *Foreign Direct Investment in Vietnam 7 years at the beginning of century 21st* provides data on the same indicators as in the second publication but focuses on the foreign-invested enterprises sector.

As for the measure of capital investment, we use the indicator of nominal

Table 1 Sample summary statistics of key variables in estimations

Variables	Mean	Standard Deviation	Min	Max	Obs.
$\Delta \log(Y_{it})$ – output growth	0.2018	0.1327	-0.0766	0.6181	132
$\Delta \log(L_{it})$ – labor growth	0.1368	0.1430	-0.3032	1.1423	132
$\Delta \log(K_{it})$ – capital growth	0.1498	0.1871	-0.5377	0.7690	132
fp_{it} – foreign presence	0.4645	0.2499	0.0033	0.9908	132

fixed assets and long-term investment of enterprises. This indicator consists of the total value of depreciated fixed assets, the value of under-construction projects, and the long-term financial investment.

To account for possible impacts of inflation, capital investment and industrial output value are deflated using the industrial annual producer price indices provided by the GSO.

The accumulated data gives us a sample of 22 manufacturing industries in seven years from 2000 through 2006 for our empirical analysis. Table 1 presents the sample summary statistics of the key variables used in estimations.

III.2 Empirical Model and Estimation

Methodology

Following Barrios and Strobl (2002), we calculate the TFP based on the production function in the log-transformation as in the following equation (1):

$$\log(Y_{it}) = \log(A_{it}) + \alpha_l \log(L_{it}) + \alpha_k \log(K_{it}) \quad (1)$$

where Y_{it} is the value of industrial output; A_{it} , L_{it} , and K_{it} are the level of technology (i.e., productivity), number of employees, and capital inputs of industry

i at time t .

Taking changes in variables in equation (1), we get the growth equation (2).

$$\Delta \log(Y_{it}) = \Delta \log(A_{it}) + \alpha_l \Delta \log(L_{it}) + \alpha_k \Delta \log(K_{it}) \quad (2)$$

Here, $\Delta \log(A_{it})$ is considered as the growth in productivity, or TFP. This TFP factor is computed after regressing equation (2) as follows,

$$TFP_{it} = \Delta \log(Y_{it}) - \hat{\alpha}_l \Delta \log(L_{it}) - \hat{\alpha}_k \Delta \log(K_{it}) \quad (3)$$

Next, we hypothesize that productivity growth is determined by the factor of the presence of foreign-invested enterprise (i.e., foreign presence) in each industry and a series of year dummy variables as in equation (4), our final estimation equation.

$$TFP_{it} = \beta_0 + \beta_1 fp_{it} + \sum_{y=2001}^{2006} \beta_y D_y + \varepsilon_{it} \quad (4)$$

where D_y is the year dummy series which controls for any common macroeconomic effects; ε_{it} is the statistical error term.

The proxy variable for foreign-invested enterprises' presence (or foreign presence), fp_{it} , is measured by shares of foreign enterprises in the market sales of each industry:

$$fp_{it} = \frac{\sum \text{foreign enterprises' sales}}{\text{industry's total sales}} \quad (5)$$

This is our variable of interest. Here, we hypothesize that the larger the foreign presence in the host country markets is, the more productive the host country industries will be.

According to our hypothesis about the role of FDI in industrial productivity growth, we expect a significantly positive sign on the coefficient of the foreign presence variable, fp_{it} . If that is the case, we would conclude that foreign investment in the Vietnamese manufacturing industries helps improve the productivity of those industries.

Furthermore, regarding different productivity catch-up effects among industries, if we get different results in regressions for each of the three industrial subgroups (light, petro-chemical, and heavy industries), we can make clear our assumption of different FDI effects on invested industries with different production technologies.

In terms of the estimation method, first, following the aforementioned paper by Barrios and Strobl (2002), we examine our model equation (4) applying the ordinary least squares method (OLS). In addition, controlling for all possible time-invariant industry-specific effects due to the application of panel data, we estimate the model by the fixed effects method (FE). Finally, a diagnostic test, LR test is applied to choose the better of the two methods.

The LR test statistic is seen in

equation (6) below:

$$LR = nT * \log\left(1 + \frac{RSS_{OLS} - RSS_{FE}}{RSS_{FE}}\right) \sim \chi^2(n-1) \quad (6)$$

RSS stands for the sum of squared residuals from the OLS and the FE regression, respectively. A high value of the LR test statistic favors the use of the FE model over the OLS model.

IV. Empirical Results

In this section, we discuss the empirical results based on the aforementioned estimation methodology. We analyze the indirect effects derived from the presence of foreign-invested enterprises on the growth of productivity in Vietnamese manufacturing industries during the period 2000-2006. Additionally, we classify the sample into three industrial subgroups regarding their production technology level and calculate the effects of FDI in each of those three subgroups. We identified three industrial subgroups because we hypothesize that different technology levels may cause invested industries groups to have different timing and speed when taking advantage of the foreign presence. Such a classification system is also employed and discussed in Dollar and Wolff (1994) and in Raut (1995).

Table 2 summarizes the estimation results for all 22 manufacturing industries. The first column is the estimation result by the OLS method. The second column

Table 2 FDI effects on productivity growth of Vietnamese manufacturing

Est. method	OLS	FE
Constant	-0.0436	
	(0.08)	
Foreign presence	0.1019***	0.3800
	(0.01)	(0.16)
Year dummies	Yes	Yes
LR ^{a)}		18.36
		[21]
R ²	0.1461	0.2570
Obs.	132	132
Notes: Figures in parentheses are p-values after adjusting for heteroskedasticity. ***, ** and * indicate statistical significance at 1, 5 and 10% level, respectively.a)		

shows the FE method. The LR test statistic favors the OLS method against the FE one. Accordingly, for the case of the whole sample, the OLS estimation result gives a positive and 1% level statistically significant coefficient on foreign presence. The coefficient (0.1019) implies that a 10% increase in the sales share of foreign-invested enterprises may result in approximately a one percent increase in manufacturing productivity growth in

Vietnam. That is, on investigating the whole sample, we can justify our FDI spillover effects hypothesis about Vietnamese manufacturing productivity growth.

Due to the hypothesis that each industrial group's production technology level influences its ability to absorb the effects of foreign presence in its own industries, we show the estimation results for the light, petro-chemical, and heavy indus-

Table 3 FDI effects on productivity growth of industrial subgroups

Subgroup	Light		Petro-chemical		Heavy	
	OLS	FE	OLS	FE	OLS	FE
Constant	-0.0937		-0.0307		0.0908	
	(0.000)		(0.290)		(0.015)	
Foreign presence	0.0540**	0.3851	0.0102	0.2069	0.0459	-0.3097
	(0.05)	(0.38)	(0.83)	(0.53)	(0.48)	(0.08)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
LR ^{a)}		5.58		3.22		6.57
		[8]		[4]		[7]
R ²	0.4354	0.4908	0.1006	0.1922	0.2752	0.3679
Obs.	54	54	30	30	48	48
Notes: Figures in parentheses are p-value after adjusting for heteroskedasticity. ***, ** and * indicate statistical significance at 1, 5 and 10% level, respectively.a)						

trial groups in Table 3.

Similar to the case for the whole sample, the LR tests for each subgroup favor the OLS method rather than the FE method.

First, for the light industrial group of nine manufacturing industries, the result is the same as that for the entire sample of 22 industries. The coefficient (0.05) on the foreign presence variable is positive with a 5% level of statistical significance. That is, light industries may achieve a one percent growth in productivity when foreign presence increases its share from zero to twenty percent, approximately.

In addition, the left two groups of five petro-chemical and eight heavy industries show large p-value which means insignificance in terms of statistics. However, the estimated coefficients on the variable of foreign presence are positive.

Despite the different analysis objectives, our paper finds similar results on the estimation for light industries as in Raut (1995). That is, in our analysis FDI spillover effects are positive for the light industries group, while R&D spillover effects are positive in Raut (1995).

This result is also consistent with Le (2008) that manufacturing industries with comparatively low technology levels benefit from the spillover effects of FDI. However, the difference is that our paper analyzes the spillover effects on productivity growth with the industrial classification based on a reference paper by Raut (1995), while Le (2008) investigates

spillover effects on wage rate following the industrial classification of the GSO.

In brief, the estimation results for the case of the whole sample justify our FDI spillover effects on productivity hypothesis. In other words, in general, the larger the share of foreign-invested enterprises in the market, the higher the productivity growth Vietnamese manufacturing industries may achieve based on the productivity spillover effects of those foreign-invested enterprises.

Furthermore, the regression results of the three subgroups of industries also provide evidence of our hypothesis about technology-level-based productivity catch-up effects. In this case, it can be concluded that the Vietnamese light-industry group rapidly benefits from the entry and activities of foreign-invested enterprises. At the same time, it is possible, perhaps after a longer time, for the two left subgroups of petro-chemical and heavy industries to take advantage of such foreign investment.

This absorptive span can be explained by the level of production technologies of those industrial groups. That is, the light-industry group uses comparatively simpler technologies, and thus shows earlier effects than do the petro-chemical and heavy-industry group.

V. Conclusion

In this paper, we analyze the mechanism

for the effects of FDI on productivity growth at industry-level in Vietnam. Not only do we investigate the entire sample of 22 Vietnamese manufacturing industries, we also take into consideration the factor of differences in production technology level. We argue that the productivity spillover effects from FDI are absorbed at different speeds due to the difference in the production technology level of the invested industries. Therefore, we classified our sample into three groups, including the light industries group, petro-chemical industries group, and heavy industries group.

The empirical results show us positive effects of foreign presence (i.e., FDI) on the growth of the entire Vietnamese manufacturing industries as well as of nine light industries. Meanwhile, it is not clear in the case of the other two comparatively higher technology level groups, the five petro-chemical industries group and eight heavy industries group. That means our hypotheses of FDI effects on productivity enhancement and of impact differences upon the production technology level are justified.

These empirical results can be interpreted as follows. Regarding the indirect or spillover effects of FDI, host country industries with comparatively simple production technologies can benefit immediately from the entry and the production activities of foreign-invested enterprises. On the other hand, it is time-consuming

for industries with comparatively higher levels of production technologies to acquire productivity gains from foreign presence.

As a result, we suggest that an examination of the indirect effects of FDI on productivity growth (i.e., productivity spillovers from FDI) should take into account the differences in production technology level of invested industries. Therefore, to benefit from the effects of FDI, developing host countries should focus on strengthening their industries' capacity and allow a longer time span for the realization of those FDI effects.

However, due to the limitation of our industry-aggregated data set, we could not investigate FDI effects between industries following recent research in this field which employs micro-data at firm level. Therefore, in a future study, in order to make clear our hypotheses and its implications, we will include firm-level micro-data to provide a more detailed picture of industrial development in Vietnam.

Acknowledgment

We would like to give our thanks to Professor Yuko Arayama, Professor Tadashi Sonoda and Professor Seeun Jeong for their meaningful comments on our work. All errors remain our own.

This work was supported by JSPS Grant-in-Aid for Young Scientists (B), Number 24730242.

Appendix

AI. Estimation of the Production Function in terms of Growth

Table AI. Production function in terms of growth estimation

Production growth function estimation - Equation (3)				
Variables	Whole	Light	Petro-chemical	Heavy
	OLS	OLS	OLS	OLS
Constant	0.1360***	0.0638***	0.1224***	0.1735***
	(0.00)	(0.00)	(0.00)	(0.00)
Labor	0.2685***	0.4540***	0.2215***	0.2948
	(0.00)	(0.00)	(0.00)	(0.16)
Capital	0.1938***	0.3985***	0.0376	0.1651***
	(0.01)	(0.01)	(0.76)	(0.00)
R-squared	0.2121	0.4521	0.2319	0.1343
Obs.	132	54	30	48

Notes: Figures in parentheses are p-values after adjusting for heteroskedasticity. ***, ** and * indicate statistical significance at 1, 5 and 10% level, respectively.

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