Chapter 11

FDI, Financial Constrains, and Productivity: Firm Level Study in Vietnam

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Chapter 11

FDI, Financial Constraints, and Productivity: Firm Level Study in Vietnam[1]

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Abstract

This paper empirically investigates the effects of foreign ownership, financial constraints, and other firm characteristics using a micro panel of firms in Vietnam from 2002 to 2008. We adopted the semi-parametric framework of Levinsohn–Petrin (2003) to estimate the total factor productivity (TFP) by controlling for the unobserved firm heterogeneity and endogeneity of the structural variables. The results of the paper highlight that foreign ownership is positively correlated with productivity. Financial constraints (e.g. low liquidity and limited access to external credit) appear to be a major threat to the productive performance of firms in the manufacturing industries in Vietnam. Our evidence also points to the presence of scale efficiency and the importance of high-tech and human capital accumulations to productivity enhancement.

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J.E.L. Classification: F21, F23, O40

1. Introduction

Foreign direct investment has been the key engine of growth for developing countries for the past decades. These countries have increasingly relied on foreign direct investment (FDI) as a key engine of output, employment and productivity growth. The underlying rationale for attracting FDI in host countries rests with productivity spillovers associated with FDI, whereby positive externalities created by the multinational activities allow indigenous firms to pick up their productivity. Based on the transaction costs theory of FDI (Caves, 1996), multinational enterprises (MNEs) exploit superior knowledge (e.g. technological and informational advantage, managerial expertise and superior organizational structure) transferred from their foreign parents to compensate for the higher operating costs incurred in the host markets. MNEs are therefore expected to demonstrate higher performance in terms of profitability and productivity than domestic-owned firms.

The productivity characteristics of MNEs and their foreign affiliates have been examined extensively in the literature. There is some evidence that foreign affiliates exhibit higher productivity performance than do domestic-owned firms. For instance, Aitken and Harrison (1999) using micro data of firms in Venezuela showed that MNEs outperform domestic-owned firms. The superior productivity performance of foreign affiliates in developing countries has been confirmed by Arnold and Javorcik (2009) for Indonesia, Javorcik (2004) for Lithuania, and Sabirianova et al. (2005) for the Czech Republic. A few studies found that the productivity advantage of MNEs' affiliates also prevails in developed countries, such as Benfratello and Sembenelli (2006) for Italy, Doms and Jensen (1998) for the US, and Girma and Görg (2007) and Griffith (1999) for the UK. However, these studies compare productivity between MNEs and domestic-owned firms, thereby neglecting the effects of difference in degree of foreign ownership within a firm on its productive performance. For instance, if a foreign stake matters to the productivity advantage of a firm, one should expect that Greenfield FDI outperforms a partially foreign-owned firm.

In addition to heterogeneous degree of foreign ownership, our empirical analyses add another two new elements of firm-specific characteristics into this strand of literature. First, we incorporate financial attributes into our empirical framework, which builds upon a body of empirical findings that point to the negative effects of financial constraints on firm survival and development (Beck et al., 2005; Demirguc-Kunt and Maksimovic, 1998; Levine, 2005). The mechanism through which financial health shapes the productivity prospects of a firm is that availability of funds stands a firm in good stead to leverage on ample business opportunities, to make superior investment decisions, and ultimately to enjoy exceptional business capacity and ability to survive in the market. Addressing this issue is vital in that financial constraints have affected multinational activities especially in developing countries where the development of financial markets is usually limited. A recent study by Alfaro et al. (2006) shows that firms in countries with well-developed financial markets tend to experience positive gains in FDI. Thus, reducing the financial constraints of firms by developing financial markets could have positive impacts on the productivity of firms.

Recent studies highlight the importance of financial markets in inducing innovation and entrepreneurship with the presence of FDI activities. Countries with better-developed financial markets increase their innovative activities in the domestic economy and thus there will be higher spillover and innovation in open economies with trade and FDI (Alfaro et al., 2004). Financial markets could increase the innovation and productivity of domestic firms with the presence of multinational firms in the following ways. First, domestic firms rely on external firms to finance their innovative and investment activities from multinational activities in the domestic economy. Second, the presence of foreign firms will induce new technologies into the domestic economy and thereby increase the entrepreneurial activities in the domestic economy. Well-developed financial markets will increase these entrepreneurial activities. The paper also studies the impact of financial constraints on the innovation of domestic firms with the presence of foreign ownership. Finally, well-functioning financial markets enhance the potential for FDI to create backward linkages and transfer technologies in the domestic economy (Javorcik and Spatareanu, 2008).

The second firm-specific treatment is the following. The current study examines the productivity of performance of firms by focusing on the effects of the high-tech capital accumulation (e.g. computers and automated machinery) on productivity, as in Oliner and Sichel (2000), Siegel (1997) and Siegel and Griliches (1992).[2] However, the roles of human capital utilization have not been sufficiently emphasized even if the developing Asian countries, including Vietnam, have flourished on swift development toward a knowledge-intensive economy where rich skilled labor sources serve as a key catalyst of sustainable productivity growth. Therefore, it may be interesting to control for the effects of human capital utilization, in addition to high-tech capital accumulation.

The present paper empirically examines linkages between total factor productivity (TFP) and firm characteristics, using a panel of 5,302 firms in Vietnam spanning the period of 2002–2008. The focus on Vietnam is motivated by two main considerations. First, foreign ownership has been increasingly important to output and employment growth in the Vietnamese economy. Second, the past decade witnessed rapid proliferation of multinational activities as a result of its market-driven momentum toward trade and investment liberalization, coupled with several policy initiatives such as tax exemption, legal reforms and improved institutional infrastructure.

Taking into account the unobserved productivity shocks, unobserved firm heterogeneity, and endogeneity of variables, among other relevant econometric issues, our empirical results indicate that firms with higher foreign ownership tend to exhibit higher TFP. One implication may be that, if employed, FDI promotion policy is better redirected toward Greenfield FDI instead of joint ventures if the policymakers' objective is to maximize benefits from productivity spillovers. In other results, financial constraints appear to have a negative impact on a firm's productivity performance. We also find robust evidence of scale efficiency. The estimates further point to positive contributions of high-tech and human capital accumulations to TFP enhancement. We

[2] Their empirical evidence points to a significant contribution of high-tech capital investment such as computers, data processing equipment, automated machinery and Information Technology (IT) capital, to total factor productivity (TFP).

find only weak evidence that international trade exposure helps Vietnamese firms advance their productive performance.[3]

The organization of the paper as follows. Section 2 discusses data sources and measurements. The derivation of TFP using the Levinsohn–Petrin (LP) framework is given in Section 2. Section 3 discusses the model and empirical methodology. Section 4 presents and analyzes the empirical results. Section 5 provides a robustness check using an alternative TFP measurement. Section 6 concludes and draws policy implications.

2. Derivation of the TFP Measure – Levinsohn–Petrin Framework

In this paper, we adopted the semi-parametric framework of Levinsohn and Petrin (2003) to estimate the total factor productivity (TFP) in order to control for the unobserved firm-specific productivity shocks. We adopt the Levinsohn–Petrin framework because of the availability of material inputs data and also the lack of consistent investment data.

A crucial issue of production function estimations is concerned with the potential correlation between unobservable firm-specific productivity shocks and input levels, which, as is well known, makes the standard OLS estimates biased and inconsistent (Grilliches and Mareisse, 1998). There are at least two econometric approaches to TFP measurement the existing literature conventionally utilizes to control for the unobservables. One is the Olley–Pakes TFP measurement in which investment serves as a proxy for these productivity shocks (Olley and Pakes, 1996). The other builds upon the production theory and is first introduced by Levinsohn and Petrin (2003) using intermediate input proxies.

We employ the Levinsohn–Petrin TFP measurement as in Levinsohn and Petrin (2003) for two main reasons. First, a proxy of investment is not valid in our case because of the absence of investment information. In contrast, the Levinsohn–Petrin TFP measurement

[3] The weak evidence may be attributable to measurement biases. Because of the lack of export and import volume data our proxy of international trade exposure pertains to dummies of exporting and importing activities, instead of the intensity of exports and imports.

is strictly data-driven now that our dataset provides complete information on the uses of materials. More importantly, even if the investment data were available, the estimates would suffer from truncating all the establishments reporting “zero” investment.

We assume that a firm’s production technology takes the log-linearized Cobb-Douglas functional form.

$$y_t = \beta_0 + \beta_l l_t + \beta_k k_t + \beta_m m_t + \omega_t + \eta_t, \tag{1}$$

where y_t is the logarithm of the firm’s gross output in year *t*, l_t and m_t denote the log-levels of freely variable inputs labor and materials respectively, and k_t refers to the logarithm of quasi-fixed input capital. A productivity shock to a firm’s technology (1) is assumed to be additively separable and comprises two components: a transmitted component (ω_t) and an i.i.d. component (η_t). It should be highlighted that the former is correlated with input choices and is the source of simultaneity biases, while the latter is not.

Levinsohn and Petrin write the demand for m_t merely as a function of the two state variables, ω_t and k_t. They show that this function is monotonically increasing in ω_t and k_t and allows inversion of the demand for m_t. Therefore, the unobservable ω_t can be re-written as a function of k_t and $m_t : \omega_t = \omega_t(k_t, m_t)$. As in Olley and Pakes (1996), we assume that ω_t follows a first-order Markov process: $\omega_t = E[\omega_t | \omega_{t-1}] + \xi_t$, where ξ_t is a shock to productivity that is uncorrelated with k_t, but not necessarily correlated with l_t. With this identification, the production technology (1) can be expressed as

$$y_t = \beta_l l_t + \phi_t(k_t, m_t) + \eta_t, \tag{2}$$

where $\phi_t(k_t, m_t) = \beta_0 + \beta_k k_t + \beta_m m_t + \omega_t(k_t, m_t)$.

The estimation can be done in two steps. We first carry out a third-order polynomial approximation to estimate the conditional moments $E(y_t | k_t, m_t)$ and $E(l_t | k_t, m_t)$. The second step pertains to solving the GMM minimization problem to identify β_k and β_m.

The Levinsohn–Petrin estimation of a firm's production technology (2) is reported in Table 1. The Wald's test of returns to scale implies increasing returns for the estimated production function even though the null of constant returns to scale cannot be rejected at the 5 percent level of significance. Having obtained the parameter estimates of the production technology, we then generate the predictions of ω_t as a proxy of firm-specific TFP.

Table 1. Levinsohn–Petrin Estimation of Production Technology

Dependent Variable: y_t	
l_t	.3357*** (.0435)
m_t	.1065 (.2121)
k_t	.6716*** (.1714)
No. Obs.	1825
Wald's Test of Returns to Scale	3.31*

Note: 1) ***, * statistically significant at 1 and 10 percent, respectively.
2) Wald's test is Chi-square distributed against the null that the production technology is constant returns to scale.

3. Data Construction

We construct our dataset of firms from the *Annual Statistical Censuses & Surveys: Enterprises* from 2002 to 2008, gathered by the General Statistics Office of Vietnam. It provides firm-level information on foreign ownership and production characteristics, such as the number of workers, gross revenue, working capital, materials, profits, and export/import status, as well as financial attributes such as liquid assets, fixed assets, liabilities and equity, among many others.

Table 2. Output and Employment Growth by Ownership, 2000–2008

	Output Growth (% p.a.)	Employment Growth (% p.a.)
Total	7.5	2.3
State	6.8	1.85
Non-state	7.3	1.93
Foreign Firms	10.4	20.41

Source: General Statistics Office, Vietnam.

Table 3. Surveyed Firms by Foreign Ownership Characteristics

	2002	2003	2004	2005	2006	2007	2008
	Number of Firms						
Total	**51680**	**62908**	**72012**	**91756**	**112950**	**131318**	**155771**
Foreign Firms	**2011**	**2308**	**2641**	**3156**	**3697**	**4220**	**4961**
100% foreign capital	1294	1561	1869	2335	2852	3342	4018
Joint venture	717	747	772	821	845	878	943
	Percentage of Firms						
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
Foreign Firms	**3.89**	**3.67**	**3.67**	**3.44**	**3.27**	**3.21**	**3.19**
100% foreign capital	2.50	2.48	2.60	2.55	2.52	2.54	2.58
Joint venture	1.39	1.19	1.07	0.89	0.75	0.67	0.61

Source: General Statistics Office, Vietnam.

Firms in our dataset operate in a wide range of economic sectors; most of which are concerned with manufactures and service activities such as trade, hotels and restaurants, and real estate business and consultancy. Table 2 indicates that relative performance of MNEs in Vietnam compared to state and non-state enterprises is striking. The growth rate of outputs during the period of 2000–2008 reached 10.4 percent. This figure is

much higher than the average GDP growth rate of 7.5 percent. Likewise, multinationals seemed to be increasingly important in terms of employment, with 20.41 percent employment growth per annum. As portrayed in Table 3, while the proportion of MNEs was stable, the number of foreign affiliates increased exponentially throughout the period 2002–2008, when they accounted for approximately 3.19 to 3.89 percent of surveyed firms. Interestingly, approximately 70 to 80 percent of MNEs are associated with Greenfield FDI (100 percent foreign capital). This figures point to a pivotal role of Greenfield FDI in the Vietnamese economy.

For estimation efficiency, our dataset is cleaned in the following ways. First, we exclude firms that do not report foreign ownership from the dataset. Firms that have no complete record throughout the period 2002–2008 are also dropped to avoid errors of data entry. Therefore, our firm-level panel comprises a total of 5,302 annual observations, spanning the years 2002–2008.[4]

4. Empirical Framework and Estimations

We now turn to a formal analysis of productivity effects associated with FDI and financial characteristics. Our empirical strategy is to incorporate FDI and financial constraint variables, in addition to the conventional determinants of productivity spillovers, into the econometric specification. We adopt the following reduced form econometric model to estimate the productive performance of firms.

$$TFP_{it}^{L-P} = \alpha_0 + \alpha_1 \ln FDI_{it} + \alpha_2 \ln LIQUIDITY_{it} + \alpha_3 \ln LEVERAGE_{it} + \alpha_4 \ln SIZE_{it}$$
$$+ \alpha_5 \ln COM_{it} + \alpha_6 \ln HUMANK_{it} + \alpha_7 XM_{it} + \mu_i + u_{it}, \qquad (3)$$

where the subscript i indexes firms; and t time. TFP_{it}^{L-P} refers to total factor productivity, measured by the LP approach. μ_i represents the firm-specific fixed effects, and u_{it} is the error term.

Central to our empirical analysis are the structural variables of foreign ownership and financial characteristics. The existing literature conventionally employs the dummies of foreign ownership as a proxy of FDI (Arnold and Javorcik, 2009; Benfratello and Sembenelli, 2006; Girma at al., 2004; Griffith, 1999). Nevertheless, this FDI measurement does not take into account changes in foreign ownership within firms and may lead to biased estimates of FDI contribution to firm performance. In addition, the use of the FDI dummies confines the scope of empirical evidence to a comparison

[4] We are not able to include the 2006 survey in the dataset now that the firm codes are absent.

between foreign-owned and domestic firms, while relative performance of firms with different degrees of foreign ownership, e.g. a performance comparison between Greenfield FDI and joint venture remains unexplored. To tackle these issues, our proxy of FDI abstracts from the traditional measure, utilizing the ratio of investment capital undertaken by foreign parties to total registered capital, denoted by FDI_{it}.

Two variables enter our econometric specification as proxies of financial health. The first is liquidity, denoted by $LIQUIDITY_{it}$, and is measured by the ratio of liquid (short-term) assets to total assets. A firm with higher liquidity is expected to be more resilient to unexpected financial shocks, to grow faster and therefore to be more productive (Beck et al., 2005). In addition, the ratio of liabilities to equity, $LEVERAGE_{it}$, is meant to capture the degrees of credit constraints facing a firm. This financial variable has been adopted in studies of financial development since access to external finance and the existence of financial constraints can have crucial effects on the firm's ability to improve its productivity performance and stay in the market (Aghion et al., 2007; Levine, 2005).

Apart from the explanatory variables representing foreign ownership and financial constraints, we also controlled for several firm-specific characteristics using the conventional determinants of productivity performance. First, our estimated production function shown in Table 1 exhibits increasing returns to scale, suggesting the existence of scale effects on TFP. Firm size, $SIZE_{it}$, is measured by total sales to control for the effects of scale economies on productivity performance.[5] Second, high-tech capital accumulation is an important engine of growth in developing economies. It has been a source of policy and academic debate that investment in high-tech capital upgrades operating performance and profitability, thereby enhancing productivity growth (Morrison and Berndt, 1991; Siegel and Griliches, 1992).[6] Analogous to the measure

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[5] An alternative measurement of firm size is the number of labor. However, this seems inappropriate in our case due to the potential multicollinearity with COM_{it}.

[6] However, empirical evidence regarding the linkages between high-tech capital accumulations and productivity growth is rather mixed. While Morrison and Berndt (1991) using US firm-level data find that the contribution of high-tech capital investment to productivity growth is small, Siegel and Griliches

employed by Oliner and Sichel (1994, 2000), COM_{it} aims to account for high-tech capital investment and is proxied by the number of computers used per worker.

Another crucial source of productivity growth is human capital utilization. It has been widely observed that developing economies have paved the way toward knowledge-intensive economies by higher rates of investment in education, training and R&D activities since the 1990s. It may be interesting to empirically investigate the roles of human capital uses in explaining firm productivity performance in Vietnam. We employ the ratio of skilled to total workers as a proxy of human capital intensity, denoted by $HUMANK_{it}$.

We also included a variable to capture the role of exporting on the productivity of firms. Firms operating in export markets tend to enjoy higher productivity growth. In principle, such activities can generate positive externalities, e.g. technological and informational spillovers in terms of better access to new technology and technical assistance, through international contacts and competition (Clerides et al., 1998; Evenson and Westphal, 1995). Nevertheless, our dataset does not provide information on volumes of international trade. We hence resort to the second-best measure of international trade exposure to control for the effects of export market linkages on productivity performance using the dummy XM_{it}. It takes values of 1 if the firms engage in exporting/importing activities and 0 otherwise.

The simplest way to obtain parameter estimates in our base-line econometric specification (3) is to carry out the standard Ordinary Least Squares (OLS) estimations. However, our concern is that OLS estimations tend to convey biased estimates owing to firm heterogeneity. The unobservable firm heterogeneity seems plausible given the knowledge that firms operate in a wide range of economic activities like manufacturing, financial intermediation, trade, real estate and consultancy services. To control for unobservable firm heterogeneity, we make use of Fixed Effects (FE) and Random Effects (RE) estimations. The former is undertaken by using OLS with

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(1992) draw contrasting conclusions that high-tech capital formation is a crucial source of economic growth.

heteroskedasticity-robust estimators to take into account the heteroskedasticity problem that arises from variation in firm size, whereas the latter is obtained by Generalized Least Squares (GLS) with the Swamy–Arora estimators.

FE and RE estimates may also be biased and inconsistent, however. The reason is that all of our structural variables, e.g. FDI, financial characteristics, high-tech capital investment, human capital utilization, and export/import status, are very likely to be endogenously determined by other unobserved variables. If the potential endogeneity bias problem exists, neither FE nor RE estimates is consistent and asymptotically efficient. There are at least two standard approaches to accounting for the potential endogeneity biases. The first is to employ the valid instrumental variables (IVs) – ones which are exogenous and strongly correlated with endogenous explanatory variables. However, this approach is data-intensive and thus may be inappropriate for our dataset. Alternatively, we adopt the second approach whereby lags of structural variables are chosen as IVs to correct any simultaneity bias in the estimations, using Generalized Method of Moment (GMM) to obtain two-step estimators (Arellano and Bover, 1995; Blundell and Bond, 1998). In so doing, our base-line econometric specification (3) is modified as follows.

$$TFP_{it}^{L-P} = \alpha_0 + \alpha_1 TFP_{it-1}^{L-P} + \alpha_2 \ln FDI_{it} + \alpha_3 \ln LIQUIDITY_{it} + \alpha_4 \ln LEVERAGE_{it}$$
$$+ \alpha_5 \ln SIZE_{it} + \alpha_6 \ln COM_{it} + \alpha_7 \ln HUMANK_{it} + \alpha_8 XM_{it} + \mu_i + u_{it}, \quad (4)$$

where α_1 captures partial dynamic adjustments of TFP_{it}^{L-P}.

Tables A1 and A2 in the Appendix summarize statistics of the abovementioned structural variables and present their correlation matrix, respectively. We are concerned that the correlation between FDI_{it} and other firm characteristics may exist, now that a foreign stake tends to affect decisions on financing, firm size, high-tech capital investment, human capital utilization, and export/import status. However, the correlation matrix in Table A2 indicates that the correlation coefficients between FDI_{it} and other firm attributes are satisfactorily low. This implies that the multicollinearity may not pose a serious problem in our estimation.

5. Empirical Results

Our empirical framework comprises two parts. The first deals with the estimation of the Levinsohn–Petrin TFP using the estimated production function reported in Table 1. Having obtained the Levinsohn–Petrin TFP, we then produce parameter estimates based on our econometric specification (3).

Table 4. OLS, FE, and RE Estimations for Levinsohn–Petrin TFP

Dependent Variable: TFP_{it}^{L-P}			
Independent Variable	**OLS**	**FE**	**RE**
$\ln FDI_{it}$	$.4603^{***}$ (.1164)	1.013^{***} (.3255)	$.5249^{***}$ (.1302)
$\ln LIQUIDITY_{it}$	1.650^{***} (.3034)	1.427^{***} (.5214)	1.613^{***} (.1328)
$\ln LEVERAGE_{it}$	$.2041^{***}$ (.0647)	$.1351^{*}$ (.0724)	$.1906^{***}$ (.0584)
$\ln SIZE_{it}$	$.7095^{***}$ (.0997)	1.170^{***} (.2649)	$.7811^{***}$ (.1107)
$\ln COM_{it}$	$.7441^{***}$ (.1352)	$.8439^{***}$ (.1967)	$.7816^{***}$ (.1328)
$\ln HUMANK_{it}$	$.4166^{**}$ (.1869)	$.5521^{*}$ (.3136)	$.4205^{**}$ (.1853)
XM_{it}	.2037 (.3210)	$-.5079$ (.3458)	$-.0113$ (.2828)
Constant	1.204 (.8292)	$-.9246$ (2.155)	1.020 (.8620)
No. of Obs.	726	726	726
R-squared	.1734	.1495	----
Wald's Chi-squared	----	----	124.50^{***}
Breusch–Pagan Test	----	----	5.13^{**}

Note: 1) Heteroskedasticity-robust standard errors in parentheses for OLS and RE.
2) RE estimates are based on Generalized Least Squares (GLS) with the Swamy–Arora estimators.
3) The Breusch–Pagan test statistic is Chi-squared distributed under the null hypothesis that there are no random effects.
4) ***, **, and * statistically significant at 1, 5, and 10 percent, respectively.

Table 4 reports preliminary estimates of the econometric specification. The first column portrays the OLS estimates with the heteroskedasticity-robust estimators. As emphasized earlier, the OLS estimates tend to be biased owing to the unobservable firm heterogeneity. We address this econometric issue by utilizing Fixed Effects (FE) and Random Effects (RE) estimations reported in the second and third columns, respectively. Even though the parameter estimates are consistent in terms of signs and statistical significance across all estimations, the Breusch–Pagan test in the last row of Table 3 rejects the null hypothesis of no random effects at the 5 percent level of significance and is thus in favor of RE estimates.

Table 5. GMM Estimations for Levinsohn–Petrin TFP

Dependent Variable: TFP_{it}^{L-P}			
Independent Variable	**Model 1**	**Model 2**	**Model 3**
TFP_{it-1}^{L-P}	$-.0184$ (.1316)	.0847 (.1406)	.0688 (.1313)
$\ln FDI_{it}$	$.6629^{**}$ (.2728)	$.7090^{**}$ (.2984)	$.6306^{**}$ (.2658)
$\ln LIQUIDITY_{it}$	1.648^{***} (.6277)	1.244^{**} (.5909)	1.738^{***} (.6533)
$\ln LEVERAGE_{it}$	$.1437^{*}$ (.0814)	$.1581^{**}$ (.0790)	$.1672^{**}$ (.0738)
$\ln SIZE_{it}$	$.9460^{***}$ (.2793)	$.9776^{***}$ (.2614)	$.9136^{***}$ (.2388)
$\ln COM_{it}$	$.9080^{***}$ (.2819)	$.8399^{***}$ (.2493)	$.9027^{***}$ (.2485)
$\ln HUMANK_{it}$	.6598 (.4166)	—	$.8540^{**}$ (.4319)
XM_{it}	$-.3789$ (.5459)		—
Constant	.2390 (2.954)	-1.778 (2.348)	.0654 (2.505)
No. of Obs.	309	381	380
Wald's Chi-squared	34.17^{***}	33.72^{***}	33.72^{***}
No. of IVs	15	17	17
Sargan test	7.88	11.90	10.78

Note: 1) The Bond–Blundell estimates are based on GMM with the two-step estimators.
2) The maximum lag for AR tests is 2.
3) Standard errors in parentheses.
4) ***, **, and * statistically significant at 1, 5, and 10 percent, respectively.
5) The Sargan test is chi-squared distributed under the null hypothesis that over-identifying restrictions are valid.

Table 5 accounts for the possibility that our dependent variable may be endogenously determined by other unobserved variables, in which case even the FE and RE estimates are biased and inconsistent. We tackle this issue by employing the two-step Bond–Blundell estimations with GMM, where our structural variables are instrumented by their lags.[7] As shown in Table 5, the first column reports the full model GMM estimation (Model 1). We then perturb the base-line model by dropping $HUMANK_{it}$ and XM_{it} from the specification (Model 2). The last column excludes only XM_{it} (Model 3). We examine the over-identifying restrictions using the Sargan test reported in the last row of Table 5. The null of valid over-identifying restrictions cannot be rejected across all specifications. The Sargan test is therefore in favor of our treatment of lagged endogenous variables as if they were exogenous, and substantiates our well-specified econometric model. Interestingly, the coefficients of TFP_{it-1}^{L-P} are statistically insignificant across all specifications, suggesting that firms in Vietnam promptly respond to productivity shocks.[8]

Our parameter estimates are strikingly robust across all estimation strategies and specifications since the different estimation techniques and model specifications in Tables 3 and 4 produce qualitatively identical results. The robust estimates imply that firm heterogeneity and endogeneity biases may not pose a serious problem in our case. The main findings can be summarized as follows.

First, the degrees of foreign ownership contribute positively to the TFP of firms in Vietnam. The coefficients of FDI_{it} are positive and statistically significant at 1 percent for OLS, FE and RE estimations and 5 percent for the GMM estimations. The productivity premium offered by an acquisition of a domestic firm by foreign investors can be explained by superior know-how, technology and organizational management, which may be transferred easily across borders from the parent to subsidiaries abroad (Markusen, 2002). However, the observed productivity enhancement effects in principle could also be market-driven in the sense that the foreign parents tend to acquire the best-performing indigenous firms.

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[7] We also carry out the Arellano–Bond estimations using GMM and the two-step estimators. The results are qualitatively identical to those of the Blundell–Bond estimations in Table 5. The results are available upon request.

[8] The insignificant coefficients of TFP_{it-1}^{l-P} are consistent with the fact that our results are strikingly robust when the dynamic specifications with the GMM estimations are undertaken in lieu of the baseline specification.

Empirical evidence that points to a positive correlation between foreign ownership and productivity advantage is not new. Our results are consistent with a substantial body of empirical studies that have asserted productivity effects of FDI across a number of industries and countries, such as Arnold and Javorcik (2009), Doms and Jensen (1998), Girma and Görg (2007) and Girma et al. (2001), among many others. These studies usually regard the productivity advancement associated with FDI as MNEs' technological advantage vis-à-vis domestic firms and leave out changes in foreign ownership within firms. Our empirical finding pushes forward the existing literature in this subject by showing that firms with higher foreign ownership (e.g. Greenfield FDI) tend to be more productive than those with low foreign ownership (e.g. joint ventures).

Second, the financial health of firms matters to TFP. Our estimates associated with financial variables, $LIQUIDITY_{it}$ and $LEVERAGE_{it}$, are positive and statistically significant at least at 10 percent across all estimations and specifications. Firms with financial constraints either in terms of low liquidity ($LIQUIDITY_{it}$) or limited access to external sources of fund ($LEVERAGE_{it}$) tend to be characterized by inferior productivity performance. Financial characteristics have effects on market selection mechanisms and investment decisions, thereby shaping growth prospects (Levine, 2005). Our empirical results also confirm the findings of past studies that liquidity helps ease the obstacles facing firms to grow faster and hence augment productivity performance (Beck et al., 2005; Demirguc-Kunt and Maksimovic, 1998), and that limited access to external credit imposes constraints on development, innovation and overall investment decisions (Becchetti and Trovato, 2002).

Third, scale efficiency appears to play a major role in improving the productivity performance of firms in Vietnam. The coefficients of $SIZE_{it}$ exhibit a positive sign and are strongly significant at 1 percent across all estimations and specifications. Therefore, our empirical exercise is consistent with the productivity analysis literature that underscores the role of changes in scale for productivity growth, such as Balk (2001). This result may also reflect the learning-by-doing effect put forward by Lucas (1988).

Fourth, firms with large high-tech capital accumulation and intensive human capital utilization tend to outperform others. The coefficients of COM_{it} appear to be positive and statistically significant at 1 percent across all estimations and specifications even though the GMM estimates of $HUMANK_{it}$ seem to be vulnerable to econometric specifications. As portrayed in Table 4, the GMM results show the positive, statistically significant coefficient only when XM_{it} is dropped. Our empirical results point to investment in high-tech equipment and human resources as a key driver of productivity performance among firms in Vietnam. In addition, our empirical framework sheds light on the literature on the linkage between capital formation and productivity growth, such as Siegel (1997) and Siegel and Griliches (1992), which puts emphasis on the role of high-tech capital such as computers and automated machines in enhancing industrial productivity. We further show that human capital is equally important.

Finally, we find only weak evidence that international trade exposure is correlated with the productivity of firms in Vietnam. The coefficients of the export/import dummy, XM_{it}, turn out to be statistically insignificant, with mixed signs across all estimations and specifications. Although measurement biases may account for the weak evidence of linkages between participation in international trade and productivity performance, our empirical findings are consistent with a number of cross-country studies that show that productivity improvements associated with international trade are small. These include Aw et al. (2000) for South Korea, Bernard and Jensen (1999) for the US, Clerides et al. (1998) for Colombia, Mexico and Morocco, and Greenaway and Kneller (2007) for the UK.

6. A Robustness Check

We undertake several robustness checks of our main findings to establish the robustness of our results using an alternative approach to TFP measurement. To inspect the robustness of our main empirical results, we perturb our empirical framework by employing the Bond–Blundell approach to TFP measurement (Blundell and Bond, 2000).

In contrast to production technology (1), we attempt to estimate the following modified Cobb–Douglas production function.

$$y_t = \beta_0 + \beta_l l_t + \beta_k k_t + \beta_m m_t + \gamma_t + \eta_i + (\nu_{it} + \varepsilon_{it}), \tag{5}$$

Where γ_t and η_i are time- and firm-specific fixed effects respectively, and the error terms ν_{it} and ε_{it} follow AR(1) and MA(0) respectively. As highlighted earlier, estimation biases arise from correlation between each of these errors and input choices. Blundell and Bond suggest input choices lagged at least two periods as instrumental variables (IVs), instead of intermediate materials as in the LP approach, in the first-differenced equation. An additional set of moments for identification pertains to suitably lagged first-differenced inputs as IVs for the equations in levels.

Table 6. Bond–Blundell Estimation of Production Technology

Dependent Variable: y_t	
y_{t-1}	.0179* (.0108)
l_t	.2984*** (.0474)
m_t	.1517*** (.0238)
k_t	.6753*** (.0424)
Constant	.6926*** (.2647)
No. Obs.	1521
Wald's Chi-squared	1906.01***
No. of IVs	18

Note: 1) The Blundell–Bond estimates are based on GMM.
2) The maximum lag for AR tests is two.
3) ***, * statistically significant at 1 and 10 percent, respectively.

Table 6 represents the Bond–Blundell GMM estimates of production technology (5) with the two-step estimator. We make use of the estimates to generate the Bond–Blundell TFP, denoted by TFP_{it}^{B-B}. Having obtained TFP_{it}^{B-B}, we re-estimate our econometric models where TFP_{it}^{L-P} in Equations (3) and (4) is replaced by TFP_{it}^{B-B}. Tables 6 and 7 reveal the estimates for TFP_{it}^{B-B}.

Table 7. OLS, FE, and RE Estimations for Bond–Blundell TFP

Dependent Variable: TFP_{it}^{B-B}			
Independent Variable	**OLS**	**FE**	**RE**
$\ln FDI_{it}$	$.1474^{***}$ (.0304)	$.4628^{***}$ (.1323)	$.1761^{***}$ (.0367)
$\ln LIQUIDITY_{it}$	$.3997^{***}$ (.0755)	.1926 (.1567)	$.3754^{***}$ (.0725)
$\ln LEVERAGE_{it}$	.0138 (.0239)	.0078 (.0230)	.0131 (.0226)
$\ln SIZE_{it}$	$.2459^{***}$ (.0503)	$.5558^{***}$ (.1362)	$.2784^{***}$ (.0562)
$\ln COM_{it}$	$.1302^{***}$ (.0372)	$.1646^{***}$ (.0366)	$.1439^{***}$ (.0338)
$\ln HUMANK_{it}$	$.0893^{**}$ (.0418)	.0512 (.0659)	$.0838^{**}$ (.0411)
XM_{it}	.0931 (.0758)	$-.0641$ (.0706)	.0443 (.0678)
Constant	-1.476^{***} (.5339)	-3.599^{***} (1.091)	-1.639^{***} (.5617)
No. of Obs.	702	702	702
R-squared	.2833	.2286	----
Wald's Chi-squared	----	----	169.53^{***}
Breusch-Pagan Test	----	----	11.86^{***}

Note: 1) Heteroskedasticity-robust standard errors in parentheses for OLS and RE.
2) RE estimates are based on GLS with the Swamy–Arora estimators.
3) The Breusch–Pagan test statistic is chi-squared distributed under the null hypothesis that there are no random effects.
4) ***, **, and * statistically significant at 1, 5, and 10 percent, respectively.

Table 7 shows the OLS, FE and RE estimates for the model with TFP_{it}^{B-B}. Our estimations with TFP_{it}^{B-B} seem to convey less significant results even though signs of the coefficients remain unchanged, and the Breusch–Pagan test again rejects the null of no random effects. The parameter estimates are qualitatively identical to those in our base-line estimations,[9] except for the fact that the coefficients of $LEVERAGE_{it}$ turn out to be statistically insignificant.

Table 8. GMM Estimations for Bond–Blundell TFP

Dependent Variable: TFP_{it}^{B-B}

Independent Variable	**Model 1**	**Model 2**	**Model 3**
TFP_{it-1}^{B-B}	.1126 (.1209)	.0428 (.1031)	.0403 (.0985)
$\ln FDI_{it}$	.6482** (.2556)	.5729*** (.2192)	.5626** (.2232)
$\ln LIQUIDITY_{it}$	.0921 (.2855)	.1327 (.2139)	.1906 (.2448)
$\ln LEVERAGE_{it}$	.0214 (.0373)	.0350 (.0260)	.0356 (.0256)
$\ln SIZE_{it}$	.8156*** (.2031)	.7185*** (.1874)	.7102*** (.1924)
$\ln COM_{it}$	.1466*** (.0475)	.1120** (.0503)	.1309*** (.0485)
$\ln HUMANK_{it}$	.0722 (.1272)	----	.1249 (.1156)
XM_{it}	−.0010 (.1671)	----	----
Constant	−5.961*** (1.527)	−5.387*** (1.401)	−5.142*** (1.547)
No. of Obs.	287	358	357
Wald's Chi-squared	154.99***	68.78***	98.43***
No. of IVs	13	14	15
Sargan test	5.02	10.44	10.39

Note: 1) The Bond–Blundell estimates are based on GMM with the two-step estimators.
2) The maximum lag for AR tests is two.
3) Standard errors in parentheses.
4) ***, **, and * statistically significant at 1, 5, and 10 percent, respectively.
5) The Sargan test is chi-squared distributed under the null hypothesis that over-identifying restrictions are valid.

Table 8 reports the GMM estimations that take into account potential endogeneity biases. Again, the Sargan test indicates that the null of valid over-identifying restrictions cannot be rejected across all specifications. Our econometric models with TFP_{it}^{B-B} are therefore well-specified, and employing the lagged structural variables as IVs is

[9] The FE estimate for $LIQUIDITY_{it}$ in Table 7 is statistically insignificant and hence in contrast to that in Table 4. However, the Breusch–Pagan test rejects the null hypothesis of no random effects in favor of the RE estimate, which remains positive and statistically significant. Therefore, our findings of a positive correlation between liquidity and productivity performance remain unaffected.

appropriate. While the estimate of XM_{it} remains statistically insignificant, the coefficients of FDI_{it}, $SIZE_{it}$ and COM_{it} are still positive and statistically significant at least at 5 percent, across different specifications. This implies that our findings concerned with the absence of productivity effects associated with international market openness and the positive contribution of foreign ownership, scale economy, and high-tech capital accumulation to productivity performance are robust with respect to TFP measurements. Nevertheless, our evidence that financial attributes and human capital utilization matter to productivity performance appears to be susceptible to the ways in which TFP is measured. As shown in this table, the coefficients of $LIQUIDITY_{it}$, $LEVERAGE_{it}$ and $HUMANK_{it}$, although exhibiting an unchanged sign, become statistically insignificant.

Our overall findings are satisfactorily robust with respect to the different approaches to TFP measurements, although financial characteristics and human capital utilization are sensitive to different specifications. Even though the Bond–Blundell TFP measurement is less satisfactory than the LP TFP from a theoretical point of view, the econometric exercise in this section serves as a sensitivity test of our main findings and yields clearer insights into the effects of our structural variables on TFP.

7. Conclusions

This paper empirically examines the determinants of productivity performance using micro-level panel data of firms in Vietnam from 2002 to 2008. Our empirical framework builds upon a well-established body of literature on the effects of foreign ownership and firm performance incorporating financial variables and other conventional determinants of firm productivity measured by the LP TFP. We attempt to control for several econometric issues and find the following interesting results.

First, and perhaps most importantly, the degree of foreign ownership is positively correlated with productivity performance. This implies that not just the presence of but also higher degrees of foreign ownership are associated with higher productivity performance in affiliate firms in the host country. Our result supports the recent industrial development policy in Vietnam that weighs in on raising the cap on foreign ownership.[10] Our empirical exercises reveal that such a policy potentially helps local firms increase their productivity performance and maintain their competitiveness in the international market. At the very least, these results indicate the value of a more careful assessment of its costs and benefits.

Our empirical framework identifies several characteristics of multinational activities that produce high productivity performance. A positive correlation between size and productivity performance points to the existence of scale efficiency whereby production factors employed in-house can advance their sophistication through an expansion of production scale. Investment in high-tech machinery (e.g. computers and automated machines) and utilization of human capital (e.g. education and training) serves as a key engine of productivity enhancement among firms in Vietnam.

Furthermore, financial constraints are also relevant to firms' productivity performance. We show that firms operating in an environment with more liquidity and more access to external credit demonstrate better productivity performance. The result of our study is consistent with the recent evidence that firms in well-developed financial markets tend to experience greater positive gains from multinational activities (Alfaro et al., 2006). Well-developed financial markets will support investment activities of firms to reorganize their production structure, to adopt new technologies, and to support the development of new industries that could create linkages (suppliers) with multinational companies.

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[10] In June 2009, the Vietnamese government announced an increase in the ceiling of foreign ownership ratio from 30 to 49 percent.

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Appendix

Table A1. Summary of Statistics

Variable	Obs.	Mean	S.D.	Min	Max
$\ln FDI$	5158	–.2833	.4515	–4.382	1.099
$\ln LIQUIDITY$	5138	–.5264	.7160	–6.598	.0533
$\ln LEVERAGE$	1845	–.6158	2.411	–10.55	6.743
$\ln SIZE$	4905	9.136	2.475	.6932	17.99
$\ln COM$	4642	–2.028	1.126	–5.622	2.481
$\ln HUMANK$	5078	–1.121	.7046	–4.727	0
XM	3401	.8944	.3073	0	1

Table A2. Correlation Matrix of Structural Variables

	FDI	*LIQUIDITY*	*LEVERAGE*	*SIZE*	*COM*	*HUMANK*	*XM*
FDI	1.000						
LIQUIDITY	–.0117	1.000					
LEVERAGE	–.0185	.0816	1.000				
SIZE	–.0318	.0965	.2064	1.000			
COM	.0586	.1319	–.0634	–.2767	1.000		
HUMANK	.0248	–.0895	–.0579	–.1830	.1102	1.000	
XM	.0415	–.0351	–.1375	–.1255	.0130	–.0655	1.000

Note: All variables are represented in logarithmic forms, except for *XM*.