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Firm performance in Vietnam: evidence from manufacturing small and medium enterprises

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Abstract

This paper examines the performance of domestic non-state manufacturing small and medium enterprises (SMEs) in Vietnam. Specifically, it evaluates firm level technical efficiency and identifies the determinants of technical efficiency of these SMEs. The paper uses an econometric approach based on a stochastic frontier production function to analyse 5,204 observations of SMEs from three surveys conducted in 2002, 2005 and 2007. The results from the estimations reveal that manufacturing SMEs in Vietnam have relatively high average technical efficiency ranging from 84.2 percent to 92.5 percent. The paper further examines the factors influencing efficiency. It finds that firm age, size, location, ownership, cooperation with a foreign partner, subcontracting, product innovation, competition, and government assistance are significantly related to technical efficiency, albeit with varying degrees and directions. Exporting does not appear to influence technical efficiency. The paper offers some evidence-based policy recommendations to improve the technical efficiency and competitiveness of manufacturing SMEs.

Keywords: *manufacturing small and medium enterprises, firm performance, technical efficiency, stochastic frontier production function, Vietnam.*

1. *Introduction*

Vietnam embarked on an economic reform program known as *Đổi Mới* in 1986. This officially heralded the move towards a market economy from a centrally-planned economy. As a result, Vietnam's economy transformed to become a multi-sector market economy which includes state, domestic private and foreign-invested sectors. Strong and sustained economic growth and rapid poverty reduction characterised the economic reform in Vietnam. Annual GDP growth averaged 6.8 percent in the 1986-2009 period (General Statistics Office, 2006; General Statistics Office, 2009; General Statistics Office, 2009). Vietnam emerged from the Asian financial crisis in the late 1990s and the recent global financial crisis in a relatively healthy state with much higher GDP growth than other countries in the region. Poverty reduction is another significant achievement Vietnam made under the reform. Rapid and sustained economic growth has improved the lives of many Vietnamese. Vietnam's poverty rate fell rapidly from 58.1 percent in 1993 to 12.3 percent in 2009 (World Bank, 2005).

With the official recognition of the private sector since *Đổi Mới,* the domestic non-state sector, which is largely made up of small and medium enterprises (SMEs), has experienced considerable growth. Following *Đổi Mới,* early regulations governing the private sector were adopted since the late 1980s and early 1990s which paved the way for the growth of the sector. The private domestic sector emerged and grew steadily throughout the 1990s. However, from the start of the new century, business registrations in Vietnam really made a jump after the introduction of an innovative and breakthrough Enterprise Law in 2000.

Although the growth in number of enterprise registrations has been strong since 2000, there is little evidence about the quality of that growth in terms of enterprise performance. This paper will evaluate the performance of Vietnamese non-state manufacturing SMEs by estimating their technical efficiency. The paper uses a parametric approach based on a stochastic frontier production function to analyse data collected from three surveys of manufacturing SMEs in 2002, 2005 and 2007. The paper is structured as follows. The next section presents an overview of the domestic non-state sector with a focus on manufacturing SMEs. Then the data, together with the methodology and econometric models for the estimation of technical efficiency and explanatory variables will be discussed. After that results from the analysis will be presented and discussed in the fourth section. The last section of the paper provides some concluding remarks and identifies several policy recommendations to improve the technical efficiency of manufacturing SMEs in Vietnam.

2. *Domestic Non-State Manufacturing Sector and SMEs in Vietnam*

Analysts have observed that private sector development and enterprise reform have played a crucial role in the reform of the Vietnamese economy (Harvie, 2004; Hakkala and Kokko, 2007). A dynamic non-state sector with an emphasis on SMEs in Vietnam will be a precondition for attaining the objectives of (1) restructuring and slimming state enterprises (2) job creation and income growth through expanding non-farm employment and income opportunities (3) attaining sustainable economic development (4) improving resource allocation efficiency and productivity growth (5) expanding exports (6) attracting FDI (7) achieving a more equal distribution of income (7) and assisting in rural and regional development (Harvie, 2007).

Vietnamese enterprises consist primarily of small and medium enterprises (SMEs). In Vietnam, an SME was first officially defined in 2001 as an enterprise with fewer than 300 workers or a registered capital of less than 10 billion VND (about US$630,000 at the time). Recently, a new definition for SMEs was introduced to replace the definition in 2001. The new SME definition, which became effective from 20 August 2009, provides a definition for each economic sector. It changes the capital clause from registered capital in the earlier definition to total capital of up to 100 billion VND (about US$ 5.6 million). It also separates SMEs into micro, small and medium enterprises with different limits for the number of employees and capital (Table 1).

Figure 1 shows the number of new enterprise registrations from 1992 to 2009. After the Company Law and Private Enterprise Law were passed in 1990 and 1991 respectively, registrations of domestic private enterprises increased steadily. Registration increased rapidly in the first few years from a low base in response to the policy changes. However, the annual registration number declined from the mid 1990s. By the end of 1999, a total of 45,000 enterprises had been established. This is a modest number given the size of the population and in comparison to other countries in the region. Between 1992-1999 the private sector grew 24 percent per annum (Steer, 2001:4). Although this growth rate was high, it could be deceptive as it grew from a small starting base.

The gradual transformation of the regulatory and legal framework for private enterprises, the fact that SOEs are politically favoured for generating employment, the import substituting nature of the development strategy and the weak capacity of private management and capital generation all had their influence on the growth of the private sector in the 1990s (Webster, 1999; Webster and Taussig, 1999). The newly emerged non-state SMEs faced several major obstacles in the 1990s including institutional weakness, capital shortage, limited access to markets, technical and management limitations, and unfavourable public attitudes (Le Cong Luyen Viet, 2001).

However, Figure 1 also shows that the growth in registration of new enterprises since 2000 has been strong. This comes as the result of the new Enterprise Law (EL) which became effective in 2000. This important law combined the earlier Company Law and Private Enterprise Law into one law. Thus, it provided the legal framework for all types of domestic private enterprises. The EL contains an important innovation with a principle often referred to as “to register first, then to check” by the business community (World

Bank, 2005). This represents a fundamental shift in the approach and tools with which the government manages enterprises. The EL has also revitalized entrepreneurship and strengthened the trust of investors and entrepreneurs in the reforms and policies initiated by the Government (Vo Tri Thanh and Nguyen Tu Anh, 2006).

Since the introduction of the EL the number of new registrations has increased rapidly. The rapid growth in registrations has been sustained since 2000 (Figure 1). According to statistics from the National Business Information Centre, more than 414,000 enterprises have been established from 2000 to 2009. New business registration during this period has increased by more than nine times the number of registrations for the 1991 - 1999 period.

By any measure SMEs account for a significant share of Vietnamese enterprises. Of the 155,771 formally registered enterprises in operation in 2007, SMEs accounted for 97.4 percent of the total enterprises according to the employee criterion or 84.7 percent according to the registered capital criterion in the definition in 2001 (Table 2).

The manufacturing sector is an important sector as it contributes the most in Vietnam's GDP. In 2008, the sector accounted for 21.10 percent of total GDP. Table 3 focuses on manufacturing SMEs and shows that they accounted for 91 percent of all manufacturing firms in operation in 2006. Their share increased gradually from 88 percent in 2000. This sector is notable for its ability to create stable jobs and produce for exports.

3. Methodology, Econometric Models and Data

Productivity and efficiency represents the economic aspect of firm performance. Growth in efficiency and productivity is the most important aspect of growth as it focuses on the quality of growth. For this reason theoretical and empirical works on firm performance focus on measuring enterprise productivity and efficiency (Storey, 1990).

Average labour productivity had been used as a measure of efficiency until Farrell (1957) introduced a method to measure efficiency in his seminal paper. Farrell's efficiency measure contains an efficient production frontier which is the output that a perfectly efficient firm could obtain from any given combination of inputs. The performance of a productive unit will be measured against that efficient frontier (Farrell, 1957:254).

Figure 2 explains Farrell's efficiency measure. With constant returns to scale the isoquant *YY'* is the efficient production frontier. The isoquant represents the minimum set of inputs per unit of output needed to produce a unit of output. Every package of inputs along the isoquant is considered as technically efficient while any point above it and to the right, such as point *P,* is defined as technically inefficient. The technical efficiency level is represented by *OR/OP* in Figure 2. Meanwhile allocative efficiency of the producer at point P is given as the ratio of *OS/OR*. In this case the isocost-line *CC'* reflects the objective of cost minimisation. Thus, *R'* is the technically and allocatively efficient point. The overall efficiency (which is also called economic efficiency) is equal to *OR/OP x OS/OR = OS/OP* (Murillo-Zamorano, 2004).

According to Kalirajan and Shand (1999:152) a measure of technical efficiency in the *i*th firm can be defined as:

$$TE = \frac{Y_i}{Y_i^*} \tag{1}$$

where:

Y_i: Actual output

Y^*_i: Maximum possible output

The above equation is the basic model used for measuring technical efficiency. The actual output is observable in this equation. However, maximum possible output is not observable and must be estimated. A ratio of one in the above equation would mean that the firm is technically efficient and operates on the production frontier.

A number of techniques have been developed to estimate this frontier. Several authors broadly classified them into two main groups: parametric and non-parametric (Kalirajan and Shand, 1999; Kumbhakar and Lovell, 2003; Murillo-Zamorano, 2004; Coelli et al., 2005). The parametric method uses an econometric technique by specifying a stochastic production function which assumes that the error term is composed of two elements. One is the typical statistical noise which represents randomness. The other represents technical efficiency which is commonly assumed in the literature to follow a one-sided distribution (Alvarez and Crespi, 2003; Murillo-Zamorano, 2004).

One the other hand, the non-parametric approach does not distinguish between technical efficiency and statistical noise. It is, therefore, considered as a non-statistical technique as the inefficiency scores and the envelopment surface are 'calculated' rather than estimated. The non-parametric approach is often associated with Data Envelopment Analysis (DEA) which is based on a mathematical programming model to estimate the optimal level of output conditional on the amount and mix of inputs (Murillo-Zamorano, 2004).

In the context of this study the stochastic frontier approach is most relevant. The first reason is the ability of the stochastic frontier approach to consider both factors beyond the control of the firm and firm-specific factors, and hence it is closer to reality. The second reason is the separation of the random variation of the frontier across firms, the effects of measurement error and other random shocks from the effect of inefficiency. The third reason is the ability of the model to analyse the determinants for inefficiency simultaneously with the estimation of technical efficiency which helps to derive policy implications.

The stochastic frontier production model was developed independently and simultaneously by Aigner, Lovell and Schmidt (ALS) (1977), Meeusen and Van den Broeck (MB) (1977), and Battese and Corra (1977). In this model there is a composed error term which captures the effects of exogenous shocks beyond the control of the analysed units in addition to incorporating technical inefficiency. Errors in measurement of outputs and observations are also taken into consideration in this model (Kumbhakar and Lovell, 2003; Murillo-Zamorano, 2004).

The generalised functional form in the Cobb-Douglas case of the stochastic production function can be specified as:

$$Y_i = x_i\beta + (V_i + U_i), \qquad i = 1, \ldots, N, \qquad (2)$$

where

Y_i is the production (or the logarithm of production) of the *i-th* firm;

x_i is a $k \times 1$ vector of (or transformation of) the input quantities of the *i-th* firm;

β is a vector of unknown parameters;

V_i are random variables which are assumed to be independently and identically distributed (*iid*) as $N(0, \sigma_v^2)$,[1]

U_i which are non-negative random variables that are assumed to account for technical inefficiency in production and are often assumed to be *iid*. $|N(0, \sigma_u^2)|$. It is assumed to be half-normal, exponential and truncated from below at zero.[2]

[1] This means that the errors are independently and identically distributed normal random variables with zero means and variances σ^2.

[2] U_i reflects one-sided deviations of actual output from the maximum level of production due to technical inefficiency. If a firm is fully technically efficient, $U_i=0$, otherwise it will be greater than zero. Thus, it is also called a one-sided error component.

Apart from the input variables, exogenous variables characterizing the environment in which a firm operates and firm-specific characteristics also influence their performance. In an attempt to identify determinants of inefficiency, many empirical studies often involve the estimation of stochastic frontiers, prediction of firm level efficiencies and identification of reasons for the differences in predicted efficiencies between firms in an industry (Kalirajan, 1981; Pitt and Lee, 1981; Hill and Kalirajan, 1993; Burki, 1996; Brada et al., 1997; Chow and Fung, 1997; Burki and Terrell, 1998; Jones et al., 1998; Zheng et al., 1998; Tong, 1999; Lundvall and Battese, 2000; Piesse and Thirtle, 2000; Aw et al., 2001; Aw, 2002; Alvarez and Crespi, 2003; Batra and Tan, 2003; Söderbom and Teal, 2004; Chapelle and Plane, 2005; Fernandes, 2006; Margono and Sharma, 2006; Roudaut, 2006; Yang, 2006; Yang and Chen, 2009).

A single-stage production model was proposed by several authors in 1991 (Kumbhakar et al., 1991; Reifschneider and Stevenson, 1991). In this model the parameters for the inefficiency effects model are jointly estimated with the stochastic frontier model. Battese and Coelli (1995) proposed a model that captures inefficiency effects for panel data based on earlier work by Kumbhakar et al. (1991). For cross-sectional data their model specification is expressed as:

$$Y_i = x_i\beta + (V_i - U_i) \tag{3}$$

or, in logarithmic form:

$$ln(Y_i) = \beta lnx_i + U_i - V_i \tag{4}$$

where:

$ln(Y_i)$ is the logarithm of the scalar output for the *i*-th firm,

β is the vector of unknown parameters to be estimated,

x_i is the vector of value of known functions of input and other explanatory variables associated with the i-th firm,

V_i are random errors which are assumed to be *iid* $N(0, \sigma_v^2)$ and independent of $v_{i,}$

U_i is non-negative random variables which are assumed to account for technical inefficiency in production and are assumed to be independently distributed as truncations at zero of the $N(\mu_{i,} \sigma_v^2)$ distribution;

With the assumption of a linear functional relationship, the mean distribution of u_i is a function of the explanatory variables and can be specified as:

$$\mu_i = z_i \delta \tag{5}$$

where

z_i is a $p \times 1$ vector of variables which may influence the efficiency of a firm;

δ is an $1 \times p$ vector of unknown parameters to be estimated.

Individual firm technical efficiencies from estimated stochastic frontiers are defined as:

$$TE_i = \frac{Exp(\ln Y_i / u_i, x_i)}{Exp(\ln Y_i / u_i = 0, x_i)} = e^{-u_i} \tag{6}$$

where

Y_i is the production of the i-th firm,

TE_i will take a value between zero and one in the stochastic production frontier. It measures the output of the *i-th* firm relative to the output that could be produced by a fully efficient firm using the same vector.

For both the stochastic frontier model and the inefficiency effects model, the maximum likelihood method can be used to estimate the coefficients of the two functions simultaneously. This will give consistent estimates of the parameters of the production frontier and the inefficiency effects model. The likelihood function is expressed in terms of the variance parameters of the frontier function:

$$\sigma^2 = \sigma_v^2 + \sigma_u^2 \text{ and } \gamma = \frac{\sigma_u^2}{\sigma^2} \tag{7}$$

where

σ_v^2 is variance of noise and

σ_u^2 is variance of inefficiency effects.

If the value of σ^2 is equal to zero, then u_i is also zero which means the firms are fully efficient. γ has a value between one to zero. If the value of γ is one, the deviations from the frontier are attributed to random error. If it has the value of one, the deviations are due to technical inefficiency.

A software package which is most commonly used in the estimation of stochastic production frontiers in the literature is FRONTIER 4.1 developed by Coelli (1996). The software program carries out three steps of estimation. The first step is Ordinary Least Square (OLS) estimates of the production function. It provides unbiased estimators for all the β except the intercept. The OLS estimates are then used as starting values to estimate the final maximum likelihood model. The second step carries out a two-phase grid search of the value of the likelihood function which is estimated for different values of γ with the β parameters derived in the OLS. The third and final step calculates the final maximum likelihood estimates (MLE) with an iterative Davidon-Fletcher-Powell algorithm. This step uses the values of the βs from the OLS and the value of γ from the intermediate step as starting values (Coelli, 1996).

There are several choices of functional form for the production frontier. The most common functional forms for the stochastic frontier production function are the Cobb-Douglas production function and the Transcendental-logarithm (Translog) production function. A hypothesis test is conducted to choose the functional form for the stochastic frontier production function:

$$H^1_0: \ \beta_4 = \beta_5 = \beta_6 = \beta_7 = \beta_8 = b_9 = 0 \tag{8}$$

The results of this test as presented in Table 6 reveals that the Translog specification is most appropriate for this study. The Translog stochastic production function can be expressed as follows:

$$\begin{aligned} \ln Y_i &= \beta_0 + \beta_1 \ln K_i + \beta_2 \ln L_i + \beta_3 \ln ME_i \\ &+ \beta_4 (\ln K_i)^2 + \beta_5 (\ln L_i)^2 + \beta_6 (\ln ME_i)^2 \\ &+ \beta_7 \ln K_i \ln L_i + \beta_8 \ln K_i \ln ME_i + \beta_9 \ln L_i \ln ME_i + V_i + U_i \end{aligned} \tag{9}$$

where:

Y_i = Output of firm i

K_i = Value of Capital of firm i

L_i = Labour input of firm i

ME_i = Value of Materials and Energy for firm i

V_i = Random error in which $v_i \sim N(0, \sigma^2_v)$

U_i = Technical Inefficiency in which $u_i \sim N(\mu_i, \sigma^2_u)$

The second line of Equation (9) includes the squared terms of the input factors, while the third line expresses the interaction terms among the inputs.

We also model the factors influencing technical inefficiency including the firm-specific and external environment variables as follows:

$$
\begin{aligned}
\mu_i = {} & \delta_0 + \delta_1 age_i + \delta_2 size_i + \delta_3 comp_i \\
& + \delta_4 urban_i + \delta_5 hh_i + \delta_6 coop \\
& + \delta_7 ltd_i + \delta_8 direx_i + \delta_9 foreign_i \\
& + \delta_{10} sub_i + \delta_{11} credit1_i + \delta_{12} land_i \\
& + \delta_{13} credit2_i + \delta_{14} new_i + \delta_{15} improve_i + \omega_i
\end{aligned} \tag{10}
$$

The variables in Equations (9) and (10) and their description are summarised in Table 4.

Two more hypothesis tests need to be conducted for the technical inefficiency effects model as presented in Equation (10). The first hypothesis test is about the absence of technical inefficiency effects. Thus, there is no inefficiency function and no deviation from technical inefficiency. This is equivalent to imposing the restriction specified in the null hypothesis as:

$$H^2_0:\ \gamma = \delta_0=\delta_1=\delta_2=\delta_3= \ldots =\delta_{15} = 0 \tag{11}$$

The second hypothesis tests whether exogenous variables included in Equation (10) have a significant influence upon the degree of technical inefficiency. A test of the null hypothesis for this is:

$$H^3_0:\ \delta_1=\delta_2=\delta_3= \ldots =\delta_{15} = 0 \tag{12}$$

This study uses recent firm-level data from three comprehensive and large-scale surveys of Vietnamese small and medium enterprises in 2002, 2005 and 2007. The surveys were carried out by the Vietnamese Institute for Labour Studies and Social Affairs (ILSSA) in Hanoi with the assistance of international counterparts from Sweden and Denmark. The first round of the survey was supported by the Swedish International Development Authority (SIDA) and the remaining ones were assisted by the Danish International Development Agency (DANIDA).

The surveys provide a valuable set of data about private sector SMEs in Vietnam. The surveys were implemented after the important Enterprise Law of 2000 was introduced.

The surveys contain the most comprehensive data about SMEs in Vietnam. Although other surveys have a larger coverage, they do not focus on SMEs[3]. In addition, the focus on domestic non-state and manufacturing SMEs in the survey make it the only dataset available about this most important sector for SMEs in Vietnam. The surveys also had coverage in different regions of Vietnam, including urban and rural areas. The sample was stratified to ensure that different types of ownership were represented based on the overall distribution of ownership in the population of domestic non-state enterprises. In total, 6,619 enterprises from different sub-sectors in manufacturing industries were interviewed in the three survey rounds.

From the raw data obtained in the surveys described above, data for analysis is constructed for the small and medium sized domestic non-state manufacturing sector. Enterprises reporting in the survey that they were not in the manufacturing sector are removed from the dataset. Similarly, enterprises with missing values are also removed. After this process has been carried out, the eligible observations for analysis have been reduced to 5,204 with 926 firms in 2002, 2,228 firms in 2005 and 2,050 firms in 2007. A summary of statistics for key variables for each survey year are given in Table 5.

4. Results and Discussions

This section presents results from our analysis using the FRONTIER 4.1 program developed by Coelli (1996). Several hypothesis tests were conducted to identify the appropriate functional form for the stochastic production function in Equations (8) and (9), to test for the presence of technical inefficiency and to test whether the inefficiency effects are a linear function of the explanatory variables according to the hypotheses in Equations (12) and (13).

[3] They include the Industrial Censuses and Business Censuses carried out by the General Statistics Office and Business Environment and Enterprise Productivity Surveys conducted by the World Bank.

Table 6 reports the results of the three hypothesis tests. The first hypothesis test for functional form indicates that the null hypothesis H^1_0 is rejected at the 1 percent level. This means that the Cobb-Douglas production function is not an adequate specification and that the Translog production function should be used. The second hypothesis test confirms that technical inefficiency is present as the null hypothesis (H^2_0 assuming that there is no technical inefficiency) is rejected at the 1 percent significance level. The third hypothesis test indicates that firm-specific and external environment factors jointly have an influence on technical inefficiency as the null hypothesis (H^3_0 that the explanatory variables do not have any influence on technical inefficiency) is rejected at the 1 percent significance level. This means that the joint effect of the explanatory variables in the technical inefficiency effects model is significant, although the individual effect of some variables could be statistically insignificant.

Table 7 provides a summary of the results from the estimation of the frontier production function with cross-sectional data from three surveys in 2002, 2005 and 2007, under the Translog functional form. The MLE also provides estimates of the variance parameters sigma-squared (σ^2) and gamma (γ). The first variance parameter, σ^2, determines whether there is technical inefficiency or not. If σ^2 is equal to zero, all firms are fully efficient. If σ^2 is larger than zero, then all firms are not fully efficient. Table 7 shows that the value of σ^2 ranges from 0.257 in 2005 to 1.35 in 2002, indicating that all firms in the sample are not fully efficient. In addition, the estimated variance σ^2 for the three periods are statistically significant at 1 percent, indicating goodness of fit and correctness of the specified distribution assumptions of the composite error term. The second variance parameter, γ, determines whether all deviations from the frontier are due to random error or technical inefficiency. If γ is equal to zero then all deviations from the frontier are caused by random error. If γ is equal to one, then all deviations from the frontier are caused by technical inefficiency. Gamma (γ) is estimated at 0.977, 0.934 and 0.943 for 2002, 2005 and 2007 respectively, and is statistically significant at 1 percent indicating that over 90 percent of the total variation from the frontier is due to technical inefficiency.

The mean technical efficiency for manufacturing SMEs are estimated at 84.3 percent, 92.5 percent, and 92.3 percent in 2002, 2005 and 2007 respectively. These results indicate that manufacturing SMEs in Vietnam can increase the current level of output by 15.7 percent in 2002, by about 7.5 percent in 2005, and by 7.7 percent in 2007 with the same level of inputs. Compared to the mean technical efficiency at around 60 percent to 70 percent of the best practice frontier in developing countries, as reported by Tybout (2000), Vietnamese manufacturing SMEs are quite efficient. Nevertheless, as the technical efficiency of Vietnamese SMEs is estimated with regards to their best practice frontier, it is not possible to conclude that Vietnamese manufacturing SMEs are more efficient than their counterparts in other developing countries.

Estimation of the technical inefficiency effects model is carried out simultaneously with the stochastic production frontier in FRONTIER 4.1. Table 8 provides a summary of the technical inefficiency effects. The discussion that follows is focussed on the sources of inefficiency.

Both firm age and firm size have a significant relationship with technical inefficiency in 2002 and 2007, but for 2005 firm age is found to be insignificant. As these two explanatory variables have a positive sign in the technical inefficiency effects model, they have a negative relationship with technical efficiency. Thus, there is no evidence of learning-by-doing for Vietnamese manufacturing SMEs. There could be some explanation for the results found here. Younger firms can be more efficient due to their new technology and equipment. Young firms can also enter the market with innovative ideas and hence are more efficient. Firm size is found to have a negative relationship with technical efficiency. This is surprising as large firms can benefit from economies of scale and their ability to access information and technology. In addition, there is the virtuous cycle built-in where more efficient firms will survive and expand. Yet, small firms could benefit from flexibility which allows them to quickly diversify and adjust their activities to become efficient. Hence, evidence from Vietnamese manufacturing SMEs supports the “small is beautiful” view, and the need for policy to encourage the development of SMEs.

Competition is found to have no significant impact upon technical efficiency in both the 2002 and 2005 surveys, although it is significant and has a negative relationship to the technical inefficiency of manufacturing SMEs in the 2007 survey. This is supported in the literature as competition is generally believed to have a positive impact on efficiency, as it induces a disciplined performance and exit for loss-making firms. A study by Ito (2006) found that market competition is a significant factor in promoting efficiency in rural firms in China.

Results summarised in Table 8 indicate that manufacturing SMEs in urban centres had lower technical efficiency in 2005 compared to their counterparts in rural areas. The most notable issue for urban enterprises is higher costs for land and labour and space constraints for expansion, which have the potential to negatively affect their efficiency performance. However, the location of firms was found to be insignificant for both the 2002 and 2007 surveys.

In term of ownership structure and efficiency, household enterprises and collectively-owned firms are found to be more efficient than other types of ownership among the non-state domestic sector. However, this is only the case in 2007 and in 2005 for collectively-owned enterprises. There is no difference in efficiency among different types of enterprises in the 2002 survey. This suggests that the owner-manager nature of household business could ensure that they responsibly carry out business activities and have different cost-cutting measures including the use of family labour resulting in higher efficiency. At the same time, household enterprises benefit directly from efficiency gains. For the case of collectively owned firms it is not clear why they are more efficient than firms with other types of ownership. The surprising result is that the more modern types of enterprises, including limited liability companies and joint-stock companies, despite having a better structure of corporate governance, have lower technical efficiency.

A portion of Vietnamese manufacturing firms have sub-contracting and co-operation arrangements with foreign partners. These two explanatory variables are examined in the technical inefficiency effects model. When they are statistically significant, except 2002 for co-operation and 2005 for sub-contracting, they are found to have a positive relationship with technical inefficiency, as shown in Table 8. By entering into a sub-contracting or co-operation arrangement, SMEs have to follow the terms and conditions of the arrangement and it will limit flexibility and innovation and hence their efficiency performance. There is no evidence of technology transfer from the sub-contracting and co-operation arrangements that benefits the efficiency performance of Vietnamese manufacturing SMEs.

Results from the analysis indicate that direct exporting does not exert a significant impact on the technical efficiency of Vietnamese manufacturing SMEs. Thus, there is no evidence for both self-selection of more efficient firms into exporting and learning-from-exporting hypotheses. The insignificant relationship between exporting and technical efficiency has also been found in previous studies (Brada et. al., 1997; Jones et. al., 1998; Commander and Svejnar, 2007).

Government assistance to firms for land and premises when they start their business and credit during their operations are found to have a significant negative relationship with the technical efficiency of Vietnamese manufacturing SMEs. This is consistent for all the three surveys with the exception of government credit in the 2005 survey. This finding casts doubt on the effectiveness of government support in providing easy access to land and credit to SMEs. Businesses can take advantage of government support to secure land and credit and use them for other purposes, but not for productive activities. Only government credit for businesses at the time of establishment is found to have a positive impact on efficiency. However, this is the case for the 2002 survey only, and it is only statistically significant at the 10 percent level.

Results also show that manufacturing SMEs with major product improvements tend to have higher technical efficiency than those without product improvement. This is evidenced by a negative and significant relationship between product improvement and technical inefficiency for all three surveys as summarised in Table 8. The same is true for product innovation through the introduction of new products for manufacturing SMEs in the 2002 survey, which shows a positive relationship between new product innovation and technical efficiency. Innovation is found to benefit efficiency, productivity and growth in small firms in some studies (Heunks, 1998; Hall et al., 2009). Yet, the relationship between new product innovation and technical efficiency is negative in 2005 and is insignificant in the 2007 survey. There are two possible explanations for this. First, there could be a lagged effect as it may take time before the innovation results in gains in efficiency. The costs involved in innovation could make firms appear less efficient at the beginning. Second, introducing new products could suggest that the firm is already experiencing difficulties and has to make some changes to improve its situation.

5. Conclusion and Policy Implications

This paper addressed the lack of research about the performance of Vietnamese SMEs, as most studies have only focussed on the growth in number of enterprise registrations. In this paper we focussed on examining the technical efficiency performance of domestic non-state manufacturing SMEs in Vietnam, using comprehensive data from large surveys of domestic non-state manufacturing SMEs in 2002, 2005 and 2007. This study is the first to use this comprehensive dataset to analyse the technical efficiency performance of Vietnamese SMEs. This research also revealed the impact of different firm characteristics and business environments on the technical efficiency performance of Vietnam manufacturing firms in the non-state sector. The research also aimed at providing empirically founded policy recommendations to enhance efficiency and competitiveness of private sector SMEs in Vietnam's rapidly developing market economy. The findings from this study are useful for both policy-makers and entrepreneurs to promote the extensive and intensive growth of Vietnamese SMEs. At the same time the study may have policy implications for other transitional economies as well as developing countries in the promotion of SMEs.

In this research we used a stochastic frontier production function to estimate their efficiency level and identify sources of efficiency for this important group of SMEs. The results from this analysis show that domestic non-state manufacturing SMEs in Vietnam have mean technical efficiencies of 84.25 percent, 92.55 percent, and 92.34 percent of the best practice frontier in 2002, 2005 and 2007, respectively. Our results indicate that these firms increased their current level of output by almost 15.7 percent in 2002, by about 7.5 percent in 2005 and by 7.7 percent in 2007 with the same level of inputs. Vietnamese non-state manufacturing SMEs have higher mean technical efficiency than manufacturing enterprises in developing countries.

This paper also identified explanatory factors for the inefficiency of Vietnamese SME manufacturing enterprises. These are useful for policy recommendations to improve the technical efficiency and competitiveness of domestic non-state SMEs in Vietnam. Specifically, older and larger manufacturing SMEs are likely to be technically inefficient. This indicates the importance of the Enterprise Law for Vietnam, with its aim of encouraging the establishment of new and technically more efficient private SMEs. Expanded marketisation and competition in domestic markets also appears to have had a desired impact on efficiency. Although not important in the 2002 and 2005 surveys, competition in the 2007 survey exerted a positive impact on SME manufacturing efficiency and this appeared to be the case irrespective of ownership form. The implementation of an effective and transparent competition policy that establishes a level playing field for all ownership types, therefore, remains a high priority for the country. Manufacturing SME weaknesses remain in terms of their cooperating with foreign partners and their participation in subcontracting. Too many SMEs are involved in simple assembly, low skill, low value adding activities that do not improve their technical efficiency. They need to upgrade their skills and technology so that their future growth, employment generation, competitiveness and efficiency will be improved. Government policies, in general, appear to be ineffective in increasing SME efficiency, particularly those focusing upon the provision of credit and access to land. The provision of finance should be based on solid commercial principles, otherwise it is unlikely to be effective and not produce substantive and sustainable efficiency outcomes. Our results suggest a re-appraisal of government financial assistance policies, including that of start-up assistance, with the aim of identifying how these could be more effectively utilised. Access to land is a major issue for many SMEs, and it is clear that current policies in this regard are adversely impacting upon SME efficiency. Finally, innovation, particularly in the form of improving existing products, is a vital ingredient in improving manufacturing SME technical efficiency. Innovation can add value to SME activities and enhance the benefits from collaboration with foreign partners and subcontracting, and can be improved through more effective targeting of government financial assistance. Consequently, many of the factors impacting SME efficiency, as identified previously, are inter-related, requiring a holistic policy response by government.

Table 1

New Definition for Small and Medium Enterprises in Vietnam

	Micro Enterprise	Small Enterprises		Medium Enterprises	
	Average No. of Employees	Total capital	Average No. of Employees	Total capital	Average No. of Employees
Agriculture, Forestry and Fishery	<10	<20 bil. VND	<200	<200 bil. VND	<300
Industry and Construction	<10	<20 bil. VND	<200	<200 bil. VND	<300
Services	<10	<10 bil. VND	<50	<50 bil. VND	<100

Source: Government's Decree No. 56/2009/ND-CP

Table 2

Number and Share of Operating SMEs by Size of Capital and Employees

	2000	2001	2002	2003	2004	2005	2006	2007
Total Enterprises in Operation	**42,297**	**51,680**	**62,908**	**72,012**	**91,756**	**112,950**	**131,318**	**155,771**
Number of SMEs by employees	39,897	49,062	59,831	68,687	88,222	109,338	127,593	151,780
Share of SMEs by employees (percent)	94.3	94.9	95.1	95.4	96.1	96.8	97.2	97.4
Number of SMEs by capital	36306	44670	54217	61977	79420	98232	114341	131888
Share of SMEs by capital (percent)	85.8	86.4	86.2	86.1	86.6	87.0	87.1	84.7

Source: Author's calculations based on Enterprises Census 2000-2008 (General Statistic Office, 2008)
Note: SME in this table is defined as an enterprise with up to 299 employees or registered capital up to VND10 billion, which correspond with the definition applicable before 2001.

Table 3
Manufacturing SMEs in Operation (2000-2006)

	2000	2001	2002	2003	2004	2005	2006
Manufacturing SMEs' share in total manufacturing firms	**88%**	**89%**	**89%**	**89%**	**90%**	**91%**	**91%**
Manufacturing SME	**9150**	**10982**	**13143**	**15003**	**18434**	**21840**	**24553**
Producing food and beverage	3252	3338	3663	3791	4156	4735	5089
Manufacture of tobacco products	13	16	12	14	14	14	14
Textile	314	391	512	585	713	901	1093
Manufacture of wearing apparel dressing and dyeing of fur	372	531	680	820	1127	1303	1483
Tanning, dressing of leather and manufacture of luggage handbags	103	148	181	199	292	364	362
Wood processing, manufacture of product made from bamboo	695	834	1012	1116	1400	1642	1973
Manufacture of pulp paper and paperboard	365	461	527	645	779	949	1063
Publishing, printing and reproduction of recorded media	256	396	551	735	1052	1269	1713
Manufacture of coke, refined petroleum and nuclear fuel	11	12	13	10	17	15	30
Manufacture of chemicals and chemical products	352	463	570	694	830	999	1158
Manufacture of rubber and plastic products	426	574	756	846	1087	1378	1564
Manufacture of other non-metallic mineral products	983	1088	1143	1197	1436	1594	1690
Manufacture of metal	106	156	209	250	304	389	448
Manufacture of metal products	586	830	1190	1516	2060	2536	2979
Manufacture of machine and other equipment	211	288	363	453	553	653	717
Manufacture of office accounting and computing machinery	2	5	10	14	23	22	24
Manufacture of engines and other electrical equipment	140	168	211	253	339	375	410
Manufacture of radio, television and communicative equipment	72	84	99	118	160	183	191
Manufacture of medical instrument, accurate instruments, optical instrument and clock	38	40	53	53	68	87	110
Manufacture of motor vehicles and trailers	163	198	244	231	276	337	218
Manufacture of other transport	223	279	312	354	399	475	504
Manufacture of furniture and other products	462	669	817	1082	1312	1583	1652
Recycling	5	13	15	27	37	37	68

Source: Authors' calculation based on Enterprises Census 2000-2007, GSO.
Note: SMEs cut-off point is enterprises with less than 300 employees

Table 4

Variables and their Description

Variables	Description
Y (lnY)	The output of the firm, proxied by the sales revenue of the firm (the log form of the output)
K (lnK)	The capital input of the firm, proxied by productive capital (the log form of the capital)
L (lnL)	The labour input of the firm, proxied by the number wage bill of the firm (the log form of the labour input.)
ME (lnME)	The materials and energy input of the firm, proxied by the costs of materials and energy (the log form of the material and energy input)
Age	Number of years since establishment up to the survey year
Size	Number of wage worker
Comp	Dummy variable indicating if the firm faces competition when
Urban	Dummy variable indicating if the firm is in urban centre when
Hh	Dummy variable indicating if the firm is a household enterprises
Coop	Dummy variable indicating if the firm is a cooperative, collective, or partnership
Ltd	Dummy variable indicating if the firm is a limited liability company, sole proprietorship or joint-stock company
Direx	Dummy variable indicating if the firm is a direct exporter
Foreign	Dummy variable indicating if the firm has long term cooperation with foreign partner
Sub	Dummy variable indicating if the firm is in subcontracting arrangement
credit1	Dummy variable indicating if the firm has received government assistance in the form of credit at start up
Land	Dummy variable indicating if the firm has received government assistance in the form of land and premise at start-up
credit2	Dummy variable indicating if the firm has received government assistance in the form of credit during operation
New	Dummy variable indicating if the firm introduced a new product in the previous two years
Improve	Dummy variable indicating if the firm introduced a major improvement to existing products in the previous two years

Table 5

Summary Statistics for Key Variables (*)

Variable	Mean	Median	St. Dev.
Output (Sale Revenue, in thousand *dong*(#))			
2002	1,763,303	254,670	8,350,001
2005	3,629,380	480,650	26,821,429
2007	3,531,711	685,500	1,7807,571
Capital (Productive Assets, in thousand *dong*)			
2002	2,202,053	524,000	6,542,259
2005	1,163,823	140,000	8,393,135
2007	1,536,217	216,500	9,310,467
Labour cost (Wage bill, in thousand *dong*)			
2002	146,229	42,200	461,174
2005	272,597	66,000	1,177,103
2007	312,609	80,000	1,062,771
Materials and Energy cost (Wage bill, in thousand *dong*)			
2002	1,459,279	152,800	7,812,698
2005	2,837,305	322,736	2,3498,263
2007	2,711,202	441,486	1,5183,928
Firm Size (Number of Wage workers)			
2002	15	6	41
2005	22	7	65
2007	18	6	32
Firm Age (Year)			
2002	9	8	8
2005	8	7	6
2007	11	9	9

Source: Authors' calculation
Note: (*) All numbers are rounded
(#) *dong* is the currency of Vietnam

Table 6

Generalised Log-Likelihood Tests of Hypotheses

	LR Statistics	$\chi^2_{0.99}$ Statistics	Decision
2002			
$\beta_4=\beta_5=\beta_6=\beta_7=\beta_8=\beta_9=0$	141.26	16.81	Reject H^1_0
$\gamma = \delta_0=\delta_1=\delta_2=\delta_3= \ldots =\delta_{15} = 0$	589.18	32.77	Reject H^2_0
$\delta_1=\delta_2=\delta_3=\delta_4= \delta_5=\delta_6\ldots=\delta_{15} = 0$	470.42	32.00	Reject H^3_0
2005			
$\beta_4=\beta_5=\beta_6=\beta_7=\beta_8=\beta_9=0$	2141.06	16.81	Reject H^1_0
$\gamma = \delta_0=\delta_1=\delta_2=\delta_3= \ldots =\delta_{15} = 0$	590.11	32.77	Reject H^2_0
$\delta_1=\delta_2=\delta_3=\delta_4= \delta_5=\delta_6\ldots=\delta_{15} = 0$	502.57	32.00	Reject H^3_0
2007			
$\beta_4=\beta_5=\beta_6=\beta_7=\beta_8=\beta_9=0$	940.95	16.81	Reject H^1_0
$\gamma = \delta_0=\delta_1=\delta_2=\delta_3= \ldots =\delta_{15} = 0$	933.38	32.77	Reject H^2_0
$\delta_1=\delta_2=\delta_3=\delta_4= \delta_5=\delta_6\ldots=\delta_{15} = 0$	742.92	32.00	Reject H^3_0

Source: Authors' calculation

Note: (a) The test statistics have a χ^2 distribution with degrees of freedom equal to the difference between the parameters involved in the null and alternative hypothesis

(b) As γ takes values between 0 and 1, in H^2_0: $\gamma = \delta_0=\delta_1=\delta_2=\delta_3= \ldots =\delta_{15} = 0$ the statistic is distributed according to a mixed χ^2 whose critical value is obtained from Kodde and Palm (1986).

Table 7

Estimated Frontier Production Function

		2002 **926 firms**		***2005*** **2228 firms**		***2007*** **2050 firms**	
		Coeff.	***S.E.***	***Coeff.***	***S.E.***	***Coeff.***	***S.E.***
Constant	β_0	3.0133***	0.3873	2.6659***	0.1687	2.6590***	0.2037
K (Capital)	β_1	-0.0021	0.0537	-0.0279	0.0224	0.1226***	0.0312
L (Labour)	β_2	0.3645***	0.0818	0.3908***	0.0282	0.3864***	0.0408
ME (Material & Energy)	β_3	0.3596***	0.0669	0.4039***	0.0290	0.2755***	0.0363
K^2	β_4	0.0041	0.0033	0.0017	0.0014	0.0060***	0.0023
L^2	β_5	0.0589***	0.0063	0.0665***	0.0018	0.0589***	0.0034
ME^2	β_6	0.0815***	0.0053	0.0755***	0.0021	0.0837***	0.0026
*K*L*	β_7	0.0177**	0.0082	0.0093***	0.0030	0.0097*	0.0050
*K*ME*	β_8	-0.0218***	0.0065	-0.0071***	0.0028	-0.0267***	0.0043
*L*ME*	β_9	-0.1307***	0.0095	-0.1377***	0.0027	-0.1247***	0.0047
Sigma-squared	σ^2	1.3477***	0.0770	0.2567***	0.0163	0.3739***	0.0105
Gamma	γ	0.9773***	0.0020	0.9341***	0.0060	0.9438***	0.0036
Log likelihood		-125.73		879.89		589.67	
Mean TE		0.8425		0.9255		0.9234	

Source: Authors' calculation

Note: *, **, *** denote statistical significance at the 0.10, 0.05 and 0.01 level respectively

Table 8

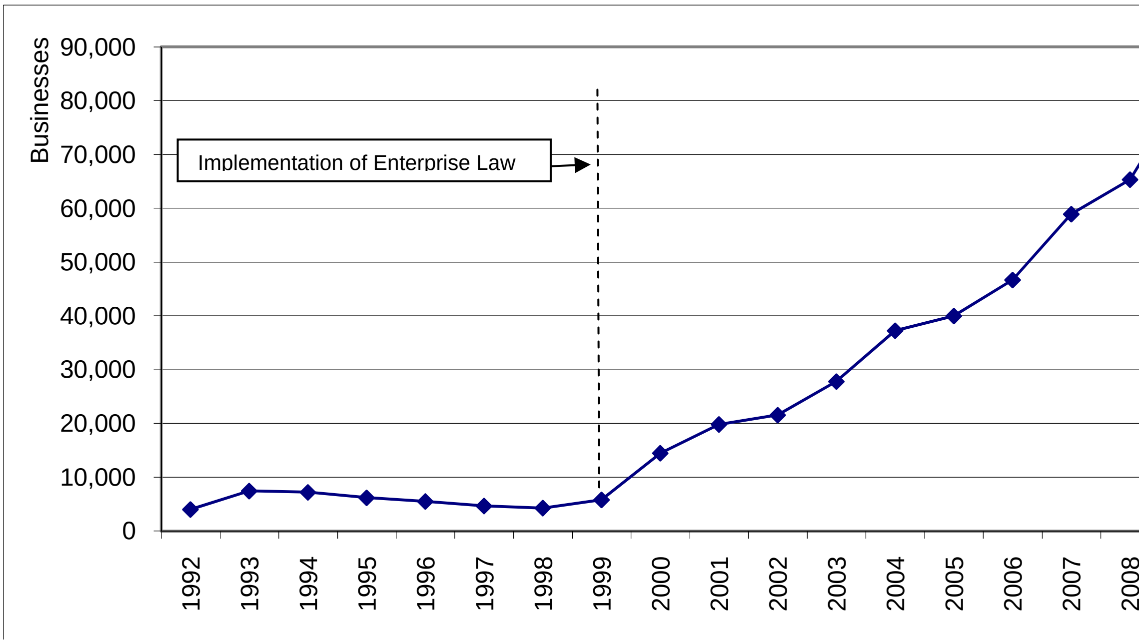
Summary of Technical Inefficiency Effects

	2002	2005	2007
Age	+***		+***
Size	+*	+***	+*
Competition			-*
Urban		+***	
Household Enterprise			-**
Cooperative/Collective,/Partnership		-***	-**
Ltd., Joint-stock Enterprise	+***	-**	
Direct Export			
Co-operation w/ Foreign Partner		+***	+***
Sub-contract	+***		+***
Govt assist-Credit at Start	-*		
Govt assist-Land at Start	+***	+**	+***
Govt assist-Credit in Operation	+*		+***
New Product	-***	+***	
Product Improvement	-***	-***	-***

Source: Authors' calculation
Note: *, **, *** denote statistical significance at the 0.10, 0.05 and 0.01 level respectively.
Correlation between explanatory variables and TE is contrary to the signs in the table.

Figure 1

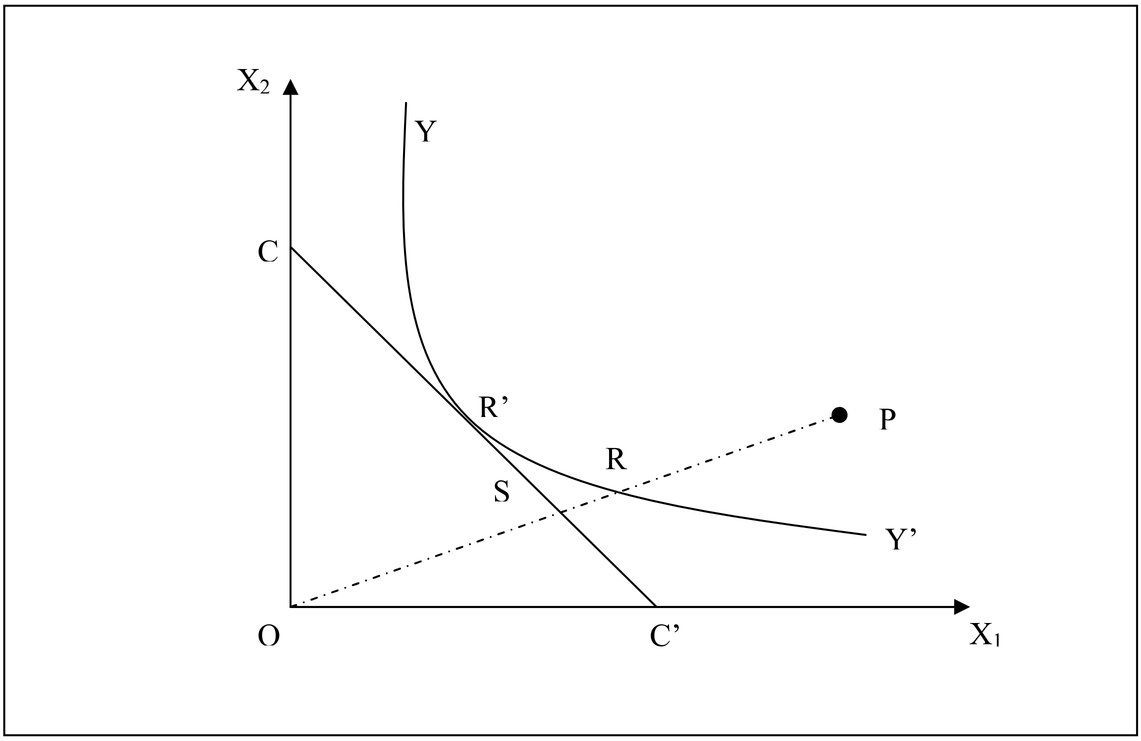
New Enterprise Registrations in Vietnam, 1992-2009



Source: National Business Information Centre, Agency for SME Development, MPI, 2009.
(*): Preliminary data.

Figure 2

Technical and Allocative Efficiency



Source: Murillo-Zamorano (2004).

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