Sector Switching: An Unexplored Dimension of Firm Dynamics in Developing Countries

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Abstract

Much of the literature on industry evolution has found firm dynamics to be an important source of sector-level productivity growth. In this paper, we ask whether the delineation of entry and exit firms matters in assessing the impact of firm turnover. Using detailed firm level data from Vietnam, it emerges that efficiency differences between sector switchers and exit/entry firms exist. Distinguishing between switchers and firm entry/exit is crucial for understanding the contribution of firm turnover to overall productivity growth. Moreover, we uncover distinct and illuminating firm and sector-level determinants of firm exit and switching, which need to be carefully considered in the search for effective policy.

Key Words: Firm dynamics, sector switching, efficiency, Vietnam

JEL Codes: D21, L6, O14

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1. Introduction

Productivity is an important indicator of manufacturing sector performance. Many studies have documented the link between productivity growth and other indicators of success, including employment creation, export status and technology adoption. Tybout (2000) reviews literature relevant to developing country contexts, and focus has regularly been on the relationship between firm turnover and productivity. Firm level data have been used extensively, and many studies suggest that entry firms are more efficient than enterprises exiting a particular sector. Accordingly, it is widely agreed that firm turnover is an important source of sector-level productivity growth.[1] No attention has however so far been paid to the potential effect, differences in the delineation of entrants and exits may have on efficiency outcomes. For example, Aw *et al*. (2001) pool firms, which change legal ownership form, location or sector, with respectively firms that close down production altogether ("real" exits) and newly established firms ("real" entrants).

Our prior is along the lines of Bernard *et al.* (2006a) that while pooling is common it is also problematic. Efficiency levels are likely to vary among the different kinds of exiting and entering firms, and this suggests that the overall contribution to productivity growth from firm turnover is a composite. Similarly, there are several reasons to believe that the factors which affect sector switching (i.e. a firm's choice to change sector) may be very different from those, which influence "real" exits and entrants. To illustrate, efficient rural firms may tend to move towards urban growth centers to benefit from agglomeration advantages (Henderson, 1986). Pooling these firms with other exits can be seriously misleading if the analyst is interested in understanding the determinants of firms that close down altogether or vice-versa. Well established sector switchers may also have better management experience than new entrants as noted in the overview by Bartelsman and Doms (2000); and switchers may have better knowledge of the general business environment and the market conditions facing the firm. All this suggests that (i) potential aggregation errors should not be ignored, and (ii) sorting out the characteristics of different groups of firms is likely to add to our understanding of firm dynamics and the contribution of firm turnover to productivity growth.

[1] See for example Aw *et al*. (2001), Bartelsman and Doms (2000) and Tybout (2000).

In this paper we explore (i) efficiency levels among different types of manufacturing firms in Vietnam, and (ii) the firm and sector level factors which determine firm exit and switching decisions. Vietnam represents an illustrative case of economies in transition for exploring these issues. Wide ranging reforms to enterprise, commercial and investment laws have been carried out in recent years; and economic growth in the last five years has been impressive. The industrial sector has played a key role in this process,[2] and industrial value added is set to grow at around 10 percent per year from 2006 to 2010 according to the Socio-Economic Development Plan (MPI, 2006). At the same time, accession to the World Trade Organisation (WTO) in January 2007 presents a new set of challenges to the sector.

The industry dynamics literature has recently evolved to consider the impact of trade liberalisation and other policy reforms on productivity, primarily through firm exit and entry. Melitz (2003), Pavcnik (2002) and Eslava *et al*. (2004) are all relevant in pointing to a variety of mechanisms through which trade liberalisation can impact positively on growth. It transpires as well that these effects will depend on the ability and willingness of firms to reallocate activity across sub-sectors and whether or not this reallocation is productivity enhancing. We argue that (i) firm turnover and sector switching are likely to play an important role in determining the overall productivity performance of the manufacturing sector both now and in the future, and (ii) in order to inform policy we need to understand whether and how manufacturing sub-sectors differ in terms of the factors that impact on firm decisions to reallocate resources.

Our data come from the Vietnamese Census of Production for 2001-2004 provided by the General Statistics Office (GSO), and we analyse firm switching and exit in the run up to WTO accession in two steps. In the first step, stochastic frontier production functions are estimated for sub-sectors of the manufacturing sector and relative efficiency measures are calculated for each firm for the period 2001 to 2004. This firm-specific efficiency measure allows us to establish the extent to which the efficiency of incumbent firms differs from that of new entrants, real exits and switching firms that reallocate resources across sectors. In the second analytical step, we formally explore

[2] Between 2001 and 2005 growth in GDP averaged around 7 percent annually with growth in 2005 reaching 8.1 percent. The industry share of GDP reached 41 per cent in 2005, with growth in the sector driven by private sector expansion.

the relationship between efficiency and firm exit and sector switching. Explanatory variables include firm specific factors such as age, size and form of legal ownership along with sector-level indicators including different concentration ratios, sector efficiency levels and rates of protection. We find clear evidence that conventional wisdom needs to be revised. The positive productivity effect of firm turnover seems – at least in the case of Vietnam – to be driven by sector switchers. Moreover, distinct differences in the firm and sector-level determinants of firm switching and real exiting emerge.

The paper is structured as follows. In Section 2, we rely on existing studies to identify potential determinants of sector switching and exit, while Section 3 presents the empirical approach. Section 4 describes the data, and empirical results are put forward in Section 5. Section 6 concludes.

2. Explanatory variables

Bernard *et al*. (2006a) suggest that product switching is important for sector dynamics, and highlight (using U.S. manufacturing data) that "product/industry/sector switching is frequent, widespread and influential in determining both firm and aggregate outcomes".[3] We ask whether this is also the case in Vietnam in what follows, and in addition enquire whether differences exist between the decision to switch sectors, on the one hand, and exit and entry decisions, on the other. Based on the literature, we propose a number of firm and sector specific determinants of firm exit and sector switching decisions. Considering firm specific explanations first, Bernard *et al*. (2006a) argue that an extended version of standard sector dynamics models can be relied on in analysing sector switching.

[3] Bernard *et al*. (2006a) refer to 2-digit ISIC categories as sectors, 4-digit ISIC categories as industries and 5-digit ISIC as products or goods. We follow their definition and focus on sector switching (2-digit level), which may be considered a more conservative measure of switching behaviour. While the data allow for analysis at the 4-digit level, which would significantly increase the number of switchers (at the industry level), we have chosen to select the 2-digit ISIC level to make our study comparable to the wide range of firm dynamic studies that use this level of disaggregation.

The seminal work of Jovanovic (1982) considers a passive learning model in which information is gathered at no cost. Firms entering a new product market do not know their exact cost structure and assuming that firms differ with regard to efficiency, they incur different costs when producing the same levels of output. Entrants do not know their exact abilities (productivity) so their performance is unknown, and each participant has to go through a learning process, accumulating information from actual market experience. Gradually firms may discover whether their abilities meet prior expectations, and if not they exit. Consequently, efficient firms survive and experience growth, whereas over-optimistic firms eventually switch sector or close down. The longer a firm has been in a sector the more knowledge it has about its own abilities, suggesting that the probability that a firm switches is negatively related to firm age. Accordingly, we hypothesize that the probability of a firm switching sector is decreasing in firm level efficiency and age as well as size, noting that the motivation for including size is well established in the firm dynamics literature

Ownership structure may also influence sector switching, even when firm specific efficiency, age and size are controlled for.[4] Wen *et al*. (2002) study the reforms of state owned enterprises (SOEs) in China and note that responsibility for many production decisions have gradually been decentralized to individual firms. However, although the importance of central planning departments and committees has been shrinking, decisions about the industries in which SOEs should engage continue to be made at central level. This political hierarchy in SOE management structure is likely to limit inter-sector dynamics, so we expect SOEs to switch sector less frequently. At the same time, the ongoing reform/privatization process in Vietnam appears to close down relatively many SOEs. We therefore hypothesize that there is a positive association between state ownership and firm closure in the exit specification at firm level.

Foreign owned enterprises, or enterprises with some foreign participation, are also expected to be more "locked into" specific sectors due to the legal constraints. Until

[4] Choices are involved in classifying firms by ownership type as discussed in the data appendix, and there are "grey" areas involved in distinguishing between state and foreign owned firms. This is however unavoidable in the type of analysis put forward here. As regards mergers these are very limited in number as this process is just starting in Vietnam. As such merging is of no quantitative significance to our results. In most mergers and acquisitions firms kept at least one business registration licence and one tax code registration. This means that one firm stays in our data as an incumbent and the rest of the merger firms exit. Note also that mergers and acquisitions are often followed by sector switch.

recently, foreign and domestic investors were governed by two separate laws: the Law of Foreign Investment and the Law of Domestic Investment.[5] Although the 1999 Enterprise Law aimed at leveling the playing field for domestic and multinational firms, foreign investment has generally been directed towards special sub-sectors selected by the Vietnamese authorities.[6] Capital shortage and technological spillover arguments motivated the introduction of preferential treatment of foreign-owned firms in the late 1990s, and following the Chinese model, special economic zones were created. While we expect foreign enterprises to be less prone to switch sector, these special arrangements make it less likely for foreign firms to shut down.

Bernard *et al*. (2006a) propose that aside from firm-specific characteristics, firm exit and sector switching are also driven by sector-specific characteristics which are common to all firms in a given sector. Examples include sudden shifts in consumer preferences affecting demand, supply shocks driven by changes in sector structure due to policy reform, new or refined production technologies and trade liberalization. All of these events affect product profitability and are thus likely to affect firm allocation decisions. We consider five such sector specific "push" and "pull" factors in what follows.

First, we expect that the dominance of state enterprises (SR) (state owned enterprise share of total sector output) plays a role in affecting exit and switching decisions. Preferential treatment of SOEs makes it difficult for non-state enterprises to compete and may force more efficient non-state firms to exit (or decide not to enter highly SOE concentrated industries). At the same time, during the ongoing transition from a planning to a market economy the SOE share of material inputs bought at market conditions may, as suggested by Jefferson and Rawski (1994) in the case of China, increase the attractiveness of highly SOE concentrated industries for smaller (private)

[5] A new Investment Law came into effect in July 2006 (CIEM, 2006). This law aims at equalizing opportunities for domestic and foreign investors. However, as outlined in Freshfields Bruchhaus Deringer (2006), a truly common framework has not yet been achieved in all areas.

[6] Thuyet (1995) documents the Vietnamese government's approach to foreign investment, which includes a list of five broad sub-sectors where foreign investors are encouraged to conduct business. The five broad sub-sectors are: (1) large scale industries (with a focus on export-oriented and import substitution industries), (2) high-technology industries, (3) labour intensive industries using raw materials and natural resources available in Vietnam, (4) construction of infrastructure, and (5) foreign-exchange-earning service industries.

enterprises acting as producers of intermediates for SOEs. The net effect on firm dynamics is consequently an interesting empirical issue.

Second, similar arguments apply when considering the dominance of foreign enterprises (FR) (foreign enterprise share of total sector output). Aitkin and Harrison (1999) emphasize that preferential treatment of foreign owned firms may distort competition and force (equally efficient) domestically owned counterparts out.[7] However, one reason why governments grant special treatment is to promote technology transfer, and new products and/or production processes introduced by foreign firms may indeed spill-over to domestic firms. Diffusion can also occur through labour turnover, so a high presence of foreign enterprises in a particular sector may attract domestic firms. In sum, whether FR is positively or negatively related to sector switching and firm exit depends on which of the above effects dominate (competition versus technology transfer).[8]

Third, the sector concentration ratio (CR), measured as the ratio of the accumulated revenue of the four largest firms to total revenue in the sector, is often referred to as a proxy for the degree of competition. Siegfried and Evans (1994) document that a high CR may strengthen collusion efforts among incumbent firms and increase the likelihood of behaviour to prevent entry and maintain higher expected profits. In parallel, Audretsch (1991) has shown that a high CR will help the survival rates of new entrants in the short run. On balance we expect that a high CR reduces firm incentives to move out of (i.e. exit or switch out of) a given sector.

Fourth, the average sector efficiency score (EFF) (calculated from the individual firm efficiency levels) is another indicator of sector level competition. However, as compared to the CR indicator, the underlying mechanism through which EFF influences firm exit and sector switching decisions is somewhat different. A high EFF serves as a push factor, increasing the probability of exit and sector switching for under-average firm performers to sectors with lower average efficiency levels, where they may be better able to compete.

[7] Evidence for Venezuela suggests that once sector specific effects are controlled for, domestic firms perform worse as foreign dominance in a sector increases (Tybout, 2000).

[8] Foreign enterprises may also create a basis for domestically owned firms to produce intermediate inputs as in the case of SOEs. Therefore, inter-industry spillovers from FDI may occur. Javorcik (2004) finds evidence of backward linkages for Lithuania while Alfaro and Rodriguez-Clare (2004) find similar evidence for Venezuela, Brazil and Chile.

Finally, the effective rate of protection (ERP) measures the proportionate increase in per unit value added of a sector due to the complete system of tariffs. More specifically, it takes into account the protection on output and the cost-raising effects of protection on inputs. Our hypothesis is that firm turnover is lower in highly protected sectors, although Arthukorola (2006) notes that much of the ERP levels and changes reflect levels and increases in import duties on intermediates rather than on final goods.

3. Empirical approach

3.1 Estimating efficiency and TFP

A broad range of methodologies have been developed for the purpose of estimating productivity,[9] and choices have to be made in identifying the appropriate approach. Measurement error in inputs is common in most firm level data, particularly for developing countries. Parametric methods that calculate productivity from a stochastically estimated production function will be less vulnerable to measurement errors than their non-parametric alternatives.[10] While this will come at the cost of a less flexible technology specification, appropriate testing procedures can be used to ensure that the production function is correctly specified. An additional issue is the simultaneity of productivity and firm input choices. When firms choose inputs they may be aware of their own productivity but the econometrician is not. As such inputs will be correlated with the unobserved error term which captures productivity. One way of dealing with this is the stochastic frontier approach.[11] This involves the calculation of productivity from a parametrically estimated production function which imposes assumptions on the distribution of the unobserved productivity component to separate productivity from the deterministic part of the production function and the statistical noise term.

[9] See Van Biesebroeck (2003) for an overview of the various methodologies that have been proposed in the literature.
[10] For example, index number approaches or data envelopment analysis (DEA).
[11] See Kumbhakar and Lovell (2000) for an overview. Alternative approaches, not used here due to data limitations, are instrumental variables estimation, for example the approach developed by Blundell and Bond (1998; 2000) and semi-parametric estimation, for example the approaches developed by Olley and Pakes (1996) and Levinsohn and Petrin (2003).

The production technology in this paper is therefore defined separately for each sub-sector using a stochastic production frontier which expresses output as a function of inputs, technical inefficiencies capturing the degree to which firms produce below the optimal level of production and a random error component (Pitt and Lee, 1981).

$$y_i^t = f\left(x_i^t;\beta\right)e^{v_i^t - u_i}$$

$$i = 1,2,....,n_j;\ \ t = 1,2,...T \tag{1}$$

where y_i^t represents the output of the ith firm in a particular sub-sector in time period t, x_i^t the vector of inputs into the production process, β the vector of parameters of the production function, and v_i^t statistical noise and other random external events influencing the production process.[12] The technical efficiency of the ith firm relative to the stochastic frontier for its group is given by the ratio of observed output to the corresponding stochastic frontier output:

$$TE_i = \frac{y_i^t}{f\left(x_i^t;\beta\right)e^{v_i^t}} = e^{-u_i} \tag{2}$$

As such, u_i are the firm specific inefficiency effects for a particular sector, and we assume v_i^t and u_i are independent. If $u_i = 0$, the firm is efficient and operates on the group specific production frontier. If $u_i > 0$, there are inefficiencies and the firm operates beneath the best-practice frontier for the sub-sector.

The stochastic production function for each sub-sector can be estimated by specifying an appropriate functional form for each model. We use a translog production function which incorporates controls for exogenous fixed time effects ω^t, for example, due to technological change or policy changes which affect all firms equally.

$$\ln y_i^t = \alpha + \sum_{k=1}^{K}\beta_k \ln x_{ik}^t + \frac{1}{2}\sum_{k=1}^{K}\sum_{l=1}^{L}\beta_{kl}\ln x_{ik}^t \ln x_{il}^t + \omega^t + v_i^t - u_i \tag{3}$$

[12] v_{ij}^t is assumed to be iid $N\left(0,\sigma_{vj}^2\right)$.

The short panel available to us prevents time varying components in the production function and the inefficiency component from being separately identified (Greene, 2005). Inefficiency effects are therefore assumed not to vary over the course of the four years. Average efficiency levels in an industry can only change from year to year if firms exit or enter the sector. The inefficiency effects are assumed to be distributed as a truncated normal distribution with mean μ. Where μ is found to be insignificant a half normal distribution is assumed.

The estimated parameters of the production function and the efficiency estimates are used to construct a generalised Malmquist index of total factor productivity growth for each sector which allows us to determine which sectors are driving productivity growth in the manufacturing sector as a whole (see Coelli *et al*. (2005) for an overview of this approach). The purpose of constructing a productivity index is to measure output growth that is net of input growth, that is, output growth due to efficiency change, technical change or the contribution of scale economies. Relative technical efficiency (RTE_{it}, calculated as the ratio of a firms technical efficiency score relative to the maximum in time *t*) can be interpreted in the same way as a distance function and as such the change from one period to the next can be used to calculate an efficiency change index comparable to that associated with the Malmquist index:

$$TEI_{it} = RTE_{it} / RTE_{it-1} \tag{4}$$

The Malmquist index measures technical change as the geometric mean of the shift in technology between two adjacent time periods evaluated at the input values associated with each time period, respectively. Since non-neutral technical change is not considered in our model, and so technological change is unaffected by year on year changes in input values, a corresponding technical change index can be constructed using the estimated parameters on the fixed time effects of the sector specific production functions (equation (5)).

$$TCI_t = \exp[\delta_t - \delta_{t-1}] \tag{5}$$

Productivity changes due to changes in scale change are incorporated using Orea's (2002) generalisation of the Malmquist index as the contribution to output of the change in the input mix from one year to the next (equation (6)).

$$SCI_{it} = \exp\left[0.5 \sum_{k=1}^{K} \left(\varepsilon_{ik} SF_i \right) \ln\left(x_{ikt} / x_{ikt-1} \right) \right] \tag{6}$$

where $SF_i = \left(\varepsilon_i - 1 \right) / \varepsilon_i$, $\varepsilon_i = \sum_{k=1}^{K} \varepsilon_{ik}$ and $\varepsilon_{ik} = \frac{\partial \ln y_{it}}{\partial \ln x_{it}}$. The Malmquist index is computed as the product of each of these components.

The remainder of our analysis focuses specifically on relative efficiency measures. We hypothesize that a firm's position relative to other firms in their sub-sector will influence their decision to either remain as incumbent in the sub-sector, switch or exit. Firms are likely to remain if they perform well and exit/switch either if they under-perform relative to the average or find that potential profits elsewhere are attractive. The sub-sector they switch to may be determined by the average performance of firms in other sectors. Thus, the following three components of efficiency will influence a firm's reallocation decision: (i) the average efficiency level of the sub-sector they are in, (ii) how well they are doing relative to other firms in that sub-sector, and (iii) the average efficiency level of the sub-sector they intend (or are considering) moving to.[13]

3.2 Modelling the reallocation decision

We estimate random effects probit models of the sector switching and exit decisions. A random effects approach is chosen given that controlling for unobserved heterogeneity using fixed effects is complicated by the incidental parameters problem (Lancaster, 2000).[14] In order to overcome problems associated with measuring productivity in

[13] We recognize that the "closeness" of sectors from where a firm switches out of and into is also likely to impact. There is no simple way given our data to account for this dimension, which is left for future research. The same goes for trying to measure the cost of switching more generally, which is conceptually comparable to the transactions costs, which are well known from for example the economic analysis of agricultural supply response (Heltberg and Tarp, 2002).

[14] The binary nature of the dependent variable leads to the incidental parameters problem which prevents the unobserved heterogeneity from being treated as a fixed effect (Neyman and Scott, 1948). As an

multi-product firms, we consider single-product firms only.[15] The underlying latent model for the sector switching decision is presented in equation (4), where s_{ijt} represents the sector switching decision for firm *i*, in sector *j*, at time *t*. Vectors x_{ijt-1} and z_{jt-1} are one-period lagged firm specific and sector specific explanatory variables, respectively, and the unobserved heterogeneity is treated as a random effect, υ_i.

$$s_{ijt}^{*} = \alpha_0 + x_{ijt-1}'\alpha_1 + z_{jt-1}'\alpha_2 + \upsilon_i + e_{ijt} \tag{4}$$

where $s_{ijt} = 0$ if $s_{ijt}^{*} \leq 0$ and $s_{ijt} = 1$ if $s_{ijt}^{*} > 0$ and α_0, α_1 and α_2 are parameters to be estimated.

4. Data

Data come from the Vietnamese Census of Production for 2001-2004 provided by the General Statistics Office of Vietnam GSO (2005).[16] The dataset includes all registered enterprises at the end of each year, and we consider 19 two-digit level sub-groups of the manufacturing sector (detailed in Table 1). The total sample consists of 61,510 observations on 23,916 manufacturing firms. We exclude, as alluded to above, firms

alternative, the unobserved effects can be treated as a random effect. It should be noted, however, that consistent estimation of the random effects model by maximum likelihood requires the assumption that the errors are independent of other regressors in the model. Since much of the focus here is on sector specific explanatory factors, correlations between the regressors and the individual effects are of less concern.

[15] Bernard *et al.* (2006b) examine the implications of unobserved product-mix variation and product switching for the measurement of firm and sector level productivity. They demonstrate that production-technology differences across products and product-choice variation across firms interact to bias standard production function based estimates of firm productivity. When firms endogenously choose between products with heterogeneous techniques, standard measures of TFP will be systematically biased (Bernard *et al.*, 2006b). Olley and Pakes (1996) and Levinsohn and Petrin (2003) control for several sources of measurement error, but they do not eliminate the bias in productivity measures due to endogenous product choice. We correct for this by sorting firms into groups that make a single product, and measure productivity across firms making the same product. We also note that multi-product firms may have different switching behaviour than single product firms.

[16] A more thorough description of the data is given in the Appendix and in GSO (2005).

that produce products from different sub-sectors, so our sample is restricted to 44,712 observations on 20,521 manufacturing firms.[17]

[TABLE 1 ABOUT HERE]

For the production function analysis, the output variable is defined as the gross value added of the firm deflated by the industrial output price index relevant to the two-digit sub-sector. It is constructed by adding total labour costs to gross profit. Inputs include (i) labour, measured as the total number of persons employed at the end of the year in question,[18] and (ii) capital, measured as the total assets of the firm at the end of the year deflated by a capital price series. Descriptive statistics are presented in Table 2.

[TABLE 2 ABOUT HERE]

Table 3 outlines the number of sector switchers, exits and entrants in the sample. Sector switching "OUT" counts the number of firms, which change main production sector (two-digit ISIC) in the subsequent year. Similarly, sector switching "IN" documents the number of firms that have just entered a new sector as compared to the previous year. We are interested in comparing firms that fall into the sector switching "OUT" and "IN" categories to "real" exits and new entrants, respectively. Around 4.6 percent (on average) switch out of a given sector each year. This is somewhat below the average number of exit firms (8-10 percent on average exit each year, depending on the sample considered). Even larger differences exist between sector switchers "IN" and new entrants, mainly due to the nature of the data (registered firms).[19]

[TABLE 3 ABOUT HERE]

[17] As a robustness check we also consider the sub-sample of firms which remain in the sample for the entire period, thus eliminating the impact of exit/entry decisions.

[18] All firms with four employees or less are excluded from the analysis, representing around 20 percent of the total sample in all years.

[19] Given that only registered firms under the enterprise law are covered makes analysing several aspects of firm entry problematic. Firms entering in 2002, 2003 or 2004 may have existed for several years before registering, and therefore do not constitute entrants in strict terms. Registration involves several benefits to firms (easier access to credit etc.). However it also makes firms more visible to government authorities (and especially tax collectors). It is therefore uncertain during which stage in their life-cycle a firm decides or is forced to register. Moreover, the post 2001 surveys did not collect information on establishment year. Given the nature of the data we therefore focus most of our attention on efficiency differentials between incumbents, exits and sector switching firms in what follows.

Table 4 provides sector details on sector switching firms, focusing on the 1,076 firms that switch "OUT" of a particular sector.[20] Each row illustrates the number of firms that switch "OUT" of a particular sector and categorizes these firms across the columns by the sector they switch "IN" to. For example, 10 firms leaving production within "Fabricated metal products" (ISIC 28) change to "Repairing of other transport equipment" (ISIC 35), whereas nine firms move in the opposite direction. The sectors that experience the greatest proportion of outward switchers are "Assembling/repairing of motor vehicles" (ISIC 34 – 12.7%), "Furniture" (ISIC 36 – 10.3%) and "Medical and optical instruments" (ISIC 33 – 8.9%). These sectors are also the ones that sector switchers most frequently switch into suggesting a positive correlation between the number of firm switchers entering and exiting specific sectors. This is consistent with much of the literature on firm dynamics which finds a positive correlation between exit and entry rates at the sector level.[21] Over 33 percent of the firms leaving a particular sector switch to the tertiary/service sector. This is particularly so for "Food processing" (ISIC 15), where 76.1 percent of exiting firms switch to the service sector. The table also documents exit rates by sector. As a percentage of the total number of firms in the sector, most firms exit "Non-metallic mineral products" (ISIC 26 – 9.4 percent) and "Basic metals" (ISIC 27 – 8.9 percent).

[TABLE 4 ABOUT HERE]

Table 5 reports summary statistics for each of the sector specific variables considered in the exit and sector switching specifications. Firstly, the variation in the SOE concentration ratio (SR) across sectors is quite high, ranging from 76.2 percent in "Publishing and printing" (ISIC 22) to 6.0 percent in manufacture of "Furniture" (ISIC

[20] The observations used in the construction of Table 4 correspond to the total in Table 3 for sector switching "OUT" with consistent information on firm age (establishment year). The 1,076 sector switching observations occur among 949 firms. Some 829 firms switch sector only once, whereas 113 and seven firms switch main production two and three times respectively. A similar table for firms in the "IN" category has been excluded due to space considerations. Results are available on request. The same table for the total of 1,431 switching "OUT" firms is presented in the Appendix (Table A). Entry rates by sector are also included.

[21] See for example Disney *et al*. (2003) who find a high level of correlation between entry and exit rates within UK manufacturing industries and Roberts and Tybout (1996) who find similar evidence in a developing country context.

36).[22] There is also a relatively high level of variation across sectors in the extent of foreign participation (FR) ranging from 3.1 percent in "Publishing and printing" (ISIC 22) where there is high degree of state involvement to 61.6 percent in "Radio and communication equipment" (ISIC 32). The sector concentration ratio (CR) shows very high concentration ratios in "Basic Metals" (ISIC 27 - 49.2 percent) and in "Medical and optical instruments" (ISIC 33 - 50.3 percent). Fourthly, the average sector efficiency score is particularly high for the ""Fabricated metal products" (ISIC 28), "Furniture" (ISIC 36) and "Wearing apparel" (ISIC 18), closely followed by sectors such as "Wood and wood products" (ISIC 20), "Paper and paper products" (ISIC 21), "Rubber and rubber products" (ISIC 25), "Machinery and equipment" (ISC 29) and "Radio and communication equipment" (ISIC 32). At the other end, we find "Repairing of other transport equipment" (ISIC 35), "Electrical machinery and appliances" (ISIC 31) and "Medical and optical instruments" (ISIC 33). Finally, summary statistics for the effective rate of protection (ERP) reveal that "Food processing" (ISIC 15), "Textiles" (ISIC 17), "Wearing Apparel" (ISIC 18) and "Assembling/repairing of motor vehicles" (ISIC 34) were highly protected sectors in the period under study.

[TABLE 5 ABOUT HERE]

5. Empirical results

5.1 Production function estimation and efficiency

Our model is estimated separately for each two-digit sub-sector described in Table 1 using Frontier Version 4.1 (Coelli, 1996). As discussed in Section 3, parametric approaches to production function estimation require restrictions on the technology underlying the production process. A series of specification tests is performed to ensure an appropriate functional form for each production function (see Table B in the Appendix). While the model should be as flexible as possible, this should not come at the price of theoretical inconsistency. Tests for the theoretical consistency of the

[22] Note that not all firms labelled as state owned firms have 100 percent state ownership. For example, for "Publishing and printing" (ISIC 22) 76.2 percent of output in the sector is produced by a firm with at least 50 percent state ownership.

estimated stochastic production functions are presented in Table C of the Appendix. If the estimated parameters violate the assumptions of monotonicity and quasi-concavity, elasticities and technical efficiency estimates can be misleading as discussed by Sauer *et al*. (2006). This is particularly the case in the present application where the primary purpose of the model is to produce accurate measures of firm level productivity.

It is reassuring here that the partial derivatives of the production functions are of the appropriate sign at the sample mean in all cases with only few violations of the monotonicity assumption throughout the sample as a whole. Curvature assumptions are satisfied at the mean for most sub-samples (i.e., quasi-concavity in inputs) with the exception of ISIC 31 and 34. In these cases, a more restrictive Cobb-Douglas specification was chosen.[23] The parameters of the final specification of each sub-sector production function are presented in Table 6.[24]

[TABLE 6 ABOUT HERE]

A key assumption of the stochastic frontier approach is that all firms *within* a sub-sector use the same technology, so this approach does not allow us to compare production technologies across sub-sectors. Technical change is captured by the inclusion of fixed time effects in the production function which controls for exogenous changes to the environment in which the sector operates, and we assume that technical progress/regress affects all firms in each sector in the same way.[25] Controlling for these aspects, our model produces one efficiency score for each firm in each sector, regardless of how many time periods they are present in that sector. We calculate a relative efficiency measure for each firm by comparing their estimated efficiency score relative to the top performing firm in each sector in each year, thus adjusting for firms that exit, enter or change activity. Scale effects capture the extent to which changes in the input mix improve the performance of the firm.

[23] While violations also occur for observations in ISIC 19 and 27, the results of the Cobb-Douglas and translog models are very similar so we proceed with the more flexible translog specification. Efficiency results are considered both including and excluding the observations which violate the curvature assumptions with almost identical results found in all cases.

[24] It should be noted that in estimating stochastic frontier production functions of this kind it is assumed that technology is homogenous across each 2-digit sub-sector analysed.

[25] Non-neutral technical change is not allowed for in our model given the short panel and problems with parameter identificaiton.

Average rates of change in TFP and its components, weighted by each firms contribution to total value added in each sub-sector in each year, are presented in Table 7.

[TABLE 7 ABOUT HERE]

Estimated TFP changes vary considerably across sectors. Of particular note, is the strong performance of ISIC 17 (Textiles), ISIC 26 (Non-Metallic Mineral Products) and ISIC 35 (Other Transport), which experience TFP growth of between 10 and 12 per cent per annum, driven by exogenous technological progress. In fact, where significant, technological change drives the productivity performance of most sectors. The poorest performing sectors are ISIC 22 (Publishing and Printing) and ISIC 36 (Furniture) where productivity declines between 2001 and 2004. Scale effects, capturing how changes in the input mix of firms improves output possibilities, make an important positive contribution to productivity growth in many sectors, suggesting that productivity enhancing reallocations of inputs is occurring in the Vietnamese manufacturing sector. Changes in average relative efficiency levels make an important contribution to overall productivity growth in ISIC 20 (Wood and Wood Products), ISIC 28 (Fabricated Metal), ISIC 29 (Machinery and Equipment) and ISIC 32 (Radio and Communication Equipment). Since we assume that firm level efficiency is time invariant, productivity enhancing changes in the average efficiency of sectors can be attributed to the entry and exit of firms. These results suggest that efficiency enhancing reallocations across sectors are important.

In our analysis of the determinants of firm exit and switching, we rely on technical efficiency as a measure of individual firm performance,[26] but focus first on differences between exits, entrants, switchers and incumbents by sector as presented in Table 8.

[TABLE 8 ABOUT HERE]

Column (1) documents mean relative efficiency differences between incumbents and new entrants. Incumbents are on average more efficient than newcomers in all sectors,

[26] Firm level efficiency is appropriate for this purpose given that, by construction, it benchmarks firms against the best performing firms in each sector, controlling for the technology at hand and exogenous technological progress which is assumed to affect all firms in the same way.

and in 14 out of 19 sectors the difference is statistically significant. A similar result emerges from comparing efficiency differences between incumbents and exits in column (2). Our results therefore show that exit is concentrated among the least efficient firms, consistent with the findings of for example Aw *et al*. (2001) for Taiwanese firms in the 1980s. However, focusing on efficiency differences between "real" entrants and "real" exits in column (3) reveals that exits have on average higher efficiency levels than new entrants. This is so in 15 out of 19 cases – and in five sectors the difference is statistically significant. This suggests that the standard finding that firm entry and exit contribute to a more efficient reallocation of resources (i.e. transferring resources from less efficient to more efficient producers) may not hold in the case of the Vietnamese manufacturing sector.[27] Switchers certainly merit separate investigation.

Columns (4) and (5) in Table 8 compare sector switchers with incumbents. Our findings confirm that incumbents produce more efficiently than sector switchers (both "IN" and "OUT"), in line with the predictions of traditional life-cycle theories. The two remaining columns (columns (6) and 7)) compare mean efficiency differences between sector switchers and entrants and exits, respectively. In nine out of 19 sectors we find that sector switchers are (on average) significantly more efficient producers than "real" new entrants. This is also the case for three sectors when sector switchers are compared to exits, even if less by way of statistical significance emerges from this comparison.

Overall, our results indicate that significant efficiency differences exist between different types of firms, and the positive contribution to growth from firm dynamics is more associated with sector switchers than with standard turnover. Pooling switchers with new and closed down firms (i) is potentially misleading in coming to grips with relative levels of efficiency, and (ii) would clearly constrain our understanding of the underlying process of development and the potential contribution of firm dynamics to productivity growth. On this background we turn to analysing the determinants of firm exit and switching.

[27] For example, results for Chile and Columbia find that inefficient plants are replaced with slightly more efficient plants, increasing overall productivity in the sector albeit by a small amount (Tybout, 2000).

5.2 Sector switching and exit

We present the first set of results from the random effects probit models of sector switching and exit in Table 9, including firm specific explanatory variables only.[28] The first columns in both the sector switching and exit specification include the weighted relative efficiency score together with province, sector and time dummies. As expected, we find a significant negative relationship between a firm's relative efficiency and sector switching as well as exit. Less (more) productive firms are more (less) likely to switch sector or close down.

Controlling for firm size and age does not qualitatively change the relative efficiency result, and both control variables have the expected (and well-determined) sign in the sector switching specification. Older and larger firms are more likely to remain non-switchers in accordance with the predictions of traditional firm life-cycle theories. Firm size has the expected negative sign in both the switching and exit specifications, and firm age affects switching negatively, so younger firms are more likely to switch. Yet, firm age is positive and significant (contrary to the hypothesized effect) in the second exit regression, where ownership is not controlled for. The ongoing reform process (and the general legal restructuring of the business sector) is key in explaining this. Older firms tend to be SOEs, and many are exiting in the reform process. This corresponds with the fact that the effect of firm age is no longer well-determined in the exit specification once we control for legal ownership type (column (3)).

Ownership structure matters for both the sector switching and exit decision, and – as hypothesized – state and foreign owned enterprises are less likely to switch than domestic privately owned firms. Similarly, in the exit specification foreign owned firms are as expected less likely to exit, whereas state owned firms show the opposite tendency. Exit is significantly associated with state ownership, and this is, as just noted, rooted in the ongoing reform process discussed by CIEM (2003).

In the final specification the efficiency variable is only well-determined in the exit specification. This suggests that relative efficiency is critical in the exit decision, but is less of a driving factor behind switching, once other characteristics are accounted for.

[28] Results of the conditional fixed effects logit are presented in Appendix Table D.

This also corresponds with the widespread (but empirically not verified) impression in Vietnam that some firms are looking to switch as a survival strategy since they are performing poorly at present, while others switch because they are (dynamic and forward looking) firms in search of higher profits elsewhere.

[TABLE 9 ABOUT HERE]

Table 10 summarizes results from the same underlying probit model using different sub-samples.[29] Column (1) compares sector switchers with incumbent firms only, whereas column (2) is restricted to a comparison between exits and incumbents. These sub-samples yield the same conclusions as the full-sample, noting especially that sector switchers are not significantly less efficient than incumbents. In column (3) in Table 10 we restrict the sample under consideration to sector switchers and exits only, and there is no evidence of a significant efficiency difference between exits and sector switchers, even when controlling for size, age, location, sector and ownership form. However, sector switchers tend to be larger, younger and with foreign participation than firms closing down production. In addition, exit firms are more often found among SOEs, which is again as expected given the nature of the reform process in Vietnam.

[TABLE 10 ABOUT HERE]

Table 11 presents the results of the sector switching and exit models incorporating our set of five sector-level determinants alongside the firm specific variables just discussed. Column (1) and column (3) (with province dummies) use the total sample, whereas column (2) and column (4) (with province dummies) are comparable with column (3) in Table 9 (comparing switchers and exits only).

The first and most important observation from Table 11 is that sector level determinants are clearly of critical importance in both switching and exit decisions. Most sector-level variables are highly significant in both columns (1)-(2) and (3)-(4), and the size of the estimated probabilities are in some cases quite noticeable, especially in the switching

[29] In Table E of the Appendix we analyse differences between firms changing main production to the tertiary/service sector and intra-manufacturing sector switchers. We do not find differences in efficiency levels (when controlling for size and age). However, among sector switchers the firms that change to services are smaller in size compared to firms switching within manufacturing. Moreover, foreign firms tend to stay within the manufacturing sector.

decision. Moreover, it is equally clear that sector variation should be carefully considered in trying to come to grips with the determinants of switching and exit given that the introduction of province dummies in columns (3)-(4) has little effect on the results. This confirms that industrial policies in Vietnam do indeed appear to be defined at national and sector rather than at regional or provincial levels, in line with policy declarations and planning documents such as MPI (2003).

Second, the results in Table 11 confirm that firms are less likely to exit and switch from sectors that are highly dominated by SOEs as measured by the SR indicator, and SOE domination also leads to lower probabilities for switching out relative to exiting. As hypothesised in Section 2, economic reform may be opening up opportunities for smaller (private) enterprises in sectors dominated by SOEs, so they start as producers of intermediates. However, in understanding the negative exit and switching probabilities associated with SR, it is possibly even more important to note that SOEs in Vietnam still received preferential treatment during the period under study. Moreover, many and well established commercial and personal links continue to exist between SOEs and other domestic firms. The domestic enterprise system is therefore highly interlinked, or better closely intertwined with SOEs – both in terms of input-output coefficients and personal contacts. This is likely to lead to less movement out of this sector in terms of exit and switching than would otherwise be the case. However, it is also clear that reform efforts are indeed starting to make themselves felt in that exiting is more probable than switching.

Third, the inter-twined nature of the domestic enterprise system has so far not extended itself to include foreign owned firms. In contrast with the technology transfer argument hypothesised in Section 2, there are in Vietnam repeated reports on limited technological spill-over and lack of linkage from foreign to domestic firms (CIEM, 2003). Firms are attracted to and enter foreign-dominated sectors. Yet, once in, they may find it difficult to compete due to less than expected technology transfers and tougher competition due to the competitive advantages associated with foreign firms. The result is that greater FR increases the probability for firms to either exit or switch sector. Moreover, and in contrast with what was noted for the SOE sector variable, foreign domination in terms of output share leads to switching being more likely than

exit. This probably reflects that firms attracted by the increasing, but still relatively recent presence of foreign companies, are typically quite dynamic. Once these newcomers realise that it is far from easy to compete and obtain new technology, they tend to switch and move on rather than close down.

Fourth, a high concentration ratio (CR) increases the probability that a firm switches sector, but this result does not hold for firm exit decisions, where the parameters are negative, but insignificant. It has in Vietnam been hypothesized that the former result may be rooted in the observation that a variety of enterprises took steps to switch out of highly concentrated sectors in anticipation of the Competition Law, approved in late 2004 (CIEM, 2006). Similarly, there is likely to be at least some enterprises which have been attracted by high concentration ratios only to find after entry that conditions are not as permissive as expected, be that due to collusion (as hypothesized in Section 2) or unexpected competitive pressures more generally. On the other hand, if firms do manage to get established and succeed in developing appropriate networks, which are often essential in Vietnam, they tend to stay (corresponding to what was suggested in Section 2), and in line with the observation that switching tends to be more likely than exit.

Fifth, a high average sector efficiency level (EFF) tends to increase the probability of sector switching and exit. This is as expected, and the fact that switching is more likely than exit is in all likelihood due to the fact that the Vietnamese business environment does contain – as suggested above – a number of firms which are willing to "try it out" in search of opportunities, but which also move on, when opportunities do not materialise.

Sixth, there is as expected a significantly lower probability of switching out from sectors that are highly protected. Accordingly, firms tend to stay in these sectors, reaping the benefits associated with protection. This is so even if the protection is expected to be short lived as has been the case in Vietnam from 2001 to 2004. In contrast, the insignificance on exit in column (1) suggests that when decisions on whether to close down or remain in a sector are taken, a longer term perspective on firm survival dominates. If it is clear that the firm is not sustainable, then better give up right

away. Putting focus on columns (2) and (4) we note that these observations are consistent with our findings for sector switchers compared with exits only.

In summary, we have identified a series of highly significant variables affecting firm switching out of a sector or closing down. Moreover, sector switchers and exits tend to be affected differently by firm and sector specific factors. Younger firms are more likely to switch sectors while exit is significantly associated with older firms. The latter result is primarily due to changes in ownership structure as state owned firms are more likely to exit rather than switch sector as a result of the economic reform process. Foreign owned firms are less likely to exit and switch sectors, but when the sample is restricted to firms which either exit or switch the latter group has a significantly higher concentration of foreign participation. Sector specific differences also exist. A higher share of foreign firm output, higher levels of sector concentration and higher sector level efficiency are more associated with sector switching than exit. In contrast, sector switching is less likely than exits where sectors are either more dominated by SOEs or heavily protected.

6. Conclusion

Much of the literature on industry evolution has found firm turnover to be an important source of sector-level productivity growth in the sense that new firms are widely understood to have higher productivity than exiting firms. In this paper, we approached industry dynamics in Vietnam from a new angle and asked, first, whether the delineation of "entry" and "exit" firms matters for the impact of firm turnover on growth outcomes. We found that the sub-group of exiting firms, which continue production in a different sector have different characteristics to those that cease production altogether.

In the manufacturing sector in Vietnam, less productive firms are more likely to switch sector and to exit as predicted by existing literature. However, while firms which switch sectors have lower efficiency levels than incumbents, they are often significantly more efficient than new entrants. This is important given that average efficiency levels are

higher amongst exiting firms compared with entrants once the sector switchers are netted out. This actually suggests – in contrast with perceived wisdom – that the aggregate turnover effect of "real" exit and entry of firms in the Vietnamese manufacturing sector may impact negatively on overall productivity. Moreover, the contribution of firm turnover to productivity growth appears more associated with firm switching than with traditional interpretations of productivity differentials between broadly defined categories of entry and exit firms, which merit more precise definition.

Secondly, our analysis brought out that there are in addition to productivity differentials other distinct and statistically significant differences between the determinants of firm switching and firm exit. At firm specific level, younger firms are for example more likely to switch sectors while exit is significantly associated with state ownership. Firm size is negatively associated with both switching and exit, but appears much more important in the exit decision. Differences also exist among SOEs and foreign owned firms in the exit decision. SOEs have been more likely to exit, while the opposite is true for foreign firms.

Sector level characteristics tend to play a more influential role in switching than in exit decisions, and the direction of impact also differs. For example, our sector level measures of competition and efficiency matter differently for firms that switch sector compared to those that exit. The former are influenced by the competitiveness of the sector they are in as measured through its concentration ratio, the average efficiency level and the extent of protection that the sector offers. In contrast, of these factors only the efficiency level comes across as critical in the exit decision.

The insight that sector level determinants are particularly influential in switching decisions is potentially very important. As noted, our first finding was that switching appears to be at the core of the contribution of firm turnover to growth. Moreover, sector level determinants are (alongside ownership characteristics) arguably much more directly amenable to policy influence than firm level characteristics such as firm age, size and relative firm-level efficiency.

A key issue for the Vietnamese manufacturing sector in the coming years is how trade liberalisation will impact on productivity and profitability. Much of the literature

suggests that this will depend on firm turnover, and focus is typically on how inefficient firms can be closed down (exit) and be replaced by new and more efficient ones (entrants). The findings of this paper suggest that differences between firms that exit and firms that switch sectors are critical and should be considered explicitly in formulating policy. In particular, firm ability to reallocate activity across sub-sectors (rather than simply close down) appears crucial.

Finally, we have in this paper (i) aimed at identifying important characteristics of firm dynamics in Vietnam in the run up to the WTO liberalisation process that are likely to be broadly applicable in other countries in transition, (ii) shed some light on the characteristics of reallocating firms, and importantly (iii) established how they differ from firms that exit. This is a necessary first step in arriving at policy suggestions that are an appropriate guide in the challenging years ahead. Further research on the nature of firms, what motivates them and what makes the reallocation process easier in sector specific contexts is a next step and a challenge to future research.

References

Aitkin, B.J. and Harrison A.E. (1999). "Do Domestic Firms Benefit from Direct Foreign Investment? Evidence from Venezuela", *American Economic Review*, 89(3), 605-618.

Alfaro, L. and Rodriguez-Clare, A. (2004). "Multinationals and Linkages: Evidence from Latin America", *Economia*, 4, 113-170.

Athukorola, P. (2006). "Trade Policy Reforms and the Structure of Protection in Vietnam", *World Economy*, 29(2), 161-187.

Audretsch, D.B. (1991). "New-Firm Survival and the Technological Regime", *Review of Economics and Statistics*, 73(3), 441-450.

Aw, B.Y., Chen, X. and Roberts, M.J. (2001). "Firm-level Evidence on Productivity Differentials and Turnover in Taiwanese Manufacturing", *Journal of Development Economics*, 66, 51-86.

Bartelsman, E. and Doms, M. (2000). "Understanding Productivity: Lessons from Longitudinal Microdata", *Journal of Economic Literature*, 38, 569-594.

Bernard, A.B., Redding, S.J. and Schott, P.K. (2006a). "Multi-Product Firms and Product Switching", NBER working paper no. 12293, Cambridge, Mass.

Bernard, A.B., Redding, S.J. and Schott, P.K. (2006b). "Products and Productivity", CEPR discussion paper no. 5126, Cambridge, Mass.

Blundell, R. and Bond, S. (1998). "Initial Conditions and Moment Restrictions in Dynamic Panel Data Models", *Journal of Econometrics*, 87, 115-143.

Blundell, R. and Bond, S. (2000). "GMM Estimation with Persistent Panel Data: An Application to Production Functions", *Econometric Reviews*, 19(3), 321-340.

CIEM (Central Institute of Economic Management) (2003). *Developing the Socialist-Oriented Market Economy in Vietnam*, edited by Dr. Dinh Van An, The Statistical Publisher, Ha Noi.

CIEM (Central Institute of Economic Management) (2006). *Vietnam's Economy in 2005 (A Reference Book)*, The Publishing House of Political Theory, Hanoi.

Coelli, T. (1996). "A guide to FRONTIER version 4.1: a computer program for frontier production function estimation", CEPA Working Paper 96/07, Department of Econometrics, University of New England, Armidale, Australia.

Coelli, T., Rao, D., O' Donnell, C. and Battese, G. (2005). *An Introduction to Efficiency and Productivity Analysis* (second edition), Springer, New York.

Disney, R., Haskel, J. and Heden, Y. (2003). "Restructuring and Productivity Growth in UK Manufacturing", *Economic Journal*, 113, 666-694.

Ericson, R. and Pakes, A. (1995). "Markov Perfect Industry Dynamics: A Framework for Empirical Work", *Review of Economics* Studies, 62(1), 53-82.

Eslava, M., Haltiwanger, J., Kugler, A and Kugler, M. (2004). "The Effects of Structural Reform on Productivity and Profitability Enhancing Reallocation: Evidence from Columbia", *Journal of Development Economics*, 75, 333-371.

Freshfields Bruchhaus Deringer (2006). "Vietnam – New Investment Law", mimeo - download from www.freshfields.com

Greene, W. (2005). "Fixed and Random Effects in Stochastic Frontier Models", *Journal of Productivity Analysis*, 23, 7-32.

GSO (2005). *The Real Situation of Enterprises: The Results of Surveys conducted in 2001-2004*, Statistical Publishing House, Hanoi.

Heltberg, R. and Tarp, F. (2002). "Agricultural Supply Response and Poverty in Mozambique", Food Policy, 27, 103-124.

Henderson, J.V. (1986). "Efficiency of Resource Usage and City Size", *Journal of Urban Economics*, 19, 47-70.

Hopenhayn, H. (1992). “Entry, Exit and Firm Dynamics in Long Run equilibrium”, *Econometrica*, 60(5), 1127-1150.

Jovanovic, B. (1982). "Selection and the Evolution of Industry", *Econometrica*, 50(3), 649-670.

Javorcik, B. (2004). “Does Foreign Direct Investment Increase the Productivity of Domestic Firms? In Search of Spillovers through Backward Linkages”, *American Economic Review*, 94, 605-627.

Jefferson, G.H. and Rawski, T.G. (1994). “Enterprise Reform in Chinese Industry”, *Journal of Economic Perspectives*, 8(2), 47-70.

Kumbhakar, S. and Lovell, K. (2000). *Stochastic Frontier Analysis*, Cambridge University Press, Cambridge.

Lancaster, T. (2000). “The Incidental Parameters Problem Since 1948”, *Journal of Econometrics*, 95, 391-414.

Levinsohn, J. and Petrin, A. (2003). “Estimating Production Functions Using Inputs to Control for Unobservables”, *Review of Economic Studies*, 70, 317-341.

Melitz, M. (2003). “The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity”, *Econometrica*, 71(6), 1695-1725.

Ministry of Planning and Investment (MPI) (2006). “The Five-Year Socio-Economic Development Plan: 2006-2010”. Hanoi, Vietnam.

Neyman, J. and Scott, E.L. (1948). “Consistent Estimates Based on Partially Consistent Observations”, *Econometrica*, 16(1), 1-32.

Olley, G. and Pakes, A. (1996). “The Dynamics of Productivity in the Telecommunications Equipment Industry”, *Econometrica*, 64(6), 1263-1297.

Orea, L. (2002). “Parametric Decomposition of a Generalised Malmquist Productivity Index”, *Journal of Productivity Analysis*, 18, 5-22.

Pakes, A. and Ericson, R. (1998). "Empirical Implications of Alternative Models of Firm Dynamics", *Journal of Economic Theory*, 79, 1-45.

Pavcnik, N. (2002). "Trade Liberalization, Exit and Productivity Improvements: Evidence from Chilean Plants", *Review of Economic Studies*, 69, 245-276.

Pitt, M. and Lee, L. (1981). "The Measurement and Sources of Technical Inefficiency in Indonesian Weaving Industry", *Journal of Development Economics*, 9, 43-64.

Roberts, M.J. and Tybout, J. (1996). *Industrial Evolution in Developing Countries: Micro Patterns of Turnover, Productivity and Market Structure*, Oxford University Press, Oxford.

Sauer, J, Frohberg, K. and Hockmann, H. (2006). "Stochastic Efficiency Measurement: The Curse of Theoretical Consistency", *Journal of Applied Economics*, 9(1), 139-165.

Siegfried, J.J. and Evans, L.B. (1994). "Empirical Studies of Entry and Exit: A Survey of the Evidence", *Review of Industrial Organization*, 9(2), 121-155.

Thuyet, P. (1995). "The Emerging Legal Framework for Private Sector Development in Vietnam's Transitional Economy", World Bank Policy Research Working Paper 1486, World Bank, Washington DC.

Tybout, J.R. (2000). "Manufacturing Firms in Developing Countries: How Well Do They Do, and Why?", *Journal of Economic Literature*, 38, 11-44.

Van Biesebroeck, J. (2003). "Revisiting Some Productivity Debates", NBER Working Paper Number 10065.

Wen, M., Li, D. and Lloyd, P. (2002). "Ownership and Technical Efficiency: A Cross-Section Study on the Third Industrial Census of China", *Economic Development and Cultural Change*, 50, 709-734.

Tables

TABLE 1: TWO-DIGIT MANUFACTURING SECTORS

Sector 15:	Manufacture of food products and beverages
Sector 17:	Manufacture of textiles
Sector 18:	Manufacture of wearing apparel, dressing and dyeing of fur
Sector 19:	Tanning and dressing of leather, manufacture of luggage, handbags, saddler, harness and footwear
Sector 20:	Manufacture of wood and of products of wood and cork; manufacture of articles of straw and plaiting materials
Sector 21:	Manufacture of paper and paper products
Sector 22:	Publishing, printing and reproduction of recorded media
Sector 24:	Manufacture of chemicals and chemical products
Sector 25:	Manufacture of rubber and plastic products
Sector 26:	Manufacture of other non-metallic mineral products
Sector 27:	Manufacture of basic metals
Sector 28:	Manufacture of fabricated metal products, except machinery and equipment
Sector 29	Manufacture of equipment and machinery
Sector 31:	Manufacture of electrical machinery and apparatus
Sector 32:	Manufacture of television and communication equipment and apparatus
Sector 33:	Manufacture of medical precision and optical instruments, watches and clocks
Sector 34:	Manufacture of motor vehicles, trailers and semi-trailers
Sector 35:	Manufacture of other transport means
Sector 36:	Manufacture of furniture; manufacturing n.e.c.

Note: The following sub-sectors are excluded from the analysis due to having few firms to facilitate the estimation of a production function:

16: Manufacture of tobacco products
23: Manufacture of coke, refined petroleum products and nuclear fuel
30: Manufacture of office machinery and computers
37: Recycling

TABLE 2: SUMMARY STATISTICS FOR PRODUCTION FUNCTION ANALYSIS

Sector	15	17	18	19	20	21	22
No. of firms	4,462	816	1,574	498	1,563	823	965
No of obs.	10,643	1,768	3,249	1,012	3,217	1,895	1,998
Value Added	628	1,277	1,478	3,070	448	703	746
(VND Million)	(2,275)	(2,935)	(2,883)	(4,809)	(1,501)	(1,896)	(2,214)
Labour Units	69	161	274	539	73	73	50
	(186)	(297)	(404)	(775)	(148)	(109)	(83)
Capital	5,848	15,195	7,751	14,128	3,353	8,828	5,708
(VND Million)	(19,133)	(32,831)	(14,973)	(24,978)	(10,359)	(23,531)	(17,811)

Sector	24	25	26	27	28	29	31
No. of firms	839	1,178	1,711	332	2,158	639	360
No of obs.	1,873	2,607	4,096	690	4,185	1,311	758
Value Added	2,045	1,058	1,390	921	469	954	1,725
(VND Million)	(4,492)	(2,864)	(3,677)	(2,837)	(1,412)	(2,127)	(3,722)
Labour Units	82	91	104	78	52	86	107
	(129)	(188)	(190)	(246)	(108)	(151)	(191)
Capital	17,443	12,068	8,510	13,107	6,231	9,371	21,924
(VND Million)	(31,880)	(25,846)	(25,501)	(31,841)	(18.302)	(19,687)	(43,868)

Sector	32	33	34	35	36
No. of firms	181	89	341	481	1,611
No of obs.	372	188	707	1,028	3,115
Value Added	4,071	1,422	1,102	1,124	663
(VND Million)	(6,368)	(2,946)	(2,917)	(2,511)	(1,706)
Labour Units	147	159	91	119	117
	(206)	(317)	(189)	(190)	(245)
Capital	33,770	26,043	14,904	16,416	6,800
(VND Million)	(50,899)	(55,670)	(37,781)	(36,272)	(16,399)

Note: Variance of variables given in parenthesis, and value added, labour units and capital are mean values.

TABLE 3: OVERVIEW OF FIRM DYNAMICS

	2001	2002	2003	2004	Total
Sector switch IN	..	214	466	489	1,169
(SW1)	..	[212]	[330]	[250]	[792]
	..	(2,0)	(3,9)	(3,5)	(2,6)
Sector switch OUT	301	607	523	..	1,431
(SW2)	[298]	[483]	[295]	..	[**1,076**]
	(3,6)	(5,7)	(4,4)	..	(3,2)
Entrants	..	2,125	2,581	3,419	8,125
(ENTRY)	..	..	..	..	..
	..	(19,8)	(21,8)	(24,8)	(18,2)
Exits	682	1,088	1,308	..	3,078
(EXIT)	[682]	[662]	[593]	..	[**1,937**]
	(8,2)	(10,1)	(11,1)	..	(6,9)
Total	8,351	10,743	11,814	13,804	44,712
	[8,339]	[8,608]	[7,416]	[6,580]	[30,943]

Note: Total number of firms (percentage in parenthesis). In brackets the number of observations without missing information on firm age. Sector switch IN (SW1): The number of firms that switched from another 2-digit ISIC sector. Sector switch OUT (SW2): The number of firms that switch main sector the coming year.

TABLE 4: SECTOR DETAILS ON SECTOR SWITCHERS

	Switch to:	15	17	18	19	20	21	22	24	25	26	27	28	29	31	32	33	34	35	36	OTH	AGR	SER	Total switchers	Percent of total	Exits	Percent of total
Switch from	ISIC 15			1		2	1		4		1		3				1	1	1	1	1	5	70	92	(1.4)	562	(8.5)
	ISIC 17	1		14		1	2		1	7												1	4	31	(3.3)	68	(7.1)
	ISIC 18		15		12	2	1	1		2			1			1				2		1	27	65	(4.2)	125	(8.1)
	ISIC 19			7		1				2		1	1							3			4	19	(3.3)	43	(7.5)
	ISIC 20	3		1			4		3	2	3	1	4						3	91		4	33	152	(8.7)	141	(8.1)
	ISIC 21	2	1	2		2		10		8	1									1			6	33	(3.1)	83	(7.7)
	ISIC 22			2			16						1	1		1							8	29	(3.2)	62	(6.9)
	ISIC 24	5	3			1	1	1		2	8		2		1		1			2		4	12	43	(4.2)	69	(6.7)
	ISIC 25		2	2	3	1	3	2	3		1	1	2	2	1	1		1	4	8	1	1	17	56	(4.2)	90	(6.7)
	ISIC 26					3		1	9	2		1	1							5		13	27	62	(2.5)	236	(9.4)
	ISIC 27					1					2		9						1				3	16	(4.5)	32	(8.9)
	ISIC 28	1			2	1	2	1		3	3	22		21	5			8	10	7		1	40	127	(6.8)	143	(7.7)
	ISIC 29	1						1		3			22		5		1	3	2	1			17	56	(8.2)	56	(8.2)
	ISIC 31						1						4	1		7		1		2			7	23	(5.7)	18	(4.5)
	ISIC 32												3		2		1				1		2	9	(4.7)	11	(5.7)
	ISIC 33										2		2	2					1				3	10	(8.9)	4	(3.6)
	ISIC 34									1			10	5					18			1	17	52	(12.7)	28	(6.8)
	ISIC 35	2				1				3			9	2	1			11		3			11	43	(7.4)	45	(7.8)
	ISIC 36			2		82	3		3	7	1	2	5	1		3		1					48	158	(10.3)	121	(7.9)
	Total switchers	15	21	31	17	98	34	17	23	42	22	28	79	35	15	13	4	26	40	126	3	31	356	**1,076**	(4.4)	**1,937**	(8.0)
	Percent of total	(0.2)	(2.2)	(2.0)	(3.0)	(5.6)	(3.1)	(1.9)	(2.2)	(3.1)	(0.9)	(7.8)	(4.3)	(5.1)	(3.7)	(6.7)	(3.6)	(6.3)	(6.9)	(8.3)				(4.4)			

Note: Total number of firms switching from/to a particular sector (percentage in parenthesis). OTH = ISIC 16, ISIC 23, ISIC 30 and ISIC 37. AGR = Agriculture/Primary sector. SER = Service/tertiary sector. Only firms for which efficiency estimates could be calculated are included.

TABLE 5: SUMMARY STATISTICS FOR SECTOR SWITCHING ANALYSIS

SECTOR SPECIFIC VARIABLES

ISIC	Main production sector	SR	FR	CR	EFF	ERP
15	Food products and beverages	0.419	0.139	0.047	0.386	72.980
17	Textiles	0.498	0.243	0.172	0.586	70.790
18	Wearing apparel	0.279	0.327	0.057	0.693	70.560
19	Leather products	0.235	0.322	0.125	0.658	39.150
20	Wood and wood products	0.260	0.124	0.088	0.678	1.150
21	Paper and paper products	0.330	0.152	0.130	0.636	17.090
22	Publishing and printing	0.762	0.031	0.098	0.452	-4.090
24	Chemical and chemical products	0.571	0.199	0.147	0.478	9.670
25	Rubber and plastic products	0.265	0.299	0.128	0.621	35.670
26	Non-metallic mineral products	0.538	0.087	0.075	0.587	50.830
27	Basic metal	0.626	0.135	0.492	0.455	0.750
28	Fabricated metal products	0.294	0.250	0.077	0.696	-20.940
29	Machinery and equipment	0.587	0.127	0.127	0.622	-8.580
31	Electrical machinery and app.	0.385	0.452	0.298	0.352	13.150
32	Radio and communication equip.	0.239	0.616	0.218	0.646	13.430
33	Medical and optical instruments	0.080	0.495	0.503	0.363	-2.950
34	Assembling/repairing motor vehicles	0.327	0.415	0.184	0.370	79.220
35	Repairing of other transport equip.	0.445	0.334	0.143	0.314	28.100
36	Furniture	0.060	0.392	0.084	0.694	23.610
Manufacturing average		0.348	0.388	0.205	0.100	38.137

Note: Summary statistics are based on the same 24,363 observations used in Table 9. SR = State owned enterprise (SOE) share of total sector output. FR = Foreign owned enterprise share of total sector output. CR = Ratio of the four largest firms accumulated revenue to the total revenue in the sector. EFF = Average sector efficiency score (EFF) calculated from the individual firm efficiency levels. ERP = Effective rate of protection, estimates obtained from Arthukorola (2006).

TABLE 6: PARAMETER ESTIMATES OF GROUP SPECIFIC PRODUCTION FUNCTIONS

Sector	15	17	18	19
Constant	0.734*** (0.046)	0.415*** (0.060)	0.167*** (0.036)	0.243*** (0.071)
$\ln x_1$	0.661*** (0.015)	0.731*** (0.037)	0.856*** (0.026)	0.769*** (0.040)
$\ln x_2$	0.466*** (0.013)	0.352*** (0.030)	0.297*** (0.025)	0.314*** (0.045)
$\ln x_1 * \ln x_1$	0.048*** (0.008)	-0.037** (0.015)	0.030** (0.012)	0.014 (0.019)
$\ln x_2 * \ln x_2$	0.045*** (0.005)	0.014 (0.009)	0.028*** (0.010)	0.059*** (0.015)
$\ln x_1 * \ln x_2$	-0.043*** (0.010)	-0.006 (0.016)	-0.043** (0.017)	-0.082*** (0.026)
Dummy 2002	0.105*** (0.018)	0.143*** (0.051)	-0.084** (0.038)	0.032 (0.059)
Dummy 2003	0.052*** (0.019)	0.134*** (0.051)	0.086** (0.038)	0.176*** (0.056)
Dummy 2004	0.018 (0.019)	0.313*** (0.051)	0.093** (0.038)	0.182*** (0.055)
$\hat{\gamma}$	0.490*** (0.015)	0.705*** (0.025)	0.875*** (0.024)	0.916*** (0.023)
$\hat{\mu}$	1.198*** (0.055)	Restricted to zero	-3.395*** (0.887)	-4.064*** (1.303)
Log likelihood	-12,169.77	-2,147.44	-3,807.50	-1,205.59
Sector	20	21	22	24
Constant	0.211*** (0.051)	0.279*** (0.043)	0.574*** (0.140)	0.729*** (0.129)
$\ln x_1$	0.830*** (0.036)	0.726*** (0.041)	0.901*** (0.042)	0.677*** (0.047)
$\ln x_2$	0.348*** (0.035)	0.454*** (0.031)	0.437*** (0.033)	0.604*** (0.035)
$\ln x_1 * \ln x_1$	0.012 (0.011)	-0.016 (0.035)	-0.002 (0.031)	0.057* (0.030)
$\ln x_2 * \ln x_2$	0.012 (0.008)	0.043*** (0.016)	0.042*** (0.015)	0.039** (0.012)
$\ln x_1 * \ln x_2$	0.015 (0.015)	-0.014 (0.042)	-0.037 (0.038)	-0.069** (0.031)
Dummy 2002	-0.045 (0.011)	0.008 (0.039)	0.051 (0.041)	0.024 (0.048)
Dummy 2003	0.011 (0.010)	-0.002 (0.040)	0.090** (0.040)	-0.001 (0.048)
Dummy 2004	0.037 (0.015)	0.124*** (0.040)	-0.055 (0.040)	-0.106** (0.049)
$\hat{\gamma}$	0.884*** (0.037)	0.926*** (0.033)	0.590*** (0.036)	0.645*** (0.051)
$\hat{\mu}$	-3.243 (3.116)	-3.943 (2.537)	1.071*** (0.185)	0.964*** (0.270)
Log likelihood	-3,507.73	-2,065.29	-1,992.56	-2,277.06
Sector	25	26	27	28
Constant	0.336*** (0.048)	0.380*** (0.034)	0.729*** (0.087)	0.257*** (0.034)
$\ln x_1$	0.662*** (0.032)	0.688*** (0.026)	0.737*** (0.069)	0.754*** (0.023)
$\ln x_2$	0.530*** (0.028)	0.485*** (0.019)	0.482*** (0.047)	0.461*** (0.018)
$\ln x_1 * \ln x_1$	0.032 (0.021)	-0.007 (0.015)	0.048 (0.041)	-0.031** (0.016)
$\ln x_2 * \ln x_2$	0.072*** (0.011)	0.039*** (0.007)	0.087*** (0.020)	0.049*** (0.007)
$\ln x_1 * \ln x_2$	-0.101*** (0.026)	-0.044** (0.018)	-0.098* (0.053)	-0.023 (0.018)
Dummy 2002	…	0.132*** (0.025)	0.166* (0.085)	-0.077** (0.033)
Dummy 2003	…	0.154** * (0.026)	0.127 (0.086)	-0.015 (0.034)
Dummy 2004	…	0.257*** (0.026)	0.046 (0.0855)	-0.012 (0.033)
$\hat{\gamma}$	0.895*** (0.059)	0.766 *** (0.012)	0.381*** (0.053)	0.865*** (0.025)
$\hat{\mu}$	-3.281*** (3.1729)	Restricted to zero	1.038*** (0.055)	-3.187*** (0.795)
Log likelihood	-3,061.35	-4,168.85	-816.75	-4,789.87

Sector	29	31♣	32	33
Constant	0.396*** (0.074)	1.281*** (0.171)	0.475*** (0.074)	1.278*** (0.299)
$\ln x_1$	0.650*** (0.045)	0.573*** (0.050)	0.332*** (0.076)	0.824*** (0.101)
$\ln x_2$	0.499*** (0.038)	0.604*** (0.037)	0.756*** (0.056)	0.337*** (0.081)
$\ln x_1 * \ln x_1$	0.001 (0.031)	…	0.036 (0.051)	…
$\ln x_2 * \ln x_2$	0.048*** (0.018)	…	0.081*** (0.020)	…
$\ln x_1 * \ln x_2$	-0.054 (0.041)	…	-0.164*** (0.053)	…
Dummy 2002	0.023 (0.053)	…	…	…
Dummy 2003	0.004 (0.053)	…	…	…
Dummy 2004	0.095* (0.053)	…	…	…
$\hat{\gamma}$	0.884*** (0.070)	0.569*** (0.058)	0.944*** (0.027)	0.656*** (0.072)
$\hat{\mu}$	-2.341 (2.701)	1.430*** (0.247)	-4.508* (2.694)	1.501*** (0.392)
Log likelihood	-1,495.70	-914.79	-423.63	-215.01

Sector	34♣	35	36
Constant	1.005*** (0.158)	0.983 *** (0.148)	0.264*** (0.042)
$\ln x_1$	0.904*** (0.044)	0.745*** (0.059)	0.756*** (0.026)
$\ln x_2$	0.297*** (0.027)	0.399*** (0.045)	0.406*** (0.024)
$\ln x_1 * \ln x_1$	…	0.050 (0.036)	0.020 (0.015)
$\ln x_2 * \ln x_2$	…	0.049*** (0.015)	0.048*** (0.009)
$\ln x_1 * \ln x_2$	…	-0.085** (0.038)	-0.059*** (0.020)
Dummy 2002	…	0.225*** (0.060)	-0.006 (0.038)
Dummy 2003	…	0.244*** (0.060)	-0.127*** (0.037)
Dummy 2004	…	0.260*** (0.066)	-0.108*** (0.036)
$\hat{\gamma}$	0.624*** (0.035)	0.598*** (0.030)	0.868*** (0.018)
$\hat{\mu}$	1.371*** (0.204)	1.436*** (0.170)	-3.257*** (0.530)
Log likelihood	-779.74	-1,242.07	-3,629.46

$\ln x_1$ is the log of labour, $\ln x_2$ the log of capital, $\ln x_3$ the log of material costs, $\hat{\gamma}$ an estimate of the share of technical efficiency in total variance and $\hat{\mu}$ the mean of the distribution of inefficiency effects.

Standard errors are given in parenthesis, *** indicates significance at the 1% level, ** indicates significance at the 5% level, * indicates significance at the 10% level

♣Restricted to Cobb-Douglas model due to violation of theoretical properties

TABLE 7: AVERAGE CHANGE IN WEIGHTED TFP 2001-2004

	Technical Efficiency	Technical Progress	Scale Effects	TFP
ISIC 15	-0.03	0.40	1.39	1.77
ISIC 17	0.38	11.16	0.25	11.84
ISIC 18	0.10	4.35	0.85	5.36
ISIC 19	0.57	6.46	0.17	7.23
ISIC 20	2.27	1.69	2.22	6.18
ISIC 21	0.48	4.85	0.92	6.33
ISIC 22	-0.22	-2.86	1.64	-1.46
ISIC 24	-0.13	3.99	1.56	5.48
ISIC 25	0.30	0.00	1.21	1.51
ISIC 26	0.01	8.96	0.80	9.84
ISIC 27	0.45	0.77	1.82	3.01
ISIC 28	2.37	0.54	1.68	4.69
ISIC 29	3.18	3.61	0.90	7.71
ISIC 31	0.32	0.00	1.45	1.77
ISIC 32	2.46	0.00	0.01	2.46
ISIC 33	0.57	0.00	0.42	0.99
ISIC 34	0.26	0.00	1.86	2.12
ISIC 35	-0.58	8.62	1.70	9.93
ISIC 36	0.84	-3.19	1.75	-0.67

Note: All figures in percentage

TABLE 8: MEAN RELATIVE EFFICIENCY DIFFERENCES

by sector	(1) INC-ENTRY t-test	(2) INC-EXIT t-test	(3) ENTRY-EXIT t-test	(4) INC-SW1 t-test	(5) INC-SW2 t-test	(6) SW1-ENTRY t-test	(7) SW2-EXIT t-test
ISIC 15	0.0137***	0.0001**	0.0000	0.0183	0.0002	0.0000	0.0000
	(3.18)	(2.41)	(0.12)	(0.98)	(1.14)	(0.78)	(0.60)
ISIC 17	0.1687***	0.0014*	-0.0003*	0.1313	0.0002	0.0004**	0.0012**
	(3.30)	(1.84)	(1.75)	(1.05)	(0.17)	(2.53)	(2.02)
ISIC 18	0.0907***	0.0009***	0.0001	0.0982**	0.0004	-0.0001	0.0006***
	(6.94)	(4.75)	(0.94)	(2.21)	(0.98)	(0.34)	(2.97)
ISIC 19	0.2474***	0.0021**	-0.0002	0.3207**	0.0028*	-0.0005	-0.0007
	(3.41)	(2.42)	(0.30)	(2.25)	(1.73)	(0.63)	(0.87)
ISIC 20	0.1009***	0.0008**	-0.0002**	0.0802	0.0007	0.0002***	0.0001
	(3.86)	(2.24)	(2.42)	(1.36)	(1.60)	(2.82)	(0.82)
ISIC 21	0.0760	0.0011*	0.0005	0.1498	0.0014	-0.0007	-0.0003
	(1.42)	(1.69)	(0.86)	(1.54)	(1.27)	(0.84)	(1.12)
ISIC 22	0.1171***	0.0010**	-0.0001	0.1310	0.0000	-0.0001	0.0011
	(3.07)	(2.02)	(0.19)	(0.99)	(0.05)	(0.14)	(1.47)
ISIC 24	0.1329***	0.0008*	-0.0005*	0.1425**	0.0013*	0.0000	-0.0005
	(4.31)	(1.89)	(1.90)	(2.16)	(1.95)	(0.19)	(0.99)
ISIC 25	0.1083***	0.0010**	-0.0001	0.0181	0.0010	0.0009***	0.0000
	(3.68)	(2.22)	(0.58)	(0.25)	(1.36)	(3.03)	(0.08)
ISIC 26	0.0251	0.0004*	0.0002	0.0640	0.0004	-0.0004	0.0000
	(1.56)	(1.65)	(0.65)	(1.18)	(0.80)	(0.78)	(0.07)
ISIC 27	0.2762	0.0038	0.0011	0.3941	0.0015	-0.0008	0.0023**
	(1.45)	(1.29)	(1.12)	(1.24)	(0.34)	(0.77)	(2.16)
ISIC 28	0.0720***	0.0003	-0.0004**	0.0197	0.0007**	0.0005**	-0.0003
	(4.75)	(1.41)	(2.09)	(0.58)	(1.99)	(2.31)	(1.18)
ISIC 29	0.1938***	0.0013	-0.0008*	0.1337	0.0011	0.0007	0.0002
	(2.82)	(1.32)	(1.75)	(1.02)	(0.95)	(1.09)	(0.20)
ISIC 31	0.2776***	0.0015	-0.0013	0.0373	0.0024	0.0024**	-0.0009
	(3.17)	(1.08)	(1.41)	(0.20)	(1.28)	(2.32)	(0.53)
ISIC 32	0.9370***	0.0079	-0.0013	1.0713**	0.0084	-0.0001	-0.0005
	(2.56)	(1.59)	(0.55)	(2.19)	(1.54)	(0.06)	(0.16)
ISIC 33	1.1092	0.0106	-0.0004	1.1227	0.0109	0.0005**	-0.0003
	(1.26)	(1.32)	(0.64)	(1.12)	(0.96)	(2.38)	(0.47)
ISIC 34	0.3180	0.0017	-0.0012	-0.0515	0.0031	0.0037*	-0.0014
	(1.61)	(0.65)	(0.56)	(0.16)	(1.22)	(1.76)	(0.61)
ISIC 35	0.1906**	0.0018	-0.0001	0.0433	0.0015	0.0015***	0.0003
	(2.27)	(1.61)	(0.34)	(0.37)	(1.07)	(2.62)	(0.93)
ISIC 36	0.1107***	0.0010***	-0.0001	0.0731*	0.0007*	0.0004***	0.0003
	(5.42)	(3.00)	(0.92)	(1.85)	(1.79)	(3.37)	(1.34)
Sector difference negative (percent of total sectors)	0.0	0.0	78.9	5.3	5.3	42.1	52.6
Percent positive and significant	73.7	57.9	0.0	26.3	21.1	47.4	15.8

Note: Difference in weighted relative efficiency (t-stats in parenthesis - *, **, *** indicate significance at a 10%. 5% and 1% level, respectively.). Numbers reported relates to the year 2003. A similar general pattern emerges using estimates from 2002. Incumbents = INC. Sector Switchers = SW. Exits = EXIT. Entrants = ENTRY.

TABLE 9: SECTOR SWITCHING AND EXIT DETERMINANTS - FIRM SPECIFIC EXPLANATIONS

	Sector Switching (SW2)			Firm Exit (EXIT)		
	(1)	(2)	(3)	(4)	(5)	(6)
Firm specific variables						
Relative efficiency (weighted)	-43.7414***	-15.1230**	-9.7153	-45.7931***	-22.2958***	-17.5795***
	(6.22)	(2.34)	(1.55)	(6.08)	(3.11)	(2.55)
Firm size (log)		-0.1257***	-0.0843***		-0.1592***	-0.1869***
		(7.05)	(4.46)		(7.16)	(7.91)
Firm age (log)		-0.1782***	-0.1182***		0.1367***	0.0218
		(4.71)	(2.98)		(3.54)	(0.61)
State owned enterprise (SOE)			-0.5335***			0.5090***
			(5.42)			(6.62)
Foreign owned firm (Multinational)			-0.2285***			-0.4127***
			(2.99)			(4.70)
Provincial dummies	Yes	Yes	Yes	Yes	Yes	Yes
Sector dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	24,363	24,363	24,363	24,363	24,363	24,363
Groups	10,570	10,570	10,570	10,570	10,570	10,570
Log Likelihood	-3872.61	-3827.66	-3809.49	-6572.56	-6519.94	-6464.44
Wald (chi-sq)	683.53	743.80	757.50	161.81	173.56	202.38
Likelihood ratio test (p-value)	0.00	0.00	0.00	0.01	0.00	0.00

Note: Dependent variable: Sector switching (SW2) and exit (EXIT). Random effects probit estimation. All estimations included a constant term and time dummies. t-values reported in parenthesis. *, **, *** indicate significance at a 10%, 5% and 1% level, respectively. Base: Food processing and HCMC. The total number of sector switchers and exits are 1,076 and 1,937 in the unbalanced panel, respectively.

TABLE 10: SECTOR SWITCHING AND EXIT DETERMINANTS

FIRM SPECIFIC EXPLANATIONS, CONTINUED

	SW2 (INC)	EXIT (INC)	SW2 (EXIT)
	(1)	(2)	(3)
Firm specific variables			
Relative efficiency (weighted)	-9.7675	-18.1121***	5.3856
	(1.54)	(2.61)	(0.35)
Firm size (log)	-0.1018***	-0.1963***	0.0703**
	(5.25)	(8.38)	(1.97)
Firm age (log)	-0.1219***	0.0148	-0.1465**
	(3.03)	(0.41)	(2.02)
State owned enterprise (SOE)	-0.5023***	0.5015***	-1.3764***
	(5.01)	(6.59)	(7.86)
Foreign owned firm (Multinational)	-0.2528***	-0.4323***	0.3400**
	(3.26)	(4.94)	(2.10)
Provincial dummies	Yes	Yes	Yes
Sector dummies	Yes	Yes	Yes
Observations	22,426	23,287	3,013
Groups	9,705	10,316	2,850
Log Likelihood	-3704.26	-6356.28	-1611.30
Wald (chi-sq)	770.98	211.18	386.95
Likelihood ratio test (p-value)	0.00	0.00	0.00

Note: See Table 9 for details.

TABLE 11: SECTOR SWITCHING AND EXIT DETERMINANTS - SECTOR SPECIFIC EXPLANATIONS

		All	SW2 (EXIT)	All	SW2 (EXIT)
		(1)	(2)	(3)	(4)
Sector specific variables					
SOE share of total sector (SR)	SW2	-0.1116***	-0.3165***	-0.1065***	-0.2977***
		(7.30)	(5.70)	(6.91)	(5.31)
	EXIT	-0.0397**		-0.0338*	
		(2.24)		(1.89)	
Multinational share of total sector (FR)	SW2	0.1682***	0.5464***	0.1410***	0.4237***
		(8.01)	(7.38)	(6.45)	(5.52)
	EXIT	0.0445*		0.0432*	
		(1.91)		(1.82)	
Sector concentration ratio (CR)	SW2	0.1183***	0.5633***	0.0583*	0.2982**
		(3.95)	(4.66)	(1.79)	(2.44)
	EXIT	-0.0251		-0.0277	
		(0.72)		(0.75)	
Sector efficiency level (EFF)	SW2	0.1420***	0.4452***	0.1183***	0.2984***
		(8.53)	(6.78)	(6.15)	(4.17)
	EXIT	0.0811***		0.0789***	
		(3.74)		(3.38)	
Sector effective rate of protection (ERP)	SW2	-0.0006***	-0.0027***	-0.0005***	-0.0021***
		(9.51)	(10.83)	(6.48)	(7.80)
	EXIT	0.0001		0.0002**	
		(1.50)		(2.06)	
Province dummies		No	No	Yes	Yes
Observations		24,363	3,013	24,363	3,013
Groups		10,570	2,850	10,570	2,850

Appendix

TABLE A: SECTOR DETAILS ON SECTOR SWITCHERS – INCLUDING ENTRANTS

Switch from / Switch to:	15	17	18	19	20	21	22	24	25	26	27	28	29	31	32	33	34	35	36	OTH	AGR	SER	Total switchers	Percent of total	Total exits	Percent of total
ISIC 15		1	1		2	1		11		1		4				1	1	1	1		6	70	101	(1.3)	756	(9.8)
ISIC 17	1		23	1	3	2	1	1	10											1	1	4	48	(3.9)	101	(8.2)
ISIC 18		24		14	2	1	5		3			2			1				3		1	27	83	(3.9)	246	(11.5)
ISIC 19		2	9		1				4		1	2	1						3			4	27	(3.8)	75	(10.6)
ISIC 20	3	2	1	1		6		3	5	3	1	5						4	130		4	33	201	(9.0)	231	(10.3)
ISIC 21	2	1	2		2		18		10	1		1							2			6	45	(3.4)	124	(9.4)
ISIC 22		1	2		1	25			2			2	1	1	2				1	1		8	47	(3.7)	136	(10.7)
ISIC 24	7	3		1	1	1	1		4	9		3		1		1			4		4	12	52	(4.0)	117	(9.0)
ISIC 25		2	3	4	2	7	5	5		1	1	11	3	2	1		2	5	9	1	1	17	82	(4.7)	144	(8.2)
ISIC 26					4	1	1	14	3		1	6		1		1			6		13	27	78	(2.7)	311	(10.6)
ISIC 27					1				1	2		16				1		1		1		3	26	(5.5)	41	(8.7)
ISIC 28	1		1	2	2	3	1	1	5	4	29		37	9		1	9	15	11		1	41	173	(6.5)	292	(10.9)
ISIC 29	1	1			1		1		3	1		33		11	1	2	5	3	2			17	82	(9.1)	101	(11.1)
ISIC 31						1			1			7	2		9		2		2			7	31	(6.0)	37	(7.2)
ISIC 32							1					4	1	4		2		1		2		2	17	(7.0)	23	(9.4)
ISIC 33										2		2	3					1	1			3	12	(9.3)	10	(7.8)
ISIC 34	1								2			14	6	2				23	1		1	17	67	(13.0)	49	(9.5)
ISIC 35	2				2				3			10	3	1			16		3			11	51	(6.9)	72	(9.7)
ISIC 36			2	1	104	3	4	7	8	3	2	15	3	1	4		1	1		1		48	208	(10.1)	212	(10.3)
Total switchers	18	37	44	24	128	51	38	42	64	27	35	137	60	33	18	9	36	55	179	7	32	357	**1,431**	(4.6)	**3,078**	(10.0)
Percent of total	(0.2)	(3.0)	(2.1)	(3.4)	(5.7)	(3.9)	(3.0)	(3.2)	(3.6)	(0.9)	(7.5)	(5.1)	(6.6)	(6.4)	(7.4)	(7.0)	(7.0)	(7.4)	(8.7)				(4.6)			
Total entrants	811	190	448	104	369	169	266	187	287	335	81	589	163	80	38	11	70	107	401				**4,706**			
Percent of total	(10.5)	(15.5)	(20.9)	(14.8)	(16.5)	(12.8)	(20.9)	(14.4)	(16.3)	(11.4)	(17.3)	(22.0)	(18.0)	(15.5)	(15.6)	(8.5)	(13.6)	(14.4)	(19.4)				(15.2)			

Note: Total number of firms switching from/to a particular sector (percentage in parenthesis). OTH = ISIC 16, ISIC 23, ISIC 30 and ISIC 37. AGR = Agriculture/Primary sector. SER = Service/tertiary sector. Only firms for which efficiency estimates could be calculated are included.

TABLE B: PRODUCTION FUNCTION ESTIMATION – SPECIFICATION TESTING

Sector 15	$\beta_{kl}=0$	$\omega^t=0$	$\mu=0$	$\gamma=0$
LL Restricted	-12,277	-12,191	-12,191	-12,986
LL Unrestricted	-12,191	-12,170	-12,170	-12,170
Test Statistic	172.99	41.60	42.94	1,633.25
Result	Reject null (1%)	Reject null (1%)	Reject null (1%)	Reject null (1%)
Sector 17♦	$\beta_{kl}=0$	$\omega^t=0$	$\mu=0$	$\gamma=0$
LL Restricted	-2,172	-2,166	-2,147	-2,264
LL Unrestricted	-2,166	-2,147	-2,147	-2,147
Test Statistic	13.28	37.64	1.18	233.72
Result	Reject null (1%)	Reject null (1%)	Do not reject	Reject null (1%)
Sector 18	$\beta_{kl}=0$	$\omega^t=0$	$\mu=0$	$\gamma=0$
LL Restricted	-3,831	-3,824	-3,816	-3,978
LL Unrestricted	-3,824	-3,807	-3,807	-3,807
Test Statistic	13.22	33.72	17.20	341.48
Result	Reject null (1%)	Reject null (1%)	Reject null (1%)	Reject null (1%)
Sector 19	$\beta_{kl}=0$	$\omega^t=0$	$\mu=0$	$\gamma=0$
LL Restricted	-1,223	-1,212	-1,211	-1,297
LL Unrestricted	-1,212	-1,206	-1,206	-1,206
Test Statistic	21.07	13.28	11.22	183.35
Result	Reject null (1%)	Reject null (1%)	Reject null (1%)	Reject null (1%)
Sector 20	$\beta_{kl}=0$	$\omega^t=0$	$\mu=0$	$\gamma=0$
LL Restricted	-3,524	-3,511	-3,510	-3,700
LL Unrestricted	-3,511	-3,507	-3,507	-3,507
Test Statistic	25.74	7.28	6.41	386.47
Result	Reject null (1%)	Reject null (10%)	Reject null (5%)	Reject null (1%)
Sector 21	$\beta_{kl}=0$	$\omega^t=0$	$\mu=0$	$\gamma=0$
LL Restricted	-2,087	-2,073	-2,069	-2,284
LL Unrestricted	-2,073	-2,065	-2,065	-2,065
Test Statistic	28.26	15.01	7.89	436.62
Result	Reject null (1%)	Reject null (1%)	Reject null (1%)	Reject null (1%)
Sector 22	$\beta_{kl}=0$	$\omega^t=0$	$\mu=0$	$\gamma=0$
LL Restricted	-2,013	-2,004	-2,001	-2,187
LL Unrestricted	-2,004	-1,993	-1,993	-1,993
Test Statistic	18.20	23.29	17.13	389.03
Result	Reject null (1%)	Reject null (1%)	Reject null (1%)	Reject null (1%)
Sector 24	$\beta_{kl}=0$	$\omega^t=0$	$\mu=0$	$\gamma=0$
LL Restricted	-2,288	-2,282	-2,280	-2,471
LL Unrestricted	-2,282	-2,277	-2,277	-2,277
Test Statistic	12.26	10.59	5.89	388.97
Result	Reject null (1%)	Reject null (5%)	Reject null (5%)	Reject null (1%)
Sector 25	$\beta_{kl}=0$	$\omega^t=0$	$\mu=0$	$\gamma=0$
LL Restricted	-3,085	-3,061	-3,064	-3,302
LL Unrestricted	-3,061	-3,061	-3,061	-3,061
Test Statistic	46.72	1.67	6.16	481.23
Result	Reject null (1%)	Do not reject	Reject null (5%)	Reject null (1%)
Sector 26♦	$\beta_{kl}=0$	$\omega^t=0$	$\mu=0$	$\gamma=0$
LL Restricted	-4,237	-4,216	4,169	-4,578
LL Unrestricted	-4,216	-4,168	-4,168	-4,169
Test Statistic	41.47	95.64	1.15	871.45
Result	Reject null (1%)	Reject null (1%)	Do not reject	Reject null (1%)

TABLE B CONTINUED: PRODUCTION FUNCTION ESTIMATION – SPECIFICATION TESTING

Sector 27	$\beta_{kl}=0$	$\omega^t=0$	$\mu=0$	$\gamma=0$
LL Restricted	-833	-821	-819	-847
LL Unrestricted	-821	-817	-817	-821
Test Statistic	23.86	9.36	4.10	51.44
Result	Reject null (1%)	Reject null (5%)	Reject null (5%)	Reject null (1%)
Sector 28	$\beta_{kl}=0$	$\omega^t=0$	$\mu=0$	$\gamma=0$
LL Restricted	-4,839	-4,794	-4,797	-5,014
LL Unrestricted	-4,794	-4,790	-4,790	-4,790
Test Statistic	90.55	7.40	14.00	450.22
Result	Reject null (1%)	Reject null (10%)	Reject null (1%)	Reject null (1%)
Sector 29	$\beta_{kl}=0$	$\omega^t=0$	$\mu=0$	$\gamma=0$
LL Restricted	-1,505	-1,499	-1,497	-1,618
LL Unrestricted	-1,499	-1,496	-1,496	-1,496
Test Statistic	11.89	6.92	3.13	245.49
Result	Reject null (1%)	Reject null (10%)	Reject null (10%)	Reject null (1%)
Sector 31♦	$\beta_{kl}=0$	$\omega^t=0$	$\mu=0$	$\gamma=0$
LL Restricted	-915	-894	-895	-962
LL Unrestricted	-894	-894	-894	-895
Test Statistic	40.78	1.59	1.18	134.48
Result	Reject null (1%)	Do not reject	Do not reject	Reject null (1%)
Sector 32	$\beta_{kl}=0$	$\omega^t=0$	$\mu=0$	$\gamma=0$
LL Restricted	-436	-424	-426	-473
LL Unrestricted	-424	-421	-424	-424
Test Statistic	24.75	5.30	3.91	99.79
Result	Reject null (1%)	Do not reject	Reject null (5%)	Reject null (1%)
Sector 33	$\beta_{kl}=0$	$\omega^t=0$	$\mu=0$	$\gamma=0$
LL Restricted	-215	-215	-217	-241
LL Unrestricted	-214	-213	-215	-215
Test Statistic	1.38	4.77	4.58	52.46
Result	Do not reject	Do not reject	Reject null (5%)	Reject null (1%)
Sector 34♦	$\beta_{kl}=0$	$\omega^t=0$	$\mu=0$	$\gamma=0$
LL Restricted	-780	-735	-736	-794
LL Unrestricted	-735	-732	-735	-736
Test Statistic	90.32	4.36	2.57	116.53
Result	Reject null (1%)	Do not reject	Do not reject	Reject null (1%)
Sector 35	$\beta_{kl}=0$	$\omega^t=0$	$\mu=0$	$\gamma=0$
LL Restricted	-1,258	-1,251	-1,255	-1,343
LL Unrestricted	-1,251	-1,242	-1,242	-1,242
Test Statistic	14.08	18.47	25.67	201.72
Result	Reject null (1%)	Reject null (1%)	Reject null (1%)	Reject null (1%)
Sector 36	$\beta_{kl}=0$	$\omega^t=0$	$\mu=0$	$\gamma=0$
LL Restricted	-3,655	-3,639	-3,641	-3,796
LL Unrestricted	-3,639	-3,629	-3,629	-3,629
Test Statistic	32.36	19.45	23.52	333.37
Result	Reject null (1%)	Reject null (1%)	Reject null (1%)	Reject null (1%)

♦ Tests are re-run for the restrictions $\beta_{kl}=0$ and $\omega^t=0$ imposing the restriction $\mu=0$. The results are confirmed.

TABLE C: THEORETICAL PROPERTIES OF ESTIMATED PRODUCTION FUNCTIONS

Sector	15	17	18	19	20
$\partial \ln y / \partial \ln x_1$: Mean	0.6040	0.8369	0.8606	0.8710	0.7846
% negative	0.00	0.00	0.00	0.00	0.00
$\partial \ln y / \partial \ln x_2$: Mean	0.3506	0.3116	0.2564	0.2164	0.3002
% negative	0.00	0.00	0.00	6.52	0.00
Curvature Violation (%)	0.13	0.00	0.00	24.51	0.00
Sector	21	22	24	25	26
$\partial \ln y / \partial \ln x_1$: Mean	0.7678	0.9611	0.6735	0.7532	0.7962
% negative	0.00	0.00	0.00	0.00	0.00
$\partial \ln y / \partial \ln x_2$: Mean	0.3492	0.3342	0.5477	0.4073	0.3732
% negative	0.00	0.00	0.00	0.42	0.00
Curvature Violation (%)	0.63	0.00	0.00	7.10	0.00
Sector	27	28	29	31	32
$\partial \ln y / \partial \ln x_1$: Mean	0.7932	0.8454	0.7271	0.5832	0.5398
% negative	0.00	0.00	0.00	5.41	0.54
$\partial \ln y / \partial \ln x_2$: Mean	0.2837	0.3120	0.4092	0.6088	0.6378
% negative	5.51	0.02	0.00	1.06	0.54
Curvature Violation (%)	36.23	3.58	0.00	59.89	7.80
Sector	33	34	35	36	
$\partial \ln y / \partial \ln x_1$: Mean	0.8236	0.8992	0.7967	0.8122	
% negative	0.00	0.00	0.00	0.00	
$\partial \ln y / \partial \ln x_2$: Mean	0.3375	0.2569	0.3068	0.3079	
% negative	0.00	29.56	0.10	0.06	
Curvature Violation (%)	0.00	51.06	3.50	2.34	

TABLE D: CONDITIONAL FIXED EFFECTS LOGIT

	Industry Switching			Firm Exit		
	(1)	(2)	(3)	(4)	(5)	(6)
Firm specific variables						
Relative efficiency (weighted)	-75.4019**	-86.7263**	-105.9120**	-146.5913**	-137.6718**	-134.8633**
	(2.06)	(2.26)	(2.61)	(2.18)	(2.08)	(2.05)
Firm size (log)		0.1710	0.2075		-0.1325	-0.1514
		(1.37)	(1.61)		(1.22)	(1.38)
State owned enterprise (SOE)		1.5040	1.5396		0.6695	0.6702
		(1.19)	(1.13)		(0.89)	(0.89)
Sector dummies	No	No	Yes	No	No	Yes
Observations	1,787	1,787	1,787	2,558	2,558	2,558
Groups	695	695	695	1,072	1,072	1,072
Log Likelihood	-640.18	-638.55	-627.17	-907.92	-906.76	-894.06
LR (p-value)	0.02	0.04	0.07	0.01	0.04	0.01

Note: Dependent variable: Sector switching (SW2) or firm exit (EXIT). Conditional fixed effects logit estimates. t-values reported in parenthesis. *, **, *** indicate significance at a 10%, 5% and 1% level, respectively. The total number of sector switchers and exits are 773 and 1,072 in the unbalanced panel, respectively.

TABLE E: COMPARISON BETWEEN INTRA-MANUFACTURING AND SERVICE SECTOR SWITCHERS

	(1)	(2)	(3)	(4)	(5)	(6)
Firm specific variables						
Relative efficiency (weighted)	-44.7841**	-45.4567**	-6.5822	-6.2422	-0.9871	-1.1072
	(2.44)	(2.44)	(0.74)	(1.16)	(0.12)	(0.13)
Firm size (log)			-0.1186***	-0.1235***	-0.1136***	-0.1196***
			(7.16)	(7.18)	(6.73)	(6.81)
Firm age (log)			0.0132	0.0139	0.0078	0.0065
			(0.43)	(0.43)	(0.25)	(0.20)
State owned enterprise (SOE)					0.0394	0.0788
					(0.37)	(0.72)
Foreign owned firm (Multinational)					-0.2253***	-0.2330***
					(3.46)	(3.53)
Province dummies	Yes	Yes	Yes	Yes	Yes	Yes
Sector dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,076	1,045	1,076	1,045	1,076	1,045
Pseudo R-squared	0.16	0.17	0.19	0.21	0.20	0.22

Note: Dependent variable: Switching to the tertiary sector (SER). Pooled probit estimates – marginal effects. All estimations included a constant term and time dummies. t-values (reported in parenthesis) are heteroskedasticity robust. *, **, *** indicate significance at a 10%, 5% and 1% level, respectively.

DATA DESCRIPTION

The data in this paper are drawn from a census of registered enterprises collected by the Vietnamese General Statistics Office (GSO) in 2001-2004 covering all 64 provinces. Each firm has a unique tax code which enables us to follow the same enterprise over time even if they change location, sector or legal ownership type. The census collects detailed data in all production sectors for non-household enterprises (registered at the province level), including agricultural (primary), manufacturing and industry (secondary), and service sector (tertiary) firms.[30] Agricultural cooperatives and the forestry sector are excluded. However, in this paper we focus exclusively on the manufacturing sector (ISIC 15 – ISIC 37).

Enterprises with a business license and a tax code which are not operating and firms which merge with another enterprise are excluded. Business units that do not keep independent business records, such as branches, are assigned to the enterprise headquarter. If an enterprise is engaged in different production activities, the main sector is defined as the one which generates the largest share of total gross revenue. The different production activities are documented at the 4-digit ISIC level (6-digit in 2004).

The definition of legal ownership form changed between the census years. We use the following eleven ownership categories based on the Census information: 1) Central state owned enterprise, 2) Local state owned enterprise, 3) Joint stock with state involvement, 4) Cooperative or collective company, 5) Private enterprise, 6) Partnership, 7) Private limited liability company, 8) Joint stock without State, 9) 100 percent foreign owned enterprise, 10) Joint venture (state owned and foreign enterprises), 11) Joint venture (Non-state and foreign enterprises). The share of state/private/foreign involvement is not well documented in all census years for categories 3), 10) and 11). Using the scarce information on ownership shares available we decided in this paper to classify 1-3 as state owned enterprises, 4-8 as private enterprises and 9-11 as enterprises with foreign involvement. The

[30] Household establishments (registered at the district level) are a dominant part of the Vietnamese business environment (in terms of numbers), but are not covered in this Enterprise Census. According to the 2002 Establishment Census (GSO, 2004), enterprises registered at the provincial level (enterprises covered by the data used in this paper) accounted for 2.1 percent of all business establishments in 2002, meaning that over 2.5 million household businesses are operating in Vietnam. Despite representing a small proportion of the total number of establishments, the enterprises covered by the account for most of the registered turnover by Vietnamese establishments (97 percent GSO (2004)). We acknowledge that household businesses operate relatively more informally, which will bias the reported turnover estimate downwards. Nevertheless, the firms covered in this paper still account for a very large proportion of the total production in the Vietnamese economy.

ownership variable is therefore an approximation, and we recognize there are "grey" areas associated with this classification.

Given that only registered firms under the enterprise law are covered in the GSO data, care should be taken when analysing some aspects of firm entry. The questionnaires after 2001 did not collect information on establishment year, and given that firms entering in 2002, 2003 or 2004 may have existed for several years before registering, doubt exists as to whether or not they constitute entrants strictly speaking. Registration may be beneficial to firms (easier access to credit etc.), but it also makes firms more visible to government authorities (and especially tax collectors). It is therefore uncertain during which stage in their life-cycle a firm decides or is forced to register. Given the nature of the data, the present paper focuses on efficiency differentials between incumbents, exits and sector switching firms.

All annual censuses provide the information necessary to measure efficiency at the firm-level. We use real value added as our output measure, calculated as the sum of gross profits and total labour costs, deflated by a GDP-deflator defined at the two-digit sector level. Real capital stock is measured as end-period capital stock book value deflated by an aggregate capital deflator and re-valued by changes in prices of the capital stock. The labour input is measured as total employment (only wage or salary receiving employees are included). Total payments to labour include: a) Wage, bonus, allowances and other incomes, b) Payments in form of social insurance, c) Other incomes those are not accounted in business costs, and d) Contributions of the owner to social insurance, health care and trade union. Material inputs include all indirect costs plus raw material costs. Material inputs are deflated by a producer price index defined at the two-digit sector level.