Industry Switching in Developing Countries

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Firm turnover (i.e., firm entry and exit) is a well-recognized source of sector-level productivity growth. In contrast, the role and importance of firms that switch activities from one sector to another is not well understood. Firm switchers are likely to be unique, differing from both newly established entrants and exiting firms that are closing down operations. In this study, we develop an empirical model that examines switching behavior using data from Vietnamese manufacturing firms during the 2001–2008 period. The diagnostic shows that switching firms exhibit different characteristics and behavior than do entry and exit firms. Switchers tend to be labor intensive and to seek competitive opportunities in labor-intensive sectors in response to changes in market environments. Moreover, resource reallocation resulting from switching forms an important component of productivity growth. The topic of switching merits attention in the future design of firm surveys across developing countries and in associated analytical studies. JEL codes: D21, L6, O14 firm dynamics, sector switching, productivity, Vietnam

Disentangling and defining the contribution of firm turnover to sector-level productivity growth is an important challenge in development economics research[1] that is also relevant to policy making. This primary motivation for this study was reinforced when we discovered that some contributions to the literature (e.g., Aw et al. 2001) categorize all firms leaving a particular sector as exit firms even if these firms do not actually close but instead switch to production

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1. See Caves (1998), Bartelsman and Doms (2000), Tybout (2000), and Syverson (2011) for background.

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in a different sector. Similarly, new entrants in a given sector regularly include both genuinely new firms and firms that previously operated in other sectors. Some studies of firm dynamics (e.g., Bernard et al. 2006) have followed establishments over time, treating sector switchers as incumbents. The classification of firms that change their main sector of production potentially affects the understanding of the reallocation processes that enhance productivity.

This thesis is substantiated by the literature on firm capabilities, including Sutton (2005) and Bernard et al. (2010), which suggests that the average productivity of switchers is likely to differ from that of real entrants/exits if the switching firms have underlying capabilities (e.g., know-how and working practices held within the firm setup) that affect the firm's level of productivity. Switchers have already incurred sunk costs and gained knowledge related to their capabilities when they initially established production. For a given postentry/switching productivity draw (in the spirit of learning models on the evolution of industry), this situation suggests that the average productivity level of switchers exceeds that of new entrants. If switching firms exhibit specific characteristics and are motivated differently than real entrants/exits, then these dynamics must be understood when assessing changes in economic policy or the external environment to determine their effect on productivity.[2]

Accordingly, rather than examining the drivers of productivity growth within firms, this study describes the dispersion of productivity across manufacturing firms in Vietnam (using census data for the period 2001–2008), with a special focus on disentangling the contribution of firm turnover to sector-level productivity growth. An industry switcher is defined as a firm whose main year t product and main year $t-1$ product belong to different four-digit industries. Although this definition may classify marginal changes in the product mix as industry switching, the data show that most industry switchers are one-product firms. Consequently, this characterization of industry switching corresponds to extreme changes in production.

This study aims to analyze the processes by which firms decide to enter, exit, or switch sectors, to make predictions about the expected relative productivity differences between firms, and to establish the contribution to productivity growth of firm turnover and sector switching (as distinguished from the "real" entry and exit of firms). Given that one of our core objectives is to diagnose the extent to which differences exist between entry, exit, and switching firms, we consider the association between firm turnover and the observed characteristics of firms and sectors as well as the association with exogenous shocks, such as regulatory changes and trade liberalization.[3] Finally, factors correlated with

2. Recent literature has focused on changes in the product mix by surviving firms as the main channel of productivity growth; see Bernard et al. (2009, 2010), Goldberg et al. (2010), and Eckel and Neary (2006).

3. On the impact of trade liberalization on productivity growth, see Melitz (2003) and Pavcnik (2002), and see Eslava et al. (2004), Olley and Pakes (1996), and Stiroh and Strahan (2003) on how deregulation induces resource allocations within an industry.

Table 1. Conceptual Framework and Definition of Switchers

	Time ($t-1$)	Time (t)		Time ($t+1$)
1	Firm not operating/not established	Manufacture of furniture (ISIC 3610)	(entry)	Manufacture of furniture (ISIC 3610)
2	Manufacture of furniture (ISIC 3610)	Manufacture of furniture (ISIC 3610)	(exit)	Closed
3	Sawmilling and planning of wood (ISIC 2010)	Manufacture of furniture (ISIC 3610)	(switch in)	Manufacture of furniture (ISIC 3610)
4	Manufacture of furniture (ISIC 3610)	Manufacture of furniture (ISIC 3610)	(switch out)	Sawmilling and planning of wood (ISIC 2010)
5	Manufacture of furniture (ISIC 3610)	Manufacture of furniture (ISIC 3610)	(incumbent)	Manufacture of furniture (ISIC 3610)

Source: Authors' illustration.

switching behavior are explored empirically and compared to factors related to entry and exit in Vietnam.

Vietnam is a populous Southeast Asian economy that has experienced rapid economic growth since 1986, when the comprehensive economic reform process known as Doi Moi was initiated. During the past decade, Vietnam has been one of the fastest-growing economies in the world, with GDP growing at an annual rate of 7.3 percent from 2000 to 2009 (World Bank 2011). The Doi Moi process has included wide-ranging reforms of enterprise, commercial, and investment laws, especially since 2000. These reforms have been coupled with extensive trade liberalization, accession to the WTO in 2007, and significant inflows of foreign direct investment. These features offer further motivation for understanding industry evolution in a dynamic transition economy.

Section I below defines sector switching and specifies three testable hypotheses. Section II presents the empirical approach, and section III describes the data. Empirical results follow in section IV, and section V concludes that correctly assessing the respective contributions of entry, exit, and switching firms to productivity growth has important analytical and policy implications.

I. Defining Industry Switching

Industry switching can be defined at various levels of sector aggregation. Switching is defined in this study at the four-digit International Standard Industrial Classification (ISIC) level, and the conceptual differences between switchers, entrants, exits, and incumbents are illustrated in table 1.[4] Differences in the classification of firms are considered from the perspective of a firm that manufactures furniture (ISIC 3610) and switches in or out of sawmilling and planing of wood (ISIC 2010). In previous studies, switchers-in

4. In this study, the four-digit industry definition is our focus. For analysis at the two-digit level, see Newman et al. (2011).

(captured in row 3) were classified as either new entrants (row 1), as in Aw et al. (2001), or as incumbents (row 5), as in Eslava et al. (2004). Similarly, switchers-out (captured in row 4) have been labeled exits (row 2) or incumbents (row 5).[5] Next, we focus on the differences in the way the literature has treated sector switchers.[6]

The above definition of industry switching has implications for multiproduct firms. The data contain information on whether firms produce more than one product (six-digit) but do not specify what products these firms produce. Thus, a multiproduct firm producing two products will be regarded as a sector switcher when its percentage rates of production marginally change from 49 percent of product 1 and 51 percent of product 2 to 51 percent of product 1 and 49 percent of product 2. Therefore, producers of more than one product are controlled for in the empirical analysis, and multiproduct firms are excluded as a robustness check. The data clearly show that switching in Vietnam is not limited to changes in the product mix. In fact, the majority of switching, as defined in this study, is associated with single-product firms.

Several empirical papers in the literature (see Bartelsman and Doms (2000) and Syverson (2011) for reviews) have shown that enterprise turnover contributes significantly to sector-level productivity growth, and various models seek to explain why productivity should enhance reallocation. Vintage models of industry dynamics suggest that, on average, new entrants are more productive because their productivity is enhanced by the latest technology. It is assumed that firm productivity remains constant over time unless it is affected by a random shock. Therefore, it is expected that the productivity of entrants will dominate that of incumbents and switchers, and firm exit occurs when productivity relative to entrants drops below a certain threshold. Eslava et al. (2004) and Foster et al. (2008) provide recent empirical evidence supporting these vintage model predictions.

Learning models on the evolution of industry yield similar insights regarding the mean productivity differences between entrants and exits, but they differ from vintage models with respect to the expected relative productivity between incumbents and entrants. For a given distribution function summarizing the heterogeneity in productivity among firms that are strictly decreasing in current productivity, Hopenhayn (1992) shows that the productivity distribution of incumbents stochastically dominates the productivity distribution of entrants.

5. Other examples of switching firms observed in the data include switchers from the manufacture of three-wheeled, no-motor vehicles (ISIC 3591) to the manufacture of motor vehicles (ISIC 3410), an example of a switch to a more technology-intensive sector. Switchers are also observed from the building of ships (ISIC 3511) to the repairing of ships and boats (ISIC 3513); these are closely related sectors for which the latter is more service driven.

6. It is possible that entering firms may immediately switch out/exit or that switching-in firms may immediately exit or switch out. In the analysis, these firms are treated as both switchers and entrants/exits.

Learning models have received empirical support in several papers, including Bartelsman and Doms (2000).

The seminal literature on the evolution of industry and industry dynamics does not consider the possibility that firms may choose to reallocate resources into new sectors to maximize profits or to avoid exiting the industry. At first glance, the importance of this possibility may not be clear. Changes to the main area of production may require a firm to undergo a learning period to gain knowledge of new production processes, and this change may be so fundamental that it may be similar to closing the business and opening a new firm in another sector. However, recent literature on the importance of firm/owner entrepreneurial capabilities (see Sutton [2005] for initial thoughts along these lines) suggests that productivity differences between switchers and entrants/exits should be expected. Given that switching firms have already incurred sunk costs when they initially established production (and have acquired, in the process, knowledge of different business procedures, access to public utilities and general market conditions), the sunk costs of switching sectors are arguably lower than the sunk costs facing new firms entering a sector.[7] Moreover, the variance of the postswitch productivity draw is expected to be smaller than that of entrants into the same sector due to the business experience gained from previous production (i.e., knowledge of the firm's underlying capabilities).

The above considerations lead to the following three testable hypotheses regarding productivity differences between entrants, exits, and incumbents, on the one hand, and switchers, on the other:

(i) Switchers-in versus Entrants

The aggregate sunk costs for switching firms will be below those of entrants. Switchers-in will have greater knowledge of both their productivity potential (entrepreneurial capabilities) and general market conditions and will therefore be likely to have a higher level of productivity than entrants.

(ii) Switchers-out versus Exits

Switchers-out will be more productive than exits. Switchers-out would also have exited if their expectations about future profitability (which depends on productivity) were equal to or less than that of exit firms. Switching depends on the observed characteristics of one sector relative to those of other sectors because expectations about future market conditions play an important role in the decision to switch and/or exit.

(iii) Switchers versus Incumbents

Switchers will be less productive than incumbents. They face a sunk cost of switching, and their information regarding their productivity

7. Switching costs may be interpreted, for example, as a depletion of capital stock as a result of certain machinery or equipment becoming obsolete. Investment in new machinery or equipment would be considered an investment that adds to the firm's capital stock.

and existing market conditions is related to their former sector rather than the new sector.

II. Empirical Approach

This section first outlines the method used to measure productivity and then describes the empirical model detailing the firm-, sector-, and industry-specific factors included in the analysis.

Productivity Measurement

Following Aw et al. (2001), we used an index number approach to estimate total factor productivity for firms in each manufacturing subsector.[8] Productivity is measured relative to the mean level of productivity in a given sector and year. To analyze productivity over time, this productivity differential is linked to changes in the reference levels of productivity from year to year.

The sector-specific total factor productivity (TFP) index is given in equation (1). The productivity of a firm is compared, in any given time period, relative to the average productivity of the sector.[9]

$$\begin{aligned} \omega_{ijt} = {} & \left(\ln Y_{ijt} - \overline{\ln Y_{jt}}\right) + \sum_{\tau=2}^{t}\left(\overline{\ln Y_{jt}} - \overline{\ln Y_{jt-1}}\right) \\ & - \sum_{m=1}^{k}\frac{1}{2}\left(s_{mijt} + \overline{s_{mjt}}\right)\left(\ln X_{mijt} - \overline{\ln X_{mjt}}\right) \\ & + \sum_{\tau=2}^{t}\sum_{m=1}^{k}\frac{1}{2}\left(\overline{s_{mjt}} + \overline{s_{mjt-1}}\right)\left(\overline{\ln X_{mjt}} - \overline{\ln X_{mjt-1}}\right), \end{aligned} \tag{1}$$

where Y_{ijt} measures the output of firm i in sector j in year t, X_{mjit} is the amount of input m used by the firm, and s_{mjit} is the expenditure of the firm on input m as a share of the total expenditure.

8. Data are only available for the value of inputs and output, so it is not possible to estimate physical productivity measures as suggested by Foster et al. (2008).

9. The construction of the index is complicated by the fact that new four-digit sectors emerged over the course of the sample period. This situation prevents us from linking to the reference productivity level for each year. Where this occurs, the reference productivity level for the two-digit sector as a whole is used. The reduced sample that does not use this correction yields very similar results (available on request).

Firm-specific productivity scores are used to compute a measure of productivity for each subsector in each year in equation (2).

$$wpr_{jt} = \sum_{i=1}^{n} w_{ijt}\omega_{ijt}, \tag{2}$$

where $w_{ijt} = \sum_{i=1}^{n} \left(y_{ijt} \Big/ \sum_{i=1}^{n} y_{ijt} \right)$.

Equation (3) shows how this weighted productivity measure can be decomposed into the average unweighted productivity level of each subsector $\bar{\omega}_{jt} = \frac{1}{n}\sum_{i=1}^{n} \omega_{ijt}$ and a term that captures how the allocation of resources contributes to productivity (Olley and Pakes 1996).

$$wpr_{jt} = \omega_{jt} + \sum_{i=1}^{n} \left(w_{ijt} - \bar{w}_{jt}\right)\left(\omega_{ijt} - \bar{\omega}_{jt}\right). \tag{3}$$

This measure is used to consider the proportional contribution of switchers to aggregate productivity growth and to compare productivity between incumbents, entrants, exits, and switchers.

Empirical Model

Productivity is critical to firm decision making, but many other firm characteristics and sector-specific characteristics can be expected to play a role in switching behavior. Equations (4a) and (4b) show the empirical models of the decisions to switch into a sector and out of a sector, respectively.

$$\Pr\left(switch\_IN_{ijt}\right) = f\begin{pmatrix} \omega_{it}, k_{it}/l_{it}, \log(l_{it}), SOE_{it}, FOE_{it}, multiprod_{it}, \\ \omega_{jt}, k_{jt}/l_{jt}, \log\left(l_{jt}\right), CR_{jt}, FR_{jt}, SR_{jt}, TR_{jt}, EX_{jt} \\ \gamma_i, \theta_j, \tau_t, \vartheta_p \end{pmatrix}, \tag{4a}$$

$$\Pr(switch\_OUT_{imt}) = f\begin{pmatrix} \omega_{it}, k_{it}/l_{it}, \log(l_{it}), SOE_{it}, FOE_{it}, multiprod_{it}, \\ \omega_{mt}, k_{mt}/l_{mt}, \log(l_{mt}), CR_{mt}, FR_{mt}, SR_{mt}, TR_{mt}, EX_{mt} \\ \gamma_i, \theta_m, \tau_t, \vartheta_p \end{pmatrix}, \tag{4b}$$

where ω_{it} is the productivity of firm *i* in period *t*, k_{it}/l_{it} is the capital-labor ratio, $\log(l_{it})$ is the log number of employees, SOE_{it} is a dummy indicator for whether the firm is state owned, FOE_{it} is a dummy indicator for whether the firm is foreign owned, and $multiprod_{it}$, is a dummy indicator for whether the firm produces more than one product. The subscript j in equation (4a) refers to the new sector entered, and the subscript m in equation (4b) refers to the old sector exited. For example, ω_{jt} is the average productivity level in sector j that the firm switches into in period t, and ω_{mt} is the average productivity level in sector m that the firm switches out of in period t. Other sector-specific variables include the following: k_{jt}/l_{jt} refers to the average capital-labor ratio; $\log(l_{jt})$ is the log average size of firms; CR_{jt} is the concentration ratio; FR_{jt} is the concentration of foreign-owned firms; SR_{jt} is the concentration of state-owned firms; TR_{jt} is the tariff rate; and EX_{jt} is the level of exports. Additionally, γ_i represents firm-specific fixed effects, θ_j and θ_m are sector-specific fixed effects, τ_t represents time dummies, and ϑ_p represents province fixed effects.

The decisions to enter, exit, or switch sectors are modeled in a similar fashion. For entry, as in equation (4a), the characteristics of the new sector are included, and for exit, as in equation (4b), the characteristics of the former sector are used. The inclusion of firm-specific fixed effects eliminates any time invariant unobserved heterogeneity influencing firms' decisions. As such, the identification of the effect of the firm-specific effects included in the model comes from the within-firm variation in firm characteristics. It is possible that some time-varying factors remain unobserved, so the (i, t) indexed variables are endogenous to firm behavior and therefore to the entry, exit, and switching outcomes. Consequently, no claim is made that results are causal.[10] Before presenting the data in section III, the motivation for the choice of firm-, sector-, and industry-specific variables included in the model is explained along with expectations regarding their influence.

Firm-Specific Factors

First, a firm's productivity level is a critical factor in decisions regarding whether to stay in production, switch sectors, or exit production altogether.[11] Firms evaluate their expected current and future profits on the basis of their own observed productivity level.

Second, capital accumulation is a key mechanism for increasing profitability. Thus, capital-intensive firms should increase profitability over time and should be less likely to exit and more likely to enter as an industry evolves. Bernard et al. (2006) have found that a firm's capital-labor ratio is an important determinant of decisions to switch sectors in the United States. In Vietnam, where labor-intensive firms arguably have a comparative advantage, labor-intensive firms are unlikely to have a higher probability of exit.

10. The authors are grateful to Alain de Janvry and Elisabeth Sadoulet for emphasizing this point.

11. Because there are difficulties in comparing productivity levels across sectors, the firm's rank in the productivity distribution is considered an alternative measure.

Third, the link between firm size and probability of survival has long been considered important.[12] This link may affect a firm's decision to switch sectors because larger firms may find it more difficult to retrain employees. To capture the effect of this factor, firm size, measured by number of employees, is included.

Fourth, arguably, ownership structure influences firm decision making in Vietnam, even after firm productivity, capital accumulation, and size are controlled for. The political hierarchy in the management structures of Vietnamese state-owned enterprises (SOEs) is likely to limit intersector dynamics; consequently, SOEs are unlikely to switch sectors. In contrast, the ongoing reform/privatization process has led to the dismantling of many SOEs, so one might expect a positive association between state ownership and firm closure. Foreign-owned enterprises (FOEs), or enterprises with some foreign participation, are also expected to be more "locked into" specific sectors because of legal constraints.[13]

Fifth, Bernard et al. (2010) and Goldberg et al. (2010) explain reallocations that enhance productivity through changes in product mix. Thus, multiproduct firms will be in a better position to churn products (i.e., dropping inefficient products to produce more efficient products) in response to changes in the economic environment and thus may be less likely to switch sectors.

Sector-Specific Factors

We will now consider a range of sector-specific measures for establishing the competitiveness of a sector relative to other sectors in the industry.

First, higher levels of average productivity in a sector make it more difficult for firms to compete. Because of difficulties in comparing productivity across sectors, we also consider the dispersion in productivity distribution a unit-neutral measure of productivity. It is easier to survive in sectors with a larger dispersion in productivity because low productivity levels are more likely to be tolerated. Accordingly, it is expected that firms are less likely to leave, and more likely to enter, sectors with a wider dispersion of productivity distribution.

Second, the average capital intensity of the sector, as measured by the capital-labor ratio, may be influential in determining a sector's competitiveness. Audretsch (1991) found that firm survival is much less likely when there is a high capital-labor ratio, but Bernard et al. (2006) found that firms in

12. Firm age is an important predictor of firm survival, but the data do not identify this characteristic. The inclusion of firm-specific fixed effects controls for any initial differences in the survival or switching probability of firms that are attributable to differences in age at the start of the sample period.

13. Until recently, foreign and domestic investors were governed by two separate laws. A new investment law came into effect in July 2006 (CIEM 2006). It aims to equalize opportunities for domestic and foreign investors.

labor-intensive sectors switched into more capital-intensive sectors when exposed to competitive pressures from imports.

Third, the average size of firms within a sector may affect switching decisions. It is more difficult for entering and switching firms to compete in a sector where the size of the average firm is large, given the economies of scale already enjoyed by incumbents. Consequently, it is expected that firms are more likely to enter or switch into sectors where firms are smaller, on average.

Fourth, the sector concentration ratio (CR), defined as the ratio of the accumulated revenue of a sector's four largest firms to total revenue in the sector, is likely to be influential because it is a proxy for sector competition. Siegfried and Evans (1994) document that a high CR may strengthen collusion efforts among incumbent firms and increase the likelihood that firms will attempt to prevent entry and maintain higher expected profits. In contrast, Audretsch (1991) shows that a high CR helps the survival rates of new entrants in the short run. On balance, it is likely that a high CR reduces incentives to move out of a given sector and is indicative of barriers to entry.

Industry-Specific Factors

Changes in exogenous conditions may "shock" enterprises, leading to different productivity outcomes. Trade liberalization, in the form of a tariff reduction, may lead to low-productivity firms exiting sectors or switching to sectors that remain protected. Because trade liberalization may lead to opportunities in new export markets, however, it is hypothesized that more productive firms will switch to sectors where these opportunities emerge.

In the manufacturing industry in Vietnam, it is critical to explore the impact of the privatization of SOEs and the entry of FOEs into the market. Where an entire industry is undergoing deregulation, a significant amount of productivity-enhancing reallocation is likely to take place. The dominance of state enterprises (SR), as measured by the share of total sector output controlled by SOEs, is likely to play a role in exit and switching decisions. Preferential treatment of SOEs makes it difficult for non-SOEs to compete and may force efficient non-SOE firms to exit (or to decide not to enter) industries with high concentrations of SOEs.

In contrast, during the transition from a planned to a market economy, the SOE share of material inputs bought at market conditions may increase the attractiveness of industries with high concentrations of SOEs for smaller, private enterprises acting as producers of intermediates for SOEs, as suggested by Jefferson and Rawski (1994) in their study of China. An added dimension is that deregulating SOEs may increase competition as a result of the decline in the level of protection and barriers to entry, thereby inducing firms to switch.

Similar arguments apply when considering the dominance of foreign enterprises (FR) in a sector, or the FOE share of total sector output. Aitkin and Harrison (1999) emphasize that preferential treatment of foreign-owned firms may distort competition, forcing out equally efficient domestically owned counterparts. However, governments grant special treatment to FOEs to promote technology transfer, so FR may create a basis for domestically owned firms to produce intermediate inputs, as is the case with SOEs. Whether FR is positively or negatively related to sector switching and firm exit depends on which of these contrasting effects dominate.

III. Data

The data originate from the 2001–2008 Enterprise Surveys collected annually by the General Statistics Office of Vietnam. These surveys include all enterprises with 30 employees or more registered in Vietnam, a representative sample of smaller firms,[14] and all firms whose main activity is in the manufacturing sector.[15] Therefore, the sample includes approximately 50,000 firms.

The extent of diversification within the manufacturing sector is substantial, as illustrated by the number of four-digit subsectors within each two-digit sector (table 2). There are no data available to examine product diversification at the six-digit level, as in Bernard et al. (2010) and Goldberg et al. (2010), but we know that between 5 and 19 percent of manufacturing firms produce more than one product. For these firms, diversification across a product mix is a potential source of productivity growth that cannot be captured in this analysis. However, changes in the product mix that make one activity relatively more important than another when defined at aggregated levels are captured by the definition of switching. The factors that determine the decision of multiproduct firms to change their product mix are likely to differ from those that determine the decision of single-product firms to completely switch sectors, making this an important control variable in the analysis.

The manufacturing sector in Vietnam is characterized by significant enterprise dynamics (table 2). This characterization is consistent with much of the existing literature on firm dynamics that finds a positive correlation between exit and entry rates at the sector level (Dunne et al. 1988, 1989; Disney et al. 2003; Roberts and Tybout 1996). Following Bernard et al. (2006), our focus here is

14. Trade and tariff data are from the World Integrated Trade Solutions database. Trade data at the four-digit level for Vietnam with the rest of the world are taken from the UN COMTRADE database. Tariff data refer to the four-digit weighted average Most Favored Nation tariff applied to imports collected from the UNCTAD-TRAINS database for all imports into Vietnam. For further details on the data and descriptive statistics, see Newman et al. (2011).

15. One caveat of the data is that they do not indicate whether an enterprise has more than one establishment, so it cannot be determined whether multiestablishment enterprises differ from single-establishment enterprises in terms of their switching behavior. Moreover, given that only a representative sample of small firms is included, it is possible that the entry, exit, and switching behavior of small firms is not fully observed. As a robustness check, firms with 30 employees or more are also analyzed in isolation.

TABLE 2. Sector Diversification and Dynamics

	Number of four-digit subsectors	Multiproduct (%)	Exits (%)	Entrants (%)	Switch (four-digit) (%)	Switch excl. multiprod. (four-digit) (%)
15 Food products and bev.	21	10.83	49.63	68.35	13.42	12.48
16 Tobacco products	3	19.05	42.86	33.33	68.57	67.86
17 Textiles	8	8.26	46.06	78.01	27.83	26.13
18 Wearing apparel	3	5.09	53.35	84.36	6.44	5.90
19 Tanning/ dressing leather	4	7.98	48.02	74.98	13.07	12.00
20 Wood and wood products	8	12.79	53.05	81.13	19.51	16.57
21 Paper and paper products	3	9.10	48.15	77.67	24.64	22.79
22 Publishing, printing, etc.	7	5.06	49.70	88.60	15.17	14.33
23 Coke, refined petroleum	4	7.14	55.71	82.86	14.71	14.29
24 Chemicals and chem. prod.	9	11.47	47.92	78.59	15.28	13.60
25 Rubber and plastics	4	8.47	42.22	80.92	15.14	14.08
26 Other nonmetallic mineral	9	16.77	49.64	69.16	15.43	13.96
27 Basic metals	4	16.58	44.19	81.80	26.27	24.47
28 Fabricated metals	8	10.11	48.89	86.88	26.72	24.03
29 Machinery and equipment	15	9.40	48.52	81.31	32.26	29.57
30 Office equipment	4	6.09	61.74	93.91	23.01	22.64
31 Electrical machinery	7	12.12	51.01	79.60	28.12	25.82
32 Radio, television, etc.	3	7.23	51.98	82.10	19.61	17.15
33 Medical, precision and opt.	5	7.48	47.64	80.31	19.37	18.80
34 Motor vehicles, transport	4	13.58	57.21	72.96	28.46	25.88
35 Other transport equip.	8	17.79	46.54	73.91	35.61	33.30
36 Furniture	18	9.86	52.77	82.98	17.13	16.16
37 Recycling	2	10.96	42.47	90.41	20.83	19.53

Source: Authors' calculations using Vietnam Enterprise Surveys 2001–2008.

Note: Statistics are based on all enterprises operating in 2008 whose main output was in the manufacturing sector at some stage between 2001 and 2008.

exclusively on four-digit switching, which ranges from 6 to 35 percent.[16] Moreover, the majority of this switching is attributable to single-product firms.

In comparison, Bernard et al. (2006) find that approximately 8 percent of U.S. manufacturing firms switched activities during five-year periods between 1977 and 1997. The fact that switching is common in Vietnam is indicative of an evolving industrial sector where new opportunities are emerging as a result of deregulation, trade liberalization, and on-going structural transformation. The extent of observed switching behavior adds further weight to the argument that the effects of switching on productivity should be separated from the effects of standard exit/entry. A better understanding of the forces responsible for switching may be helpful in designing effective economic policy in developing countries.

IV. Empirical Results

Our empirical results are grouped under the following four headings: productivity growth, switching, firm entry and exit, and robustness checks.

Productivity Growth

Productivity is first estimated for each subsector of the manufacturing industry. Output is the total revenue of the firm deflated by the two-digit sector-level GDP deflator. Inputs are composed of the following elements: (i) labor, measured as the total number of persons employed at the end of the year; (ii) capital, measured as the total assets of the firm at the end of the year deflated by a capital price series; and (iii) other costs of production deflated by the two-digit sector-level producer price index. The cost of labor is the firm's reported wage bill deflated by the producer price index, and the cost of capital is charged at the average annual commercial bank lending rate in each year plus an estimated depreciation rate of 2 percent per annum.[17]

Each sector's trend in productivity from 2001 to 2008 is computed using the index number approach outlined in section II.[18] In all sectors in all years, the covariance between output and productivity is positive, indicating that more productive firms account for a larger share of output (table 3). The size of the covariance term does not change significantly over time, suggesting that the main source of productivity growth can be traced to changes in the productivity level of firms rather than to increases in the concentration of output in

16. As many as 68 percent of firms switched activity across four-digit sectors in the tobacco products sector (table 2), but this sector consists of very few firms and is not included in the main analysis.

17. Summary statistics for each of the variables are provided in table A1.

18. The figures are computed based on a two-digit level of aggregation for presentation purposes. The results are very similar when productivity is measured at the four-digit level and using the Olley and Pakes (1996) approach for each two-digit subsector.

TABLE 3. Weighted Productivity Estimates and Decomposition (Manufacturing Sample)

Activity 15	*n*	Weighted	Covariance	Activity 17	*n*	Weighted	Covariance
2001	2,715	.174	.115	2001	385	.299	.093
2002	2,962	.198	.124	2002	471	.301	.118
2003	3,046	.215	.140	2003	551	.643	.120
2004	3,280	.494	.149	2004	635	.495	.127
2005	3,665	.530	.163	2005	784	.528	.117
2006	4,383	.587	.162	2006	957	.601	.179
2007	4,506	.385	.153	2007	1,058	.374	.124
2008	5,306	.721	.142	2008	1,293	.288	.086
Activity 18	*n*	Weighted	Covariance	Activity 19	*n*	Weighted	Covariance
2001	522	.413	.146	2001	236	.203	.098
2002	766	.487	.172	2002	290	.258	.165
2003	934	.363	.156	2003	316	.281	.095
2004	1,206	.466	.166	2004	395	.360	.130
2005	1,320	.537	.149	2005	453	.389	.072
2006	1,548	.525	.150	2006	441	.479	.109
2007	1,783	.338	.096	2007	524	.340	.106
2008	2,580	.568	.071	2008	659	.387	.039
Activity 20	*n*	Weighted	Covariance	Activity 21	*n*	Weighted	Covariance
2001	724	.116	.118	2001	429	.107	.075
2002	818	.173	.111	2002	494	.187	.072
2003	914	.486	.104	2003	596	.241	.074
2004	1,096	.354	.111	2004	689	.210	.087
2005	1,261	.440	.113	2005	871	.261	.089
2006	1,440	.387	.087	2006	960	.185	.077
2007	1,755	.411	.100	2007	1,033	.257	.085
2008	2,366	.554	.091	2008	1,301	.598	.062
Activity 22	*n*	Weighted	Covariance	Activity 24	*n*	Weighted	Covariance
2001	333	.250	.136	2001	428	.280	.101
2002	454	.271	.182	2002	509	.323	.142
2003	580	.571	.190	2003	598	.538	.149
2004	820	.496	.202	2004	688	.579	.189

2005	1,023	.536	.182	2005	840	.673	.200
2006	1,564	.466	.170	2006	1,026	.563	.200
2007	1,457	.310	.182	2007	1,120	.442	.167
2008	1,890	.754	.139	2008	1,376	.674	.155
Activity 25	*n*	Weighted	Covariance	Activity 26	*n*	Weighted	Covariance
2001	523	.154	.077	2001	1,044	.680	.672
2002	683	.182	.104	2002	1,069	.336	.257
2003	769	.420	.096	2003	1,122	.476	.232
2004	971	.371	.105	2004	1,282	.547	.206
2005	1,222	.499	.105	2005	1,425	.587	.206
2006	1,427	.404	.098	2006	1,479	.558	.182
2007	1,664	.185	.082	2007	1,641	.462	.187
2008	2,000	.556	.051	2008	2,004	.667	.178
Activity 27	*n*	Weighted	Covariance	Activity 28	*n*	Weighted	Covariance
2001	142	.180	.139	2001	722	.157	.134
2002	185	.299	.130	2002	941	.182	.133
2003	223	.329	.115	2003	1,239	.395	.122
2004	267	.363	.096	2004	1,611	.405	.111
2005	351	.408	.082	2005	2,057	.473	.119
2006	388	.331	.093	2006	2,551	.367	.114
2007	510	.363	.111	2007	3,009	.294	.101
2008	634	.090	.079	2008	3,984	.495	.091
Activity 29	*n*	Weighted	Covariance	Activity 31	*n*	Weighted	Covariance
2001	264	.296	.088	2001	167	.179	.087
2002	342	.306	.115	2002	195	.110	.118
2003	404	.285	.125	2003	238	.530	.123
2004	466	.604	.130	2004	316	.673	.207
2005	559	.451	.125	2005	372	.335	.130
2006	628	.439	.136	2006	398	.204	.132
2007	758	.337	.125	2007	385	.251	.110
2008	887	.249	.091	2008	498	.764	.076

(Continued)

TABLE 3. Continued

Activity 15	*n*	Weighted	Covariance	Activity 17	*n*	Weighted	Covariance
Activity 32	*n*	Weighted	Covariance	Activity 33	*n*	Weighted	Covariance
2001	76	.280	.109	2001	37	.408	.089
2002	101	.299	.213	2002	49	.428	.066
2003	125	.471	.206	2003	53	.213	.048
2004	151	.378	.246	2004	60	.595	.119
2005	169	.664	.201	2005	83	.249	.163
2006	187	.458	.150	2006	95	.245	.091
2007	229	.249	.133	2007	101	.551	.096
2008	299	.395	.227	2008	125	.450	.111
Activity 34	*n*	Weighted	Covariance	Activity 35	*n*	Weighted	Covariance
2001	182	.214	.293	2001	247	.362	.182
2002	222	.249	.267	2002	298	.308	.175
2003	222	.568	.269	2003	344	.521	.200
2004	247	.426	.219	2004	363	.529	.207
2005	301	.625	.193	2005	452	.587	.195
2006	239	.514	.146	2006	452	.484	.179
2007	275	.331	.164	2007	558	.483	.195
2008	348	.446	.178	2008	618	.914	.141
Activity 36	*n*	Weighted	Covariance				
2001	601	.175	.132				
2002	679	.307	.208				
2003	901	.618	.130				
2004	1,118	.512	.141				
2005	1,373	.515	.123				
2006	1,552	.475	.097				
2007	1,793	.405	.110				
2008	2,510	.542	.090				

Source: Authors' calculations using Vietnam Enterprise Surveys 2001–2008.

Note: Sectors 16, 23, 30, and 37 are excluded because of the small number of firms that operate in these sectors.

Table 4. Contribution of Switchers to Productivity before and after Switching

	Contribution of Switchers to TFP			Contribution of Switchers to WTFP		
	After switch	Before switch	p value t-test of difference	After switch	Before switch	p value t-test of difference
2002	14.41	14.40	.9954	21.41	22.76	.4436
2003	15.71	12.67	.0000	12.32	11.09	.0412
2004	11.35	8.97	.0000	9.87	7.23	.0000
2005	12.57	11.07	.0000	9.12	7.89	.0000
2006	24.64	21.53	.0000	20.77	19.63	.0002
2007	17.63	15.26	.0000	16.02	12.58	.0000
2008	5.53	4.51	.0000	3.90	3.13	.0000

Source: Authors' calculations using Vietnam Enterprise Surveys 2001–2008.

Table 5. Testing the Differences in Productivity Rankings

	Number of firms	Average rank in productivity distribution	t-statistic (difference = 0)	p value
Incumbents	84,942	.546		
Entry	21,438	.400	67.215	.000
Incumbents	76,967	.548		
Switchers-in	9,010	.512	11.219	.000
Incumbents	84,942	.546		
Exit firms	9,230	.436	34.740	.000
Incumbents	64,723	.546		
Switchers-out	6,849	.520	7.029	.000
Entry	21,438	.400		
Exit	9,230	.436	−10.929	.000
Entry	27,600	.393		
Switchers-in	10,813	.499	−34.559	.000
Exit	9,230	.436		
Switchers-out	9,532	.478	−10.324	.000

Source: Authors' calculations using Vietnam Enterprise Surveys 2001–2008.

Note: Switchers-in and entry firms are compared to firms in the receiving sector, whereas switchers-out and exit firms are compared to firms in the expelling sector.

more productive firms.[19] This does not mean, however, that reallocations of output within and across sectors do not contribute to productivity growth.

To determine whether switching is economically important, the proportional contribution of switchers to aggregate productivity in the sector that they switch out of is compared with their proportional contribution to the sector that they switch into (table 4). Moreover, productivity differences between incumbents, entrants, exits, and switchers are described in a manner that

19. This is similar to the findings of Aw et al. (2001) for Taiwanese manufacturing.

follows Aw et al. (2001) (table 5). This description facilitates the testing of the hypotheses outlined in section I.

Switching firms generally contribute significantly more to productivity in the sector that they switch into than in the sector that they left (table 4). This pattern holds for both weighted and unweighted TFP, with the only exception occurring between 2001 and 2002. Although the magnitude of the gains is not substantial, these gains are achieved in the year immediately following the switch, when firms have undoubtedly incurred some costs in switching activities.[20]

A firm fixed-effects regression for switching firms was conducted for the year of the switch, where firm TFP is regressed on dummy indicators controlling for time, industry, province, and sector-level productivity. These results, which are not reported here, confirm the findings presented in table 4 and suggest that there is a break in a positive direction after the switch.

The comparison of productivity performance between switching and other firms is not straightforward. Relying on productivity levels is not appropriate because, in the construction of the productivity index, firms are positioned relative to the average within the sector, making comparisons across sectors impossible to interpret. The same situation arises when we attempt to interpret growth rates in productivity levels for switching firms.

To overcome this obstacle, the productivity performance of each firm is ranked within each sector in each year. Simple *t*-tests are then performed of the differences between incumbent, switching, entry, and exit firms in terms of their productivity ranking. Incumbent firms rank higher in the productivity distribution than entry and exit firms on both measures (table 5). Similarly, exit firms rank higher than entry firms. These results are not surprising because entry firms may incur high sunk costs that negatively affect their productivity performance in the year of entry.[21]

The results also show that switchers-in rank higher in terms of productivity than entry firms in the sector into which they enter, and switchers-out rank higher than exit firms in the sector that they switch from. This result suggests that switching firms are indeed a separate and important source of productivity growth, which is consistent with the predictions in section I above and with the emerging literature on firm capabilities, which we have referenced. Finally, incumbents have a higher productivity ranking than switchers in the

20. When switching is defined at the two-digit level, the results are mixed; in some years, firms contribute more to the sector that they switch into than the sector that they switch out of, but in other years, the opposite is true. These mixed results are not surprising given that switching between two-digit sectors requires a significant change in production activities, and it may take time for firms to adjust. Overall, this finding suggests that there are more gains to aggregate productivity from firms that switch between more closely related sectors than at the two-digit level. The results are not presented here but are available on request.

21. When the performance of entry firms is compared to that of exit firms over their lifecycles, entry firms outperform exit firms. This finding is consistent with the extensive literature on firm turnover that emphasizes resource reallocations involving the exit and entry of firms into sectors as an important source of productivity growth.

sectors that they switch into and out of, which is also consistent with our expectations.[22]

Given the difficulties in comparing productivity levels across sectors and, consequently, of comparing productivity in switching firms before and after they switch sectors, it is not possible to conclude definitively that switching firms become more productive as a result of moving from one sector to another. Two observations may be made, however. First, switching firms contribute more to overall productivity in the sector that they switch into than in the sector that they switch from, suggesting that switching leads to a reallocation of resources that enhances productivity (table 4). Second, switching firms have higher productivity levels and rank higher in the productivity distribution than entry and exit firms in the same sector (table 5).

Switching

The first set of switching results relates to the decisions of firms to switch into and out of particular sectors (table 6). The former identifies sector-specific pull factors because sector characteristics in the year after the switch are included. The latter identifies sector-specific push factors because the sector characteristics in the year before the switch are included. In other words, although we are not estimating a dynamic model, the key focus is to identify the push and pull factors through the timing of their inclusion in the model. Switching and sector-specific variables are defined at the four-digit industry classification level, and sector-level variables are computed separately for each firm i by excluding information on firm i in the computation of the sector-level aggregates. These definitions and computations ensure that the individual characteristics of the switchers do not drive the sector-specific effects.

For firm-specific factors, switching firms rank higher in the productivity distribution of the sectors that they switch into and have higher productivity levels than other firms (i.e., after the switch), and they rank below incumbents and other firms in the sectors that they switch out of (i.e., before the switch). There is some evidence that switching firms are not the worst performing firms in the sectors that they switch out of (column 6), which is consistent with the hypothesis that switching firms are more productive than exit and entry firms. Switching firms have a relatively higher level of productivity compared to firms in the sector that they switch into (column 2) than firms in the sector that they switched out of (column 6), providing further evidence that firms that switch sectors manage to improve their relative performance. Thus, expectations seem to hold; switching sectors to exploit profitable opportunities is a viable alternative to exiting production altogether.

Switching firms tend to be larger than other firms in the sectors that they switch into and smaller than the firms in the sectors that they switch out of,

22. Comparing productivity levels across groups of firms leads to the same conclusions. Moreover, the results are similar when switching is defined at the two-digit level. Results are available on request.

which is consistent with Dunne et al. (1988). Given that much of the literature suggests a positive association between size and survival probability, this finding indicates that firms switch to sectors in which they are larger than other firms when compared to the firm sizes in the sectors that they left. These firms will therefore survive longer. There is also weak evidence that switchers tend to have a lower capital-labor ratio than nonswitching firms. Given the fact that switching firms are generally larger, labor-intensive firms are more likely to be switchers than are capital-intensive firms. Moreover, there is evidence that multiproduct firms registered in Vietnam are less likely to switch, in accordance with the findings of Bernard et al. (2010) and Goldberg et al. (2010), who show that multiproduct firms can change their product mix in response to changing market conditions without switching sectors.

For sector-specific factors, our results show that although firms registered in Vietnam switch between low productivity sectors, the magnitude of the coefficient is lower for the sectors that they switch into than for the sectors that they switch out of, suggesting that firms switch into lower productivity sectors (table 6). Switching firms tend to be more productive than the firms that are already operating in the sectors that they switch into, demonstrating that switching firms seek productivity enhancing opportunities when deciding to switch sectors. The average size of the sector, as measured by the number of employees, and the average capital-labor ratio play important roles. Firms switch out of sectors that have high capital-labor ratios where they are smaller in size (push factors) and into sectors with low average capital-labor ratios (pull factors) where they are relatively larger. Because the analysis is set in the context of a developing country with low labor costs, it is not surprising that firms switch into sectors where they can potentially exploit low labor cost advantages. Moreover, because our earlier results indicated that switchers are more likely to be labor-intensive firms, it is not surprising for these firms to switch into labor-intensive sectors.

For market structure variables, switching is less likely to occur into sectors with a large proportion of FOEs (i.e., a high FR). This result is consistent with previous literature showing that firms avoid sectors dominated by FOEs (Aitkin and Harrison 1999; Tybout 2000).[23] Firms are also more likely to switch into sectors with lower CRs. It might be expected that a high CR would reduce firms' incentives to move out of a sector, but firms are more likely to switch

23. When switching is defined at the two-digit level, firms switch out of sectors with low levels of foreign ownership and into sectors with high levels of foreign ownership, which is different than the results presented here under a more disaggregated definition of industry switching. This is indicative of a general move by firms toward more competitive sectors at an aggregate level, presenting the possibility that the presence of learning spillover effects and technology diffusion will make a sector attractive to domestic enterprises. The results at the four-digit level suggest that switching firms choose not to compete directly with foreign-owned firms that produce similar products but that within two-digit sectors, firms seek opportunities to benefit from vertical technology spillovers from foreign-owned firms. For further details, see Newman et al. (2011).

TABLE 6. Determinants of Switching

	Switch in				Switch out			
Firm-specific	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Productivity	.018***	.039***		.039***	.005	.021***		.021
	(.005)	(.005)		(.015)	(.005)	(.005)		(.013)
Rank productivity			.030***				−.014*	
			(.007)				(.008)	
lnK/L	.000	.001	−.001	.001	−.002	−.001	−.003*	−.001
	(.002)	(.002)	(.002)	(.002)	(.002)	(.002)	(.002)	(.002)
Size	.010***	.010***	.006**	.010***	−.006**	−.005*	−.006**	−.005**
	(.003)	(.003)	(.003)	(.003)	(.003)	(.003)	(.003)	(.003)
State-owned	.014	.018*	.018*	.018	.004	.009	.008	.009
	(.011)	(.011)	(.011)	(.012)	(.012)	(.011)	(.011)	(.011)
Foreign-owned	.075*	.052	.050	.052	.002	−.027	−.027	−.027
	(.042)	(.040)	(.040)	(.035)	(.058)	(.055)	(.055)	(.040)
Multiproduct	.010*	.011*	.010*	.011**	−.010*	−.017***	−.016***	−.017***
	(.005)	(.005)	(.005)	(.005)	(.005)	(.005)	(.005)	(.005)
Sector-specific								
Productivity[a]		−.020***		−.020***		−.007***		−.007*
		(.004)		(.007)		(.002)		(.004)
IQR productivity[b]			−.011***				−.002***	
			(.003)				(.001)	
lnK/L[a]		−.037***	−.032**	−.037		.056***	.052***	.056*
		(.013)	(.013)	(.037)		(.013)	(.013)	(.031)
Size[a]		−.010	−.003	−.010		−.042***	−.044***	−.042**
		(.007)	(.007)	(.018)		(.007)	(.007)	(.017)
CR[a]		−.114***	−.121***	−.114		.047	.037	.047
		(.030)	(.030)	(.079)		(.032)	(.032)	(.082)
FR[a]		−.061**	−.069***	−.061		−.022	−.024	−.022

(Continued)

Table 6. Continued

	Switch in				Switch out			
		(.025)	(.025)	(.070)		(.025)	(.025)	(.072)
SR[a]		.012	.011	.012		−.014	−.013	−.014
		(.020)	(.020)	(.048)		(.021)	(.021)	(.056)
Tariff level[c]		−.250***	−.237***	−.250***		.186***	.193***	.186
		(.025)	(.025)	(.087)		(.045)	(.044)	(.144)
Export intensity[c]		.022***	.021***	.022***		.004	.004	.004
		(.003)	(.003)	(.008)		(.003)	(.003)	(.008)
Observations	136,235	126,683	126,683	126,683	115,189	107,323	107,323	107,323
Firms	49,409	46,790	46,790	46,790	39,820	37,968	37,968	37,968
Clustering	Firm	Firm	Firm	Industry	Firm	Firm	Firm	Industry

Source: Authors' calculations using Vietnam Enterprise Surveys 2001–2008.

Notes: All models include firm, sector (four-digit), time, and provincial fixed effects. Robust standard errors clustered at the firm/industry level reported in parenthesis. *, **, and *** indicate significance at 10%, 5%, and 1% levels, respectively.

[a] Average for each four-digit sector computed separately for each firm *i* excluding information on firm *i*.

[b] Interquartile range for the four-digit sector.

[c] Average for each four-digit sector.

TABLE 7. Determinants of Entry and Exit

	Entry				Exit			
Firm-specific	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Productivity	−.063***	−.092***		−.092***	−.003	−.004		−.004
	(.004)	(.005)		(.010)	(.003)	(.004)		(.006)
Rank productivity			−.242***				.004	
			(.008)				(.006)	
lnK/L	.015***	.013***	.014***	.013***	.000	.000	.001	.000
	(.002)	(.002)	(.002)	(.002)	(.001)	(.002)	(.002)	(.001)
Size	−.046***	−.047***	−.027***	−.047***	−.025***	−.026***	−.026***	−.026***
	(.003)	(.003)	(.003)	(.003)	(.002)	(.002)	(.002)	(.002)
State-owned	−.073***	−.071***	−.067***	−.071***	.048***	.047***	.047***	.047***
	(.010)	(.010)	(.010)	(.011)	(.008)	(.008)	(.008)	(.007)
Foreign-owned	−.168***	−.154***	−.147***	−.154***	.035	.036	.036	.036
	(.043)	(.044)	(.040)	(.038)	(.031)	(.033)	(.033)	(.026)
Multiproduct	.009**	.009*	.015***	.009**	.006	.005	.005	.005
	(.005)	(.005)	(.005)	(.004)	(.004)	(.004)	(.004)	(.004)
Sector-specific								
Productivity[a]		.015***		.015***		.003		.003
		(.002)		(.003)		(.002)		(.002)
IQR productivity[b]			.000				.002***	
			(.001)				(.001)	
lnK/L[a]		.003	.014	.003		.006	.006	.006
		(.010)	(.009)	(.022)		(.008)	(.008)	(.013)
Size[a]		.080***	.044***	.080***		−.006	−.006	−.006
		(.006)	(.006)	(.025)		(.005)	(.005)	(.012)
CR[a]		−.055**	−.035**	−.055		.008	.009	.008
		(.024)	(.023)	(.050)		(.020)	(.020)	(.037)
FR[a]		−.111***	−.086***	−.111**		.056***	.056***	.056*
		(.020)	(.020)	(.056)		(.016)	(.016)	(.032)
SR[a]		.000	−.007	.000		.025*	.025*	.025
		(.017)	(.017)	(.049)		(.014)	(.014)	(.027)
Tariff level[c]		−.034	−.078***	−.034		.011	.009	.011
		(.026)	(.026)	(.078)		(.014)	(.014)	(.048)
Export intensity[c]		−.011***	−.011***	−.011*		.003*	.003*	.003

(Continued)

TABLE 7. Continued

	Entry				Exit			
		(.003)	(.003)	(.006)		(.002)	(.002)	(.004)
Observations	146,058	135,976	135,976	135,976	146,058	135,976	135,976	135,976
Firms	50,807	48,179	48,179	48,179	50,807	48,179	48,179	48,179
Clustering	Firm	Firm	Firm	Industry	Firm	Firm	Firm	Industry

Source: Authors' calculations using Vietnam Enterprise Surveys 2001–2008.

Notes: All models include firm, sector (four-digit), time, and provincial fixed effects. Robust standard errors clustered at the firm/industry level reported in parenthesis. *, **, and *** indicate significance at 10%, 5%, and 1% levels, respectively.

[a] Average for each four-digit sector computed separately for each firm *i* excluding information on firm *i*.

[b] Interquartile range for the four-digit sector.

[c] Average for each four-digit sector.

TABLE 8. Determinants of Switching – Robustness Checks

	Switch in						*Switch out*					
	Large firms	Private firms	Excluding multiprod.	Excluding re-entrants	Relative to optimum	Olley & Pakes	Large firms	Private firms	Excluding multiprod	Excluding re-entrants	Relative to optimum	Olley & Pakes
Firm-specific	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Productivity	.020***	.055***	.036***	.037***			.014**	.031***	.017***	.018***		
	(.006)	(.006)	(.005)	(.005)			(.006)	(.006)	(.005)	(.005)		
Rank productivity					.033***	.010*					−.010	−.008
					(.008)	(.006)					(.008)	(.007)
lnK/L	.003	.001	.000	.001	−.002	−.001	.002	.000	−.001	.000	−.003	−.002
	(.002)	(.002)	(.002)	(.002)	(.002)	(.002)	(.003)	(.002)	(.002)	(.002)	(.002)	(.003)
Size	.006*	.013***	.011***	.011***	.006**	.011***	−.006*	−.003	−.003	−.005*	−.006**	−.009**
	(.003)	(.003)	(.003)	(.003)	(.003)	(.003)	(.003)	(.003)	(.003)	(.003)	(.003)	(.004)
State-owned	.015		.020*	.020*	.018*	.019	.004		.021*	.004	.008	−.007
	(.011)		(.012)	(.011)	(.011)	(.013)	(.011)		(.012)	(.011)	(.011)	(.014)
Foreign-owned	.054		.056	.055	.049	.009	−.027		−.027	−.029	−.027	−.006
	(.041)		(.043)	(.041)	(.040)	(.046)	(.054)		(.058)	(.057)	(.055)	(.039)
Multiproduct	.015**	.010*		.010*	.010*	.018**	−.010*	−.021***		−.016***	−.016***	−.015**
	(.006)	(.006)		(.006)	(.005)	(.007)	(.006)	(.006)		(.006)	(.005)	(.007)
Sector-specific												
Productivity[a]	−.006*	−.013***	−.013***	−.020***	.004**	.044	−.005***	−.002	−.006**	−.006***	−.006***	.029
	(.003)	(.003)	(.004)	(.004)	(.002)	(.058)	(.002)	(.002)	(.002)	(.002)	(.002)	(.067)
lnK/L[a]	−.044***	−.048***	−.031**	−.038***	−.034***	−.020	.052***	.070***	.045***	.053***	.051***	.080***
	(.015)	(.015)	(.013)	(.013)	(.013)	(.016)	(.015)	(.016)	(.013)	(.013)	(.013)	(.016)
Size[a]	−.005	−.008	−.012*	−.007	−.007	−.005	−.040***	−.050***	−.044***	−.043***	−.043***	−.044***
	(.008)	(.008)	(.007)	(.007)	(.007)	(.008)	(.008)	(.009)	(.007)	(.007)	(.007)	(.009)
CR[a]	−.113***	−.069*	−.142***	−.120***	−.128***	−.115***	.081**	.054	.057*	.056*	.026	.090**
	(.037)	(.037)	(.032)	(.031)	(.030)	(.037)	(.039)	(.039)	(.034)	(.033)	(.032)	(.040)
FR[a]	−.004	−.075**	−.064**	−.056**	−.059**	−.066**	.013	−.023	−.013	−.017	−.030	−.002
	(.028)	(.030)	(.026)	(.025)	(.025)	(.031)	(.028)	(.030)	(.025)	(.025)	(.025)	(.031)

(Continued)

TABLE 8. Continued

	Switch in						*Switch out*					
	Large firms	Private firms	Excluding multiprod.	Excluding re-entrants	Relative to optimum	Olley & Pakes	Large firms	Private firms	Excluding multiprod	Excluding re-entrants	Relative to optimum	Olley & Pakes
SR[a]	.014	.023	−.007	.013	.012	−.014	−.005	−.010	−.003	−.012	−.015	−.020
	(.024)	(.024)	(.022)	(.021)	(.020)	(.025)	(.025)	(.026)	(.022)	(.022)	(.021)	(.026)
Tariff level[b]	−.166***	−.314***	−.244***	−.260***	−.233***	−.239***	.145**	.123**	.199***	.204***	.187***	.141**
	(.029)	(.030)	(.027)	(.026)	(.025)	(.032)	(.056)	(.053)	(.047)	(.045)	(.045)	(.056)
Export intensity[b]	.013***	.025***	.023***	.023***	.022***	.020***	−.001	.006	.006*	.003	.004	.006
	(.003)	(.004)	(.003)	(.003)	(.003)	(.004)	(.003)	(.004)	(.003)	(.003)	(.003)	(.004)
Observations	69,717	103,918	117,262	123,504	126,683	93,230	62,692	86,588	98,767	104,337	107,323	77,907
Firms	19,356	41,125	45,360	45,665	46,790	41,664	17,845	32,725	36,630	36,874	37,968	33,758

Source: Authors' calculations using Vietnam Enterprise Surveys 2001–2008.

Notes: All models include firm, sector (four-digit), time, and provincial fixed effects. Robust standard errors clustered at the firm/industry level reported in parenthesis. *, **, and *** indicate significance at 10%, 5%, and 1% levels, respectively.

[a] Average for each four-digit sector computed separately for each firm i excluding information on firm i.

[b] Interquartile range for the four-digit sector.

into sectors that are more competitive than the sectors that they leave. Therefore, switching firms may seek less regulated sectors, suggesting that more competitive sectors with lower levels of concentration attract firms. It should be noted, however, that the statistical significance of the results for foreign-ownership and sector-level concentration is not robust to clustering the standard errors at the industry level (column 4).

We have identified strong evidence that firms switch into sectors with low tariff levels and high levels of trade exposure (pull factors) and out of sectors with high tariff levels (a push factor). The results show that firms are willing to switch to different four-digit sectors to exploit potential opportunities from trade reform.

Firm Entry and Exit

There is a significant amount of heterogeneity in the characteristics of entry firms (table 7). The results show that entry firms have lower productivity levels than incumbents and firms that switch into a sector. Entry firms are more capital intensive and usually have fewer employees than other firms. They are more likely to be private domestic firms as opposed to state- or foreign-owned firms. These patterns reflect the deregulation in the manufacturing sector over the analysis period, which provided many new opportunities for private domestic firms. There is also some evidence that entry firms are more likely to be multiproduct firms, implying that a new type of flexible enterprise has emerged.

Consistent with the literature on firm survival, smaller firms are more likely to exit production (table 7). Exit is also associated in a statistically significant way with state ownership and is rooted in the ongoing reform process discussed by the Central Institute of Economic Management (2003). It is clear from this analysis that the firm-specific characteristics of entry and exit firms are very different from those of switching firms.

In summary, our entry and exit results are consistent with the existing literature on industry evolution, but the expanded analysis in this study, which has identified switching as separate from exit and entry, suggests an unexplored dimension in the context of developing countries.

Further differences are embedded in sector-specific characteristics. The results show that entry firms are more likely to enter sectors with high productivity levels and with larger average firm sizes than sector switchers. New firms are also less likely to enter into trade-intensive sectors than switchers, who are more likely to seek trade opportunities. Similar to switching firms, entry firms are deterred by high CRs and are less likely to enter sectors with a high concentration of foreign-owned firms. The latter finding is consistent with the idea that preferential treatment of foreign-owned firms might distort competition by deterring domestic firms from entering sectors with a high foreign ownership presence (Aitkin and Harrison 1999; Tybout 2000). Finally, we found evidence to indicate that both entry and switching firms are less likely to enter sectors with high tariff levels, which may mean that barriers to entry exist in these sectors.

Robustness Checks

To check robustness, we first consider a subset of data that includes large manufacturing firms (defined as having more than 30 employees) for which a full population of firms is available. Second, a subsample of private firms is studied. Third, all multiproduct firms are excluded because productivity measurements are complicated for firms that produce more than one product. Fourth, firms that exit and re-enter the sample are omitted. Fifth, we consider two alternative measures of productivity. The first is an index number approach based on a relative measure of productivity that compares firms with the best-producing firm in a sector. The second measure was constructed using the Olley and Pakes (1996) semiparametric approach to productivity measurement. To enhance comparability in the latter two robustness checks, a firm's rank in the productivity distribution is used rather than the firm's productivity level. The findings from these robustness checks are broadly consistent across all specifications (table 8).

The most notable results are that switching firms (i) are more productive than other firms in their new sectors, (ii) are larger in terms of the number of employees, (iii) are unlikely to switch out of a sector if they are multiproduct firms, (iv) are likely to switch into sectors with lower average levels of productivity, (v) are more likely to switch into sectors with low capital-labor ratios, and (vi) are more likely to switch into sectors with low tariff levels and high levels of export intensity. Overall, our key findings above are confirmed.

V. CONCLUSION

This study began by observing that sector switchers are likely to have different characteristics and behavior from "real" entry and exit firms. This subject has never been empirically studied or established in the context of a developing country. This is arguably an important omission in the existing literature on firm dynamics and in the understanding of the impact of firm turnover on both productivity and resource reallocation at the firm and sector level.

Using a unique panel data set from Vietnam that covers a large number of manufacturing firms for the 2001–2008 period, we found solid evidence that the reallocation of resources within and across sectors accounts for a significant proportion of total productivity growth in the Vietnamese manufacturing sector. Firm switchers make an important contribution to these reallocations. They contribute more to productivity in the sector that they switch into than the sector that they switch out of, and they are more productive than firms entering or exiting the sector.

The analysis also revealed that switching firms have characteristics that differ from both entry and exit firms, and switching firms appear to be motivated by different sector-specific factors. Switching firms tend to be larger than firms in the sector that they switch into, while entry firms tend to be smaller than other firms in the sector. Our analysis also shows that multiproduct firms are less likely to switch sectors.

Firms seek competitive opportunities when deciding which sectors to switch into, and they appear to avoid sectors with large concentrations of foreign firms. Moreover, trade liberalization is positively associated with switching behavior; firms are more likely to switch into sectors with better opportunities to trade (i.e., sectors with lower tariffs and a greater proportion of exported output).

Our analytical approach and the empirical findings of this study may serve as a starting point for similar analyses in other developing countries and may inspire a redesign of enterprise surveys across the developing world. The correct assessment of the respective contributions of entry, exit, and switching firms to productivity growth has important analytical and policy implications. At this stage, however, empirical evidence is almost nonexistent.

We can draw several conclusions regarding Vietnam from this work. First, there are much more complex firm dynamics underlying the robust economic progress achieved in this dynamic East Asian economy than those found in standard firm entry and exit explanations. Second, in practice, firms have adjusted to changing circumstances in sometimes innovative and not always predictable ways. Finally, government policy should pay careful attention to both the potential for productivity enhancement and the reduction of reallocations through sector switching. This policy should also help discourage firms from switching into sectors that are not associated with comparative advantage.

APPENDIX

TABLE A1. Descriptive Statistics for Productivity Analysis

	Revenue (million VND)	Labor (number employees)	Capital (million VND)	Other costs (million VND)
15 Food products and beverages	26,999	101	22,052	33,691
	(144,003)	(300)	(114,730)	(160,912)
17 Textiles	24,379	203	42,700	27,633
	(172,394)	(543)	(235,551)	(223,110)
18 Wearing apparel	13,322	342	15,006	15,279
	(47,825)	(708)	(43,741)	(66,379)
19 Tanning/dressing leather	46,321	1,096	56,457	49,528

(Continued)

Table A1. Continued

	Revenue (million VND)	Labor (number employees)	Capital (million VND)	Other costs (million VND)
	(202,041)	(3,369)	(235,526)	(227,280)
20 Wood and wood products	4,895	70	5,821	4,799
	(15,252)	(168)	(20,526)	(15,576)
21 Paper and paper products	11,917	72	17,144	10,958
	(41,428)	(165)	(78,593)	(35,798)
22 Publishing, printing, etc.	5,465	37	7,315	5,893
	(24,318)	(82)	(36,396)	(27,069)
24 Chemicals and chem. products	35,228	99	36,902	38,788
	(156,910)	(256)	(143,717)	(171,274)
25 Rubber and plastics	17,197	87	20,591	14,276
	(54,274)	(200)	(60,577)	(45,220)
26 Other nonmetallic mineral	18,933	137	40,637	17,796
	(99,188)	(268)	(249,302)	(123,819)
27 Basic metals	60,926	119	60,665	69,740
	(239,265)	(522)	(237,293)	(269,482)
28 Fabricated metals	10,328	54	12,625	14,003
	(42,842)	(143)	(46,959)	(59,604)
29 Machinery and equipment	13,514	90	20,692	15,788
	(53,221)	(210)	(75,188)	(63,813)
31 Electrical machinery	59,244	234	61,172	66,396
	(189,640)	(794)	(160,859)	(215,311)
32 Radio, television, etc.	64,853	199	70,867	91,420
	(189,703)	(493)	(173,636)	(280,609)
33 Medical, precision, and optical	26,029	155	32,231	35,781
	(186,179)	(388)	(87,192)	(289,953)
34 Motor vehicles, transport	59,747	127	64,975	91,141
	(283,758)	(241)	(260,270)	(456,288)
35 Other transport equipment	62,714	190	80,341	68,996
	(459,070)	(468)	(356,834)	(477,028)
36 Furniture	12,789	164	16,506	12,989
	(41,393)	(425)	(54,033)	(42,162)
Manufacturing average	22,375	146	25,852	25,960
	(141,009)	(641)	(140,823)	(169,534)

Source: Authors' calculations using Vietnam Enterprise Surveys 2001–2008.

Note: Means with standard deviations presented in parentheses. Descriptive statistics are presented in levels but included in logs in the productivity analysis.

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