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# Foreign Direct Investment and the Survival of Domestic Private Firms in Viet Nam

ARI KOKKO AND TRAN TOAN THANG\*

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Foreign direct investment (FDI) may benefit local firms in the host country through various kinds of spillovers, but it may also raise competition and result in the crowding out of domestic firms. Using detailed firm-level data for the period 2001–2008, this paper examines the aggregate effect of FDI on the survival of domestic private firms in Viet Nam. We estimate the impact of both horizontal and vertical FDI and explore how the presence of state-owned enterprises (SOEs) influences the exit hazard for private firms. The results suggest that horizontal and upstream FDI raise the exit hazard significantly, while downstream FDI may reduce the hazard. The presence of SOEs has a direct negative effect on the survival odds of local private firms in the same industry, but there is also an indirect impact on the exit hazard from FDI. Local firms are more vulnerable to foreign entry in sectors with high SOE shares. Looking at the net effects of FDI during the period 2001–2008, we find that results vary between sectors and over time but that the overall impact has been surprising small. The paper also discusses policy conclusions and implications for empirical analyses of spillovers from FDI.

*Keywords:* FDI, state-owned enterprises, exit hazard, survival, Viet Nam

*JEL codes:* F23, F21, L11

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## I. Introduction

Much of the academic literature on the host-country effects of foreign direct investment (FDI) has focused on various types of external effects or spillovers that may benefit or harm local firms. In particular, technology and knowledge spillovers have been subject to extensive research. The overall evidence is mixed, with several studies finding evidence of positive spillovers, but others arguing that the impact of FDI on technology and productivity in local firms is insignificant or even negative (Blomström and Kokko 1998, Görg and Greenaway 2004, Meyer and Sinani 2009, Wooster and Diebel 2010). One reason for the mixed findings could be that the ability of local firms to absorb spillovers differs between countries and industries, depending on the nature of competition between foreign and local

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firms, the development level of the host economy, the trade policy environment, and various other market conditions.

However, the entry and presence of foreign investors does not only have an impact on the technologies used in domestic firms, but it also affects various other characteristics of the host-country market. Apart from their direct and indirect effects on technology choice and knowledge, foreign investors may have some influence on the nature and intensity of competition and on the demand, supply, and quality of inputs and intermediate goods. These impacts may also influence the empirical measurement of various spillovers and externalities. Some of the effects are likely to be highly beneficial to local industry—it is hard to argue that access to new knowledge and technology, better and cheaper intermediate goods, or increased demand for locally produced inputs would be harmful to local firms—but other consequences of foreign entry and presence may well be negative. For example, FDI typically results in increased competition in both output markets and markets for skilled labor and other inputs, which may result in the crowding out of domestic firms.

Consequently, some studies have also focused on the crowding out or survival effects of FDI. These studies typically try to estimate how the inflow of FDI affects hazard rates or the likelihood that local firms are forced to leave the market. This strand of literature tends to suggest that there is often a negative horizontal survival effect, i.e., that the competition from foreign multinational corporations (MNCs) raises the likelihood of exit for domestic firms in the industry. The pattern for vertical FDI may be different since there is no direct competition effect when foreign investors are engaged in upstream or downstream sectors. However, there are relatively few studies on the survival effects of FDI in general and a particular scarcity of studies on developing countries and transitional economies.

The purpose of this paper therefore is to explore the impact of FDI on the survival of domestic private firms (DPFs) in Viet Nam. We will also discuss the relationship between the survival of DPFs and the presence of state-owned enterprises (SOEs) in the local market. This question is worthy of investigation because of the imperfect market competition in Viet Nam. Since private entrepreneurship emerged only recently in the country, DPFs are in general relatively young and small and have to compete with SOEs that are not only larger but also benefit from various policy-related privileges. If the presence of foreign-owned firms is expected to influence the survival odds of DPFs, the same is sure to hold also for the presence of SOEs.

From a policy perspective, it is clear that questions about the survival of firms are important. Together with firms' entry and growth patterns, survival and exit shape the dynamics of domestic industry development. In particular, there are important political connotations in the short run if it is found that FDI forces domestic firms out of business, possibly contributing to lower growth rates and unemployment problems. These concerns may be especially relevant in the context

of Asian development, where the nature and motives of inward FDI has recently shifted from cost savings to market penetration (Fujita 2011).

The paper will make at least four contributions to the extant literature. First, we examine the survival effects from both horizontal and vertical FDI, in contrast to earlier studies which focus on the survival impact of horizontal FDI alone. Second, unlike most of the earlier studies that consider domestic firms as a homogenous group, we highlight the role of SOEs for industry dynamics. Third, we explicitly try to manage estimation problems related to the endogeneity of covariates. Fourth, in addition to identifying the partly offsetting effects of horizontal and vertical FDI, we also attempt to calculate the net effect of foreign presence. In addition, our concluding discussion throws some doubt on the value of existing microlevel estimates of the spillover effects of FDI, which are typically based on enterprise samples that include firms that are crowded out (and by definition do not benefit from technology spillovers) as well as firms that survive (and may benefit from spillovers).

Apart from this introduction, the paper consists of five sections. Section II outlines the empirical setting for the study and describes some of the specific characteristics of DPFs in Viet Nam. The context is obviously distinct from that in developed countries. The heritage from central planning and the ongoing transition process also distinguishes Viet Nam from many other developing economies. Section III provides a brief literature review. Section IV presents the data, empirical model, and variables used in the regression analysis, while section V discusses the estimation results. Section VI concludes with a discussion of the policy consequences and theoretical relevance of the findings.

## II. Domestic Private Firms in Viet Nam

In 1986, Viet Nam launched an economic reform process to address some of the weaknesses of central planning and to introduce elements of private entrepreneurship and market economics. This process known as *Doi Moi* or renovation has resulted in the gradual liberalization and privatization of both input and output markets, although SOEs remain important actors in many sectors of the economy. By the mid-1990s, as part of the *Doi Moi* process, the Government of Viet Nam had introduced a series of reforms supporting the development of the private sector, including the promulgation of a Company Law and a Private Enterprise Law in 1990, changes in the Constitution recognizing the role of private enterprise in 1992, a Domestic Investment Promotion Law in 1992, and a Bankruptcy Law in 1993. After many years of being heavily restricted or even considered an illegal business form, DPFs gradually gained recognition as important economic actors, with almost the same status as SOEs and foreign owned firms.

However, the development of DPFs has not been straightforward. In the late 1990s, more than 10 years after the initiation of the reform process, domestic policy

Table 1. Total Output Share by Sector, 2008 (%)

Sectors	FDI Firms	SOEs	DPFs
Food processing	24.34	42.73	32.25
Textile, leather, wood	39.80	26.46	33.56
Gas, chemicals	35.54	44.28	20.03
Construction	7.36	35.08	57.44
Metal, machinery	51.26	24.47	24.13
Electricity, energy	13.83	58.12	27.94
Commerce, repairs	5.85	36.77	57.27
Transportation	22.50	22.29	55.13
Telecommunication	21.78	48.83	28.40
Financial services	19.92	50.38	29.55
Research and development	37.56	47.16	15.26
Real estate	28.85	28.39	42.71
Other services	13.20	55.42	31.34

DPF = domestic private firm, FDI = foreign direct investment, SOE = state-owned enterprise.

Source: Authors' calculations from the enterprise census.

makers still had mixed views regarding DPFs (Hakkala and Kokko 2008). The development of the private sector was therefore slow and cautious, and only around 40,000 private enterprises were in existence at the end of 2000, contributing less than 10% of GDP (CIEM-UNDP 2010). The introduction of the Enterprise Law in 2001, which greatly simplified the procedures for establishing DPFs, together with political statements confirming the importance of private enterprise, became a turning point for the development of the domestic private sector. The number of newly established private firms started growing steeply from 2001.

By 2008, the number of DPFs had surpassed 150,000. They accounted for 27.3% of total output, with much higher shares in sectors such as construction (57%), commerce (57%), and transportation (55%). Although SOEs maintain a dominant position, DPFs and foreign firms jointly account for well over half of total output in most broad industry groups (Table 1).

Despite their growing number, DPFs remain fairly weak in comparison with SOEs and foreign enterprises. In 2008, almost three-quarters of DPFs were found in labor-intensive industries with low technology and poor management. Most DPFs also belong to the small-sized and medium-sized enterprise sector. While the average number of employees in SOE was 425 and that in foreign owned firms about 325, the average DPF had just 24 employees. Only 12% of Viet Nam's DPFs had more than 50 employees in 2008 (Table 2).

It is not surprising that affiliates of foreign multinational firms are larger and stronger than DPFs. SOEs also hold a favored position in Viet Nam's "socialist market economy" and have special privileges in terms of access to output markets, land, and credit sources (Hakkala and Kokko 2008). DPFs, by contrast, generally struggle to manage the large sunk costs involved with the international market. Only a small number of DPFs were engaged in direct exports in the early 2000s, and most of them did not have appropriate strategies for the rapidly internationalizing

Table 2. Firm Size Distribution, 2008 (%)

Firm Size	SOEs	DPFs	FDI	Total
0–50	20.97	87.20	29.46	76.61
50–100	17.29	6.27	18.10	8.12
100–200	21.09	3.59	18.03	6.36
200–300	11.11	1.17	9.66	2.75
300–1,000	22.21	1.44	18.52	4.72
1,000–3,000	6.05	0.30	4.71	1.19
3,000–5,000	0.89	0.02	0.90	0.17
5,000–10,000	0.35	0.02	0.38	0.07
> 10,000	0.05	0.00	0.24	0.02
Total	100.00	100.00	100.00	100.00

DPF = domestic private firm, FDI = foreign direct investment, SOE = state-owned enterprise.

Source: Authors' calculations from the enterprise census.

economy (Kokko and Sjöholm 2005). DPFs also struggle to compete with the SOEs in factor markets. Hansen, Rand, and Tarp (2009) and Carlier and Son (2004) concluded that the main problem related to the funding of business in Viet Nam was not the shortage of capital but rather unequal access to capital. In 2003, SOEs accounted for less than 4% of total employment but received nearly half of total official credit.

DPFs face problems in the formal credit market because of the unwillingness of banks to extend credit to private firms, which are often considered to be more risky than state-backed SOEs and rarely able to provide collateral (generally land). The constrained access to bank credit limits access to land markets, and vice versa, creating a vicious cycle for the DPFs. Shortages of investment capital also limit DPFs' ability to upgrade technology, which often leads to slow productivity growth. This is a severe handicap for both the growth and survival of DPFs.

### III. Literature Review

A term commonly used in discussions about survival and exit hazards is the "crowding out effect." An early argument for this effect is provided by Grossman's (1984) occupational choice model, which suggests that in an open economy, inward FDI may lead to the failure of domestic firms because foreign firms typically pay higher wages than DPFs. He argued that the best potential entrepreneurs are also the best workers. Therefore, by paying higher wages, foreign firms may discourage individuals from entrepreneurship. The higher wages paid by foreign firms may also force local companies to compete for the most productive labor, adding to wage costs and raising the exit hazard (Driffield and Girma 2003, Pesola 2006). However, effects operating through the labor market are not the only channels through which FDI influences the survival odds of local firms. Later studies have gone beyond arguments based on labor markets and conceptualize the crowding

out effect of inward FDI as the sum of competition, spillovers, and production linkages.

Looking at the horizontal impact of inward FDI in the local market, the expected effect on domestic firms is largely negative. Foreign entry does not only add to increased competition for labor and other inputs but also reduces output prices—the price effects on both the input and output sides raise the exit hazard for domestic firms, all other things being equal. The variable that adds some uncertainty is the possible presence of horizontal productivity or technology spillovers. Those local firms that are able to learn from the technologies or practices employed by their foreign competitors may be able to improve their efficiency and productivity. This positive spillover effect may in some cases be strong enough to mitigate the increased exit hazard, but it is clear that many local firms will mainly be influenced by increasing competition rather than positive spillovers, at least in the short run (Aitken and Harrison 1999; Blomström, Kokko, and Zejan 2000; Caves 2007; Crespo and Fontoura 2007). Several factors have been identified as determinants of spillovers, including the complexity of foreign technology and the technology gap between domestic and foreign firms (Kokko 1994), the absorptive capability of domestic firms (Cohen and Levinthal 1990, Kinoshita 2001), and the strategic role of the foreign affiliates in the network of their parent company (Kokko and Kravtsova 2008, 2012).

The expected effects of FDI in upstream and downstream sectors are not equally clear-cut because vertical FDI does not include any direct competition effect. Instead, impacts are largely determined by the nature of the linkages between local firms and their foreign suppliers and customers. Vertical FDI is often expected to generate various productivity spillovers, e.g., through the increase in product varieties and the use of specialized inputs from backward linkages, or the technical support and guidance provided through forward linkages (Rodriguez-Clare 1996, Markusen and Venables 1999). However, negative effects are also possible, in particular when FDI results in changes in technological standards and quality requirements. FDI in upstream sectors may crowd out competing local firms that supply inputs with lower price and quality, forcing downstream firms to adjust technologies. Downstream FDI may crowd out the traditional customers of local firms operating in upstream sectors. Downstream FDI may also stimulate the entry of foreign suppliers, adding to the competition in the upstream sectors. The aggregate impact of vertical FDI on the exit hazard for domestic firms is therefore hard to predict on theoretical grounds, although it is reasonable to expect a priori that the impact of downstream FDI should be less negative than that of horizontal FDI.

More generally, the positive effects from linkages seem to depend on the characteristics of the incoming FDI (Veugelers and Houtte 1990, Pradhan 2006). For example, depending on entry mode, foreign firms can influence the number of domestic firms by directly replacing domestic firms or by inducing domestic firms to merge in order to manage tougher competition. In a longer term perspective,



foreign entries with high research and development (R&D) investment may crowd out research and development investment of domestic firms, reducing the domestic firms' long-term survival odds (Haller 2005). Similarly, and in line with Grossman (1984), foreign firms can trigger brain drain in domestic firms in upstream or downstream sectors.

Using social network analysis, Giuliani (2008) showed that backward linkages do not necessarily create information linkages and knowledge transfer. In his empirical analysis of Costa Rica, only 21% of the backward linkages overlapped with information linkages, which is below the expectation from theoretical literature. Lin and Saggi (2007) suggested that the backward linkages between foreign firms and suppliers can result in the delinking of existing connections between local producers and their local suppliers, hence making some local producers worse off. Other studies (Navaretti and Venables 2004, Carluccio and Fally 2010, Markusen and Stähler 2011) also suggest the possibility that fierce competition in factor markets due to the foreign entry may harm domestic firms in upstream and downstream sectors. The entry of foreign firms may result in the entry of new suppliers, lead to tougher competition, and induce more exits in the intermediate goods market.

#### **A. Theoretical Models of FDI and Survival**

Markusen and Venables (1999) provide one of the first formal models that combine these different effects. They note that FDI generates a competition effect, which is likely to be particularly strong in final goods markets and will lead to lower market prices that may force less efficient domestic firms out of the market. At the same time, they posit that foreign firms in downstream industries may foster the formation of local suppliers through production linkages, as they demand inputs for their production processes. They may therefore induce domestic firms to enter the intermediate goods market, which in turn leads to reductions in input prices. Such price reductions suggest two effects: increased entry of domestic firms in the downstream sectors and more exits in the upstream sectors. Hence, Markusen and Venables (1999) predict both horizontal and vertical impacts, with entry as well as exit effects following from the presence of foreign firms in the domestic market.

More recent studies have extended the theoretical analysis. Navaretti and Venables (2004) use a monopolistic competition model to derive the welfare effects of multinational entry on domestic firms. Under the assumption that foreign firms produce at a similar marginal cost as domestic firms, they suggest that the entry of foreign firms replaces domestic firms one by one. This prediction is repeated by Markusen and Stähler (2011) under assumptions of fixed and endogenous domestic market structures. They suggest that if the market structure is endogenous, changes in the foreign firm's output level will not change aggregate production and the size of active domestic firms, but instead result in market entry or exit. If the market structure is fixed, foreign investment will lead to an increase in aggregate output but



a reduction in the output and the profit of domestic firms. That reduction may in the longer term result in further exit of domestic firms.

Kosova (2010) links the survival question to the firm's growth and suggests that the determinants of growth and survival may be similar. Her static model is the dominant-fringes model, in which the dominant firms are foreign and the fringe firms are domestic. Foreign firms operate as market leaders and select an output level (where the marginal revenue equals marginal cost) which determines the market price and hence the quantity sold by the fringe firms. A proportion of fringe firms will be crowded out if their marginal costs are substantially larger than those of foreign firms. The dynamic version of Kosova (2010) is based on a combination of the dominant-fringes model and dynamic industrial models (Jovanovic 1982) and technological shock models (Sun 2002). The results suggest that the exit hazard of domestic firms decreases with higher output prices, positive technology shocks, and the expectation of higher efficiency. Moreover, a higher growth rate of foreign firms leads to a higher exit rate of domestic firms. This effect is described as the dynamic crowding out effect.

## **B. Empirical Evidence on FDI and Survival**

There are few empirical studies on the impact of FDI on the survival of domestic firms. Appendix 1 briefly summarizes the results from the most well-known studies, and shows that the empirical evidence is contradictory. Studies by Iurchenko (2009) for manufacturing in the Ukraine; Ferragina, Pettiglio, and Reganati (2009) for the service sector in Italy during the period 2005–2007; Burke, Görg, and Hanley (2008) for the United Kingdom (UK) manufacturing in 1997–2002; and Girma and Görg (2003) for Ireland in 1973–1996, all find evidence of positive survival effects from FDI. These results stand in contrast to negative or nonsignificant effects of horizontal FDI found by Louri, Peppas, and Tsionas (2006) for Greece in 1997–2003 and Girma and Görg (2003) for the UK in 1973–1996.

One explanation for the contradictory results could be that none of the studies mentioned above examine the survival effect from vertical FDI. To the best of our knowledge, Wang (2010) is the only study to explicitly consider the effect of vertical FDI on the survival of domestic firms. He analyzes the survival probability of 47,000 manufacturing firms in Canada during the period 1973–1996. The findings suggest that the competition from horizontal FDI shortens the domestic firms' expected survival span, but that FDI in forward and backward sectors have positive effects as a result of positive technology spillovers. Overall, the conclusion is that the positive effects outweigh the negative effects, but it should be noted that this conclusion is based only on a comparison of marginal effects.

There are no earlier studies of the impact of FDI on firm survival in Viet Nam. Vijverberg and Haughton (2002) examine the life spans of household enterprises using the Viet Nam Living Standard Survey. Carlier and Son (2004) discuss survival

and exit of firms in a qualitative study that is based on a small sample of enterprises. Hansen, Rand, and Tarp (2009) use the Cox proportional hazard function to estimate the impact of government support on the survival and growth of small and medium-sized enterprises for a sample of 2,500 enterprises. All three studies focus on local and sectoral conditions as determinants of firm survival, but do not include FDI among the covariates.

### C. Other Determinants of Firm Survival

FDI is obviously not the only variable influencing firm survival, and recent literature has identified a number of other key determinants of the survival and exit of firms. The relationship between a firm's survival and its age and size is described in a number of industrial organization studies (Jovanovic 1982, Hopenhayn 1992, Ericson and Pakes 1995, Lambson 1991). A core argument in this line of research is that firms do not know about their "true" efficiency before entering the market. Upon entry, they find out about their true efficiency and respond accordingly when faced with uncertainty and productivity shocks; some firms survive and grow while others exit. There is a learning process (Jovanovich 1982) so that older firms, which have had more learning opportunities, are more likely to survive until the next time period. There is also a correlation between firm size and survival, meaning that larger firms have a higher propensity to survive.

Exits of firms are not only caused by the characteristics of individual firms, but also by sectoral characteristics. For example, Lambson (1991) posits that firm performance depends on prevailing market conditions such as input prices and market demand. If market conditions change frequently and sunk costs are large, both the entry and exit of firms will be influenced by changes in input prices. Industry dynamics are also affected by demand shocks that influence firms' expectations about future demand.

The role of competition has also been highlighted in many studies (Agarwal, Sarkar, and Echambadi 2002; Nelson and Winter 1982). Competition does not only lead to the crowding out of inefficient firms, but exerts a more complex effect. Market concentration may stimulate collusion, creating more scope for profits and therefore a higher probability to survive. Market concentration may also result in the establishment of barriers to entry, which could allow some inefficient incumbent firms to survive longer than would otherwise be the case.

A factor closely related to competition is technological change. Klepper (2002) and Klepper and Simons (2005) highlight the importance of technological events that may lead to a shakeout in the industry. These events may originate within or outside the industry and affect both potential new entrants and incumbents. Externally generated innovations will result in a race to adapt to or take advantage of the new technologies. Firms that manage to adopt new technologies gain lower unit costs and expand to a greater optimal size, while firms that fail to adjust become

unprofitable and exit. Internally generated innovations developed by incumbent firms often set new standards for products. Consumer demand shifts to such standardized designs, and firms compete to produce the standard product at the lowest possible cost. Exit risk rises as firms shift from a past regime of product innovation to a new regime of process improvement. Firms that do not succeed at process innovation are driven out of business.

The empirical evidence for the determinants of survival is reasonably consistent with the theoretical predictions. Manjon-Antolin and Arauzo-Carod (2008) provide a comprehensive summary that classifies the firm's survival determinants into internal and external categories. For internal determinants, most empirical studies find that size and age, R&D, and ownership of firms are key determinants. Evidence suggests that the effects of age and size are not uniform: size may have a nonlinear impact, and there may also be an inverse U-shaped impact of age. The role of R&D has been confirmed in many studies, e.g., by Audretsch (1995) for the US and Esteve-Perez and Manez-Castillejo (2005) for Spain. The evidence of ownership focuses mainly on the distinction between foreign and domestic firms. Most studies, including Mata and Portugal (2002), Kimura and Fujii (2003), Görg and Strobl (2003b), and Esteve-Perez, Manez-Castillejo, and Sanchis-Llopis (2008) report findings suggesting that foreign firms are more footloose than domestic firms, meaning their threshold for exit from the host market is lower. Esteve-Perez and Manez-Castillejo (2005) find no difference in the hazard rate for limited and unlimited liability companies.

For the external factors, the most prevalent determinants are industry characteristics, spatial factors, and the business cycle. Agarwal, Sarkar, and Echambadi (2002) and Esteve-Perez, Manez-Castillejo, and Sanchis-Llopis (2008) both point to a higher hazard rate for firms in high-tech industries. This is explained by the rapid obsolescence of the firms' technological endowment in rapidly changing high-tech sectors. In addition, the entry rate (Mata and Portugal 2002, Lopez-Garcia and Puente 2006) and the minimum efficient scale (MES) of production (Audretsch and Mahmood 1995, Strotmann, 2007) determine the probability of a firm's survival. A high rate of entry puts pressure on incumbents, while a high MES acts as a barrier to both entry and exit. The evidence for spatial factors is mixed. For example, Strotmann (2007) found that rural firms are more likely than urban firms to survive. Louri and Barbosa (2000) and Fritsch, Brixey, and Falck (2006) report contradictory results.

Survival is also related to fluctuations in the business cycle (Manjon-Antolin and Arauzo-Carod 2008). In many studies, sectoral growth is an important determinant of survival: firms fail more often in recessions. Researchers using cohort dummies and time dummies generally confirm the importance of macroeconomic conditions (Lopez-Garcia and Puente 2006; Esteve-Perez, Manez-Castillejo, and Sanchis-Llopis 2008; Disney, Haskel, and Heden 2003).

#### IV. Data, Estimation Issues, and Variables

##### A. Data

The data for this study are extracted from Viet Nam's yearly enterprise census, which is conducted by the General Statistical Office (GSO). The census includes all known active firms in the economy in each year. The current dataset covers the period 2001–2008.

The data are merged to form a panel dataset. Each firm has an identifier that is the tax code. The tax codes are not always available immediately to new firms, which means that some of the newly established firms have instead been identified using telephone/fax numbers. Over 5,000 firms had to be excluded from the sample due to the lack of information necessary to identify them from the annual data.

After merging all annual observations and dropping the firms that could not be identified over time, the dataset makes up an unbalanced panel dataset containing a total of 86,108 individual firms, starting with 28,358 firms in the year 2001 and ending with 55,701 firms at the end of 2008. Three types of firms can be identified in this dataset: DPFs, SOEs, and foreign-owned firms. A large number of firms enter and exit during this period. Among the DPFs operating at the beginning of the period, only 45.6% survived until 2008. The corresponding number for foreign firms is 52.6%.

The survival function of a firm is defined as the probability that the firm survives past time  $t$  given that the firm has survived until time  $t$ . In this context, time  $t$  is defined as the length of a year. Therefore, firms at risk of failure at time  $t$  are firms in their  $t$ 'th year in the dataset. From 2001 to 2008 there are 7 time-intervals coded from 1 to 7, and time  $t$  in this analysis is considered as an interval-discrete time period rather than continuous.

A firm's exit or death at time interval  $t$  is identified when the firm is observed in interval  $t$  but does not exist in subsequent intervals. This means that the time of a firm's exit is not exactly known: only the interval in which the firm exited is known. Similarly the firm's entry into the market is not known exactly until it is observed in the interval time period  $t$  in the dataset. Both cases require the use of discrete time models instead of continuous time models.

After arranging the data in order to implement the discrete time model, the data is expanded according to time intervals, so that each firm has one observation or more than one observation, depending on how long they survive. For example, a firm surviving through the entire sample period will have seven observations in the final dataset, which altogether has 312,506 observations. There were 53,109 firms in the dataset at the end of the analysis period. Since we do not have information about events after 2008, we do not know how long they survive afterwards. Hence, they are classified as right censored.

## B. Model Specification

The survival function  $S(t)$  of a firm at time  $t$  is defined as the probability of that firm remaining in the market beyond time  $t$  (see Jenkins 2005 for the details):

$$S(t) \equiv Pr(T > t) = 1 - F(t) \quad (1)$$

where  $F(t) = Pr(T \leq t)$  is called the failure function, representing the areas below the density function  $f(t)$  of time spells. A related concept—the hazard rate or hazard function—is defined as:

$$\theta(t) = \frac{f(t)}{1 - F(t)} = \frac{f(t)}{S(t)} \quad (2)$$

The hazard rate is not expressed exactly, but as the conditional probability of the firm to exit shortly after surviving up to time  $t$ . Because of the close relationship between the survival function and the hazard function, it is common to estimate the hazard rate instead of estimating survival time.

Survival literature distinguishes two types of hazard functions: the proportional hazard model (PH) and the accelerated failure time model (AFT). With a few exceptions (e.g., Wang 2010), most of the existing analyses of survival use variants of the PH model, such as the cloglog and lognormal models (Bandick and Görg 2010, Kosova 2010) or models based on the Cox proportional hazard function (Görg and Strobl 2003b, Taymaz and Özler 2007; Burke, Görg, and Hanley 2008). The choice of hazard function is based on the assumption of how the firm's survival odds change over time. For the PH type, the typical characteristic is a separability assumption stating that:

$$\theta(t, X) = \theta_0(t) \exp(\beta'X) \quad (3)$$

where  $\theta(t, X)$  is the hazard rate at survival time  $t$  for a firm with covariate vector  $X$ ;  $\theta_0(t)$  is called a baseline hazard function, depending on  $t$  but not  $X$  (expressing a common exit pattern for all firms in the dataset); and  $\exp(\beta'X)$  is a non-negative function of covariates  $X$ . This assumption implies that the absolute difference in  $X$  reflects the proportionate difference in the hazard at each time  $t$ .

If it is assumed that time is continuous, then it is appropriate to use continuous models like the Cox proportional hazard model. If time is instead defined as a discrete variable, it is more appropriate to use discrete models like logit or complementary logit models (cloglog). In the current dataset, it can be argued that although time is continuous, the spell length is measured only in 1-year intervals (from July to July). Firms can exit the market at any time within the interval. In survival language, this means the failure can occur within a specific interval, but it is not known exactly

when it happens. Datasets with this nature can be described as censored interval data, and in combination with the proportional hazard assumption, it is most appropriate to use the cloglog model for estimation purposes. Therefore, the hazard function for interval  $j$  used below will take the form:

$$\log(-\log[1 - h_j(X)]) = \beta'X + \gamma_j \text{ or } h(a_j, X) = 1 - \exp[-\exp(\beta'X + \gamma_j)] \quad (4)$$

where  $X$  is the vector of covariates and  $\gamma_j$  is the log of the difference between the integrated hazard  $\theta_0(t)$  evaluated at the end and the beginning of the interval.

A further issue is the fact that the dataset is right-censored. At the end of the period of analysis, there is a group of firms that remain active, but it is unknown how long they will survive. OLS estimation for this type of censored data can be biased. We solve this problem by using standard survival estimation procedures. To do that, the dataset is rearranged into a particular form by splitting the observations by the number of spells (years) in the dataset. As shown by Jenkins (2005), this makes it possible to use a standard binary estimation procedure. In all, four steps are done before the estimations:

- i. We expand the data for each firm in accordance with its survival time. This means that each firm will have more than one observation in the dataset if it survives for more than one time interval. We end up with 312,506 observations out of which 51,710 are right-censored observations.
- ii. We construct the time-varying covariate vector ( $X$ ) and merge it with the firm-year based data.
- iii. We select the functional form for the hazard function. As noted above, we focus on models with PH properties, where the cloglog model is our preferred choice.
- iv. We estimate the model using binary dependent variable regression models.

### C. Construction of Covariates

The vector  $X$  for the hazard function (4) is constructed on the basis of the findings in the literature review as well as the availability of information in the current dataset. It includes three components: sectoral characteristics, firm characteristics, and dummy variables.

### D. Sectoral Characteristics

$HFDI$ ,  $DownFDI$ , and  $UpFDI$  represent the foreign presence within a sector as well as in downstream and upstream sectors. These variables are the key variables

for testing the hypotheses related to the impact of foreign presence. The calculation for foreign presence variables is based on the output share of foreign firms in 3-digit sectors, as follows:

$$HFDI_{jt} = \frac{\sum_i FDI_{ijt}}{\sum_i R_{ijt}} \quad (5)$$

where  $FDI_{ijt}$  are the output values of foreign firm  $i$  in 3-digit VSIC sector  $j$  at time  $t$  while the denominator ( $R_{ijt}$ ) is the total output of all firms in the sector.

$UpFDI$  and  $DownFDI$  are calculated as the product of horizontal FDI in downstream and upstream sectors weighted by the coefficients of the IO table  $\alpha_{st}$  and its transposed matrix  $\delta_{st}$ :

$$UpFDI_{jt} = \sum \alpha_{st} HFDI_{jt} \quad \text{and} \quad DownFDI_{jt} = \sum \delta_{st} HFDI_{jt} \quad (6)$$

$HFDI$  is expected to raise the hazard of exit and hence reduce the survival odds of DPFs (a static crowding out effect), while  $DownFDI$  and  $UpFDI$  are also expected to influence DPFs through spillovers and demand creation and may therefore either raise or reduce the hazard.

In some of the regressions, we will also use the corresponding measures for SOEs. They are denoted  $HSOE$ ,  $UpSOE$ , and  $DownSOE$ , and they are defined similarly as the FDI variables.  $GFDI_j$  reflects the output growth of FDI in the sector  $j$ . Based on Kosova (2010), we would expect the variable to have a negative effect on the survival of domestic firms. However, Audretsch (1991, 1995) argues that demand and output growth could elevate price above average cost, allowing firms to improve their price cost margins and their survival probability. Because of these contradictory prior expectations, we have no firm expectation for the sign of this variable in the model. The output growth rate of SOEs,  $GSOE$ , is defined in an analogous manner.

$EXPORT$  is the ratio of exports to total sales for each 3-digit sector. This variable is intended to control for the fact that firms in export-oriented sectors may have better survival odds thanks to the demand from the world market.

Another reason for expecting exports to be important is that exporting is likely to influence the competition between DPFs and foreign-owned firms. More specifically, holding the volume of FDI-generated output constant, it can be expected that the competitive pressure felt by DPFs is lower when the foreign firms are export-oriented rather than focused on the local market. We therefore include the variable  $EXPRATIO$ , which reflects the export to sales ratio of foreign-owned firms in each 3-digit sector. To explore the relation between export oriented FDI and local competition further, we also interact  $EXPRATIO$  with  $HFDI$ .

$IMPORT$  is the ratio of imports to total sales for each 3-digit sector. In the short term, an increase in imports of final goods is supposed to raise the exit hazard of DPFs.



The Herfindahl index represents the concentration in the market. It is calculated as the sum of squares of the output shares in the sector (see Tirole 1988):

$$HERF_{jt} = \sum \left( \frac{x_{ijt}}{X_{jt}} \right)^2 \quad (7)$$

where  $x_{ijt}$  is the output of firm  $i$  in sector  $j$  at time  $t$ .  $X_{jt}$  is total output of sector  $j$ . The Herfindahl index is included in the model because it is closely correlated with the market power of larger firms. The effect of this variable on the survival of DPFs, however, is not unambiguous. High concentration typically results in high price-cost margins, which means that incumbent firms should have a lower hazard rate and a higher probability of survival. At the same time, high concentration suggests that less efficient firms face pressure to leave the market.

*MSCALE* is the MES of the industry, measured as the log of median employment size in the 3-digit sector. Audretsch (1995) argued that a firm may be forced to exit the market if its production scale is below the technically efficient minimum level required by the industry. Sectors which have a high minimum scale are believed to have high price-cost margins and hence ensure a higher survival rate for those firms that can reach this scale. The average effect, however, is unclear. New firms in sectors with high *MSCALE* also encounter more difficulties than firms that enter other sectors (Görg and Strobl 2003b).

*ENTRY* is the entry rate in 3-digit sectors, computed as the ratio between the total number of firms entering into the sector and the total number of firms operating at that time. A high entry rate reflects a low cost of entry to the market. In addition, a high entry rate also reflects high competition and may lead to slower growth for individual firms as well as a high exit rate. In fact, Siegfried and Evans (1994) suggest that there is a direct relationship between the entry and exit rates because inefficient incumbents will be replaced by more efficient entrants. The *ENTRY* variable is included to test for this replacement hypothesis.

### E. Regional Characteristics

*NBR* and *DIVER* are geographical variables. They are included to capture the impact of density and therefore competition in a geographical context and to capture the agglomeration effect on firms' survival. The inclusion of these variables is motivated by the heterogeneity across different provinces in Viet Nam.

*NBR* is a proxy for neighborhood concentration. It is computed as the neighbor agglomeration index:

$$NBR_{jr} = \sum_{k \neq r}^{61} \frac{C_{jk}}{d_k^2} \quad (8)$$

where  $C_{jk}$  is the total output of sector  $j$  of province  $k$ , and  $d_k$  is the distance (in kilometers) from province  $k$  to province  $r$ . In other words, this variable is the sum of the distance-weighted outputs of other provinces. If a province is located in a more concentrated region, the value of  $NBR$  is higher. Hence, this indicator reflects the local competition and is expected to raise the hazard of exit.

$DIVER$  is the diversity index computed as:

$$D_r = \sum_j (q_{jr})^2 \quad (9)$$

where  $q_{jr}$  is the share of output from sector  $j$  in province  $r$ . Diversity comes into effect through the availability of complementary goods and services and choices, and it is assumed to reduce the vulnerability to external shocks and the exit hazard.

## F. Firm Characteristics

$REL\_SIZE$  is measured as the ratio between the firm's employment and the average size of firms in its industry (3-digit VSIC). Larger firms are expected to have a lower hazard of exit because they may benefit from scale economies and have more capacity to do R&D as well as to expand their networks and diversify their products.

$CAP\_INT$  denotes the capital intensity of the firm and is measured as the ratio of fixed assets (deflated by the gross domestic product [GDP] deflator) to the total number of employees. The variable is included to capture the effect of specific capital costs as well as the underlying efficiency level as analyzed by Kejzar and Kumar (2006).

$AGE$  is the age of the firm, measured as the number of years since their establishment. Firms' age reflects the experience of the firm in the market, also covering the learning process that could be either passive or active (Jovanovic 1982, Hopenhayn 1992). The older the firm, and the longer the learning process, the lower the hazard of exit.

In addition, to control for sectoral/regional heterogeneity, dummies for sectors and regions are included. There are 10 sectoral dummies that are based on the 1-digit VSIC, capturing all subsectors in agriculture, mining, manufacturing, and services. Seven regional dummies are constructed on the basis of the standard regional classification in Viet Nam. They capture both geographical and economic development differences between regions.

It should be noted that like many other survival studies, the present model does not include time dummies. A first reason is that they would be highly correlated with the variable  $AGE$  in the model. Second, the business cycle, technological progress, and other temporal shocks are already included in the time varying covariates in the model, like the growth of SOEs and FDI, as well as changes in the market

Table 3. Variable Definitions

Variables	Computation	Mean	Std. Dev.	Expected Sign <sup>a</sup>
<i>HFDI<sub>jt</sub></i>	Foreign presence at time interval <i>t</i> in sector <i>j</i> , measured as total output value of FDI firms in sector <i>j</i> /total output value of the sector	0.220	0.267	+
<i>UpFDI<sub>jt</sub></i>	Foreign presence at time interval <i>t</i> in upstream sectors relative to sector <i>j</i> , computed from <i>HFDI</i> and transposed IO table coefficients	0.260	0.133	+/-
<i>DownFDI<sub>jt</sub></i>	Foreign presence at time interval <i>t</i> in downstream sectors relative to sector <i>j</i> , computed from <i>HFDI</i> and IO table coefficients	0.307	0.128	-
<i>HSOE<sub>jt</sub></i>	SOE presence at time interval <i>t</i> in sector <i>j</i> , measured as total output value of SOEs in sector <i>j</i> /total output value of the sector	0.478	0.303	+
<i>UpSOE<sub>jt</sub></i>	SOEs presence at time interval <i>t</i> in upstream sectors, computed from <i>HSOE</i> and transposed IO table coefficients	0.381	0.156	+/-
<i>DownSOE<sub>jt</sub></i>	SOEs presence at time interval <i>t</i> in downstream sectors, computed as sum product of <i>HSOE</i> and IO table coefficients	0.328	0.125	-
<i>GFDI<sub>jt</sub></i>	Sales growth of FDI firms in sector <i>j</i> at time <i>t</i>	1.255	0.819	+/-
<i>GSOE<sub>jt</sub></i>	Sales growth of SOEs in sector <i>j</i> at time <i>t</i>	1.043	0.693	+
<i>EXPORT<sub>jt</sub></i>	Export ratio of sector <i>j</i> at time <i>t</i>	0.062	0.165	-
<i>EXPRATIO<sub>jt</sub></i>	Export ratio of foreign-owned firms in sector <i>j</i> at time <i>t</i>	0.186	0.284	-
<i>IMPORT<sub>jt</sub></i>	Import ratio of sector <i>j</i> at time <i>t</i>	0.1202	0.214	+
<i>HERF<sub>jt</sub></i>	Herfindahl index, proxy for concentration in the market, calculated as the sum of squares of employment share in sector <i>j</i>			+/-
<i>MSCALE<sub>jt</sub></i>	MES of sector <i>j</i> , computed as the median employment of sector <i>j</i>	32.514	35.164	+/-
<i>ENTRY<sub>jt</sub></i>	Entry rate in sector <i>j</i> at time <i>t</i>	0.241	0.082	+
<i>NBR<sub>rt</sub></i>	Neighborhood concentration index, measured as the spatial market concentration of provinces surrounding province <i>r</i> at time interval <i>t</i>	448,445.4	68,421	+/-
<i>DIVER<sub>rt</sub></i>	Spatial diversity index, measured as the sum of squares of sectoral output shares in province <i>r</i> at time <i>t</i>	9.198	66.906	-
<i>REL_SIZE<sub>it</sub></i>	Relative size of the firm <i>i</i> at time <i>t</i> , measured as the output of firm <i>i</i> to median output in sector <i>j</i>	1.157	3.813	-
<i>CAP_INT<sub>it</sub></i>	Capital intensity, measured as total value of fixed assets to number of employees of firm <i>i</i> at time <i>t</i>	140.80	371.97	-
<i>AGE<sub>it</sub></i>	Age of firm <i>i</i> at time <i>t</i> measured as number of years since establishment to time <i>t</i>	4.525	4.151	-

<sup>a</sup>Expected effect of the variable on the hazard of exit.

Source: Authors' computations.

structure. Furthermore, due to the close correlation between the growth of SOEs and sectoral growth (which could be used to proxy the growth of market demand), we drop sectoral growth from the estimations to avoid multicollinearity. Table 3 summarizes the variables included in the regression models, as well as the mean,

standard deviation, and expected impact on the exit hazard. A correlation matrix is provided in Appendix 1.

### G. Endogeneity

There is some potential endogeneity in the model specification noted above. A first source of endogeneity is unobservable heterogeneity caused by the business cycle, institutional reform, regional and industry factors, and other variables that are not included in the model but that may influence both the survival of domestic firms and foreign entry into the market. A second source of endogeneity is the interdependence or simultaneous causality between survival and some covariates in the model. The entry and exit of firms may be simultaneously determined, as new entrants force less efficient incumbents out of the market (Manjon-Antolin and Arauzo-Carod 2008). The exit of incumbents may also generate a “vacuum” of local input supplies or customers that motivate or allow new actors to enter the market.

In other words, entry and exit can be simultaneous not only because all firms are faced with similar market barriers but also because one can cause the other. In addition, foreign firms may prefer to enter sectors that have high (or low) exit rates, which may be seen as an indication of more (or less) competition. Neglecting these endogeneities may obviously cause spurious estimation results.

Responses to the endogeneity of covariates are hard to find in the survival literature, and even more scarce in studies examining the survival effects of inward FDI. Earlier studies have employed different strategies to handle the problem. Many studies have ignored it (for example Wang 2010; Ferragina, Pittiglio, and Reganati 2009; Iurchenko 2009; and Burke, Görg, and Hanley 2008), some have addressed it by introducing lags or sectoral dummies (Kosova 2010, Görg and Strobl 2003b), while others have used more advanced methods such as instrumental variables (Girma and Görg 2003, Bandick and Görg 2010). Ignoring potential endogeneity or simply using sectoral dummies or lags of potentially endogenous variables may not be sufficient to ensure unbiased estimation. We will therefore use a two-stage instrumental variable model to address this problem.

## V. Results and Discussion

### A. Descriptive Statistics: Survival of DPFs

As a first step, we investigate the survival of firms using nonparametric methods. Table 4 provides a first glance at the data in survival format. The first column shows the number of intervals, that is, the number of years of survival. The second column is the total number of firms at risk of failure during each interval. It shows that for the first interval 79,852 DPFs were at risk. It should be noted that

Table 4. Survival of DPFs and Foreign Firms

Interval	Beg. Total	Deaths	Lost	Survival	Std. Error	95% Confidence Interval	
<b>DPFs</b>							
1	79,852	9,376	9,027	0.8755	0.0012	0.8732	0.8779
2	61,449	5,080	7,347	0.7986	0.0015	0.7956	0.8015
3	49,022	3,434	7,230	0.7382	0.0017	0.7348	0.7415
4	38,358	3,286	6,339	0.6692	0.0019	0.6654	0.6730
5	28,733	6,311	4,998	0.5082	0.0023	0.5037	0.5127
6	17,424	655	5,072	0.4859	0.0024	0.4813	0.4905
7	11,697	0	11,697	0.4560	0.0024	0.4813	0.4905
<b>Foreign</b>							
1	6,256	540	435	0.9106	0.0037	0.9031	0.9175
2	5,281	398	405	0.8392	0.0048	0.8295	0.8484
3	4,478	264	511	0.7867	0.0055	0.7757	0.7973
4	3,703	260	444	0.7280	0.0062	0.7157	0.7399
5	2,999	769	388	0.5284	0.0076	0.5134	0.5432
6	1,842	34	396	0.5175	0.0077	0.5023	0.5324
7	1,412	0	1,412	0.5175	0.0077	0.5023	0.5324

Log-rank test = 30.02;  $P = 0.0000$   
 Likelihood-ratio test = 30.6092;  $P = 0.0000$

Source: Authors' computations.

this is the total of all DPFs established at any time during the period 2001–2008. At the end of the interval, there were 9,376 firms that failed or died as shown in the third column named “Deaths.” This is the sum of firms that did not survive after their first year (appearance in the dataset). The fourth column, “Lost,” gives the number of firms that were censored or that were out of risk. This indicates that 9,027 firms that were established in the last year of the sample survived until the end of the sample period, i.e., were right-censored. Correspondingly, the data for the seventh interval shows that 11,697 enterprises recorded seven spells of survival. Since they survived through the whole sample period, there were no observations in the “Deaths” column. Moreover, all of them were right-censored, and survived beyond the sample period. Hence, they are all included in the “Lost” column.

The estimation of the survival function and its statistics are presented in the remaining columns. As shown in Jenkins (2005), the rate of survival at interval  $j$  is estimated by:

$$S_j = \prod_{k=1}^j \frac{(N_k - \frac{1}{2}m_k) - d_k}{(N_k - \frac{1}{2}m_k)} \tag{10}$$

where  $N_k$  is the number of firms at the start of the interval,  $m_k$  is the number of firms censored, and  $d_k$  is the number of firms that died. The “Survival” column records the estimated survival rates for all intervals. As shown in the table, only 45% of the

firms remained after 7 years. The table also reveals that the median of the survival duration is approximately 5 years.

The estimated survival rates of foreign firms are somewhat higher than those of DPFs at every interval: foreign firms have a median survival time of around 6 years. The last two rows in the table provide tests for the equality of survival functions. Both the log-rank test and the likelihood test indicate that the differences in survival propensity are statistically significant. This finding contradicts Görg and Strobl's (2003a) results for Irish manufacturing, which suggested that foreign firms seemed to be more footloose than domestic firms. However, it should be noted that most DPFs in Viet Nam during this period were relatively young and small—both of these characteristics raise the likelihood of exit.

Earlier survival studies in Viet Nam have shown somewhat lower survival rates, but these studies focused on firms established before 2001 (Hansen, Rand, and Tarp 2009) and household enterprises (Vijverberg and Haughton 2002). It is likely that the survival rates for firms established during the 1990s were lower because of the less favorable regulatory environment. Moreover, the lower survival rates of household enterprises are partly explained by the fact that they were even smaller than the DPFs established after 2001.

## B. Econometric Results

As a first step of the econometric analysis, we have tested whether the assumptions for the proportional hazard model hold. Finding that this is the case (results not reported here but available on request), we proceed to estimate the PH model (equation 4). To handle the possible endogeneity of covariates *HFDI* and *ENTRY*, we complement the base equation (which assumes no endogeneity) with a variant where the potentially endogenous variables are lagged, as well as an estimation using the instrumental variable method (2SCML).

Table 5 shows the results of the model for all DPFs. All specifications are stratified at the 1-digit sector level. This procedure allows for differences in the baseline hazards. This kind of specification is supported by the Wald test presented at the bottom rows of the table. Column (1) of Table 5 is the estimation where *HFDI* and *ENTRY* are assumed to be completely exogenous. Column (2) presents the results of the estimation using the first lags of the endogenous explanatory variables. Column (3) shows the results with the 2SCML correction factors. It can be noted in column (3) that the correction factors in the first stage of the 2SCML estimation are statistically significant at the 1% level, confirming the prior suspicion that the *HFDI* and *ENTRY* variables are endogenous. Column (3) is therefore the preferred estimation equation.

Although the hazard ratio is commonly used to present the hazard function estimation, Table 5 reports the coefficient forms. The reason is that the signs of the coefficients are also the signs of the effects: a negative coefficient means a lower risk

Table 5. Estimation Results—Impact of FDI

	Exogenous (1)	Lag 1 (2)	2SCLM (3)
<i>HFDI</i>	0.253*** (42.16)		0.341*** (26.16)
<i>Lag1.HFDI</i>		0.262*** (32.03)	
<i>UpFDI</i>	-0.198*** (17.42)	-0.208*** (11.32)	0.469*** (14.41)
<i>DownFDI</i>	0.228*** (12.77)	0.202*** (7.59)	-0.408*** (10.26)
<i>ENTRY</i>	0.543*** (16.91)		0.219*** (5.67)
<i>Lag1.ENTRY</i>		0.871*** (19.77)	
<i>GFDI</i>	-0.009 (1.0718)	-0.013 (1.067)	0.256*** (17.15)
<i>EXPORT</i>	0.742*** (9.82)	-0.695*** (5.76)	-1.083*** (8.65)
<i>EXPRATIO</i>	0.00 (0.10)	0.001 (1.80)	-0.004*** (4.37)
<i>HFDI * EXPRATIO</i>	-0.006 (26.47)	-0.004*** (9.37)	-0.005*** (9.07)
<i>IMPORT</i>	-0.187** (17.02)	0.040** (2.63)	-0.314*** (17.76)
<i>HERF</i>	-0.198*** (24.55)	-0.352*** (24.77)	-0.593*** (32.74)
<i>MSCALE</i>	-0.383*** (16.79)	-0.444*** (12.60)	-1.218*** (23.20)
<i>NBR</i>	-0.126*** (16.93)	-0.051*** (4.71)	-2.588*** (29.52)
<i>DIVER</i>	-0.047*** (15.27)	0.002 (0.46)	-0.060*** (11.69)
<i>REL_SIZE</i>	-0.175*** (18.23)	-0.134*** (9.62)	0.159*** (9.20)
<i>CAP_INT</i>	-0.008 (1.02)	0.013 (1.17)	-0.001 (0.07)
<i>AGE</i>	-0.423*** (34.30)	-0.416*** (16.33)	-0.079** (2.88)
<i>Constant</i>	-1.116*** (8.39)	-0.860*** (3.49)	16.96*** (20.87)
<i>HFDI_correction</i>			0.263*** (9.68)
<i>ENTRY_correction</i>			-8.878*** (31.72)
N	306,477	225,796	217,284
Log pseudo likelihood	-56,701.25	-27,722.85	-24,934.99
Wald tests	7,043.85	2,973.58	3,321.32

\* = significant at the 10% level, \*\* = significant at the 5% level, \*\*\* = significant at the 1% level.  
 Note: Cloglog model, dependent variable: dead1 (1 = firm exit, 0 = otherwise). All estimations are in coefficient form rather than as hazard ratios. The *HFDI\_correction* and *ENTRY\_correction* variables are the error terms from the instrument equations of the 2SCLM procedure. Numbers in parentheses are z-values. Coefficients for regional/sectoral dummies are not shown.

Source: Authors' computations.



of exit. With a few exceptions, the variables have the expected sign in the estimation reported in column (3). However, several variables have the opposite sign in the first two columns of the table. These large differences between the estimations can be explained by the possible biases caused by ignoring endogeneity or inappropriately using lagged variables as instruments.

Focusing first on the variables of interest in column (3), it can be seen that there is a significant relationship between FDI and the exit hazard faced by DPFs. The presence of foreign firms in the same sector (*HFDI*) raises the probability of exit very notably. More specifically, the coefficient  $\beta_{HFDI} = 0.341$  suggests that a 1 percentage point increase in *HFDI*, ceteris paribus, will induce an increase in the hazard of exit by  $100(e^{0.341} - 1) = 40.6\%$ .

This aggregate impact of horizontal FDI on the exit hazard is, as noted earlier, the sum of two effects: the negative competition effect and the potentially positive productivity spillover effect. However, since learning is generally not instantaneous, it is the former that dominates in the short run. The result confirms the static crowding out effect described in Kosova (2010). Louri, Peppas, and Tsionas (2006) and Wang (2010) found similar effects for DPFs in Greece and Canada, respectively, but Görg and Strobl (2003b) and Backer and Sleuwaegen (2003) found the opposite for Ireland and Belgium.

Kosova (2010) distinguishes the static crowding out effect from a dynamic crowding out effect that is related to the output growth of foreign firms in the same sector. The coefficient of the variable *GFDI* in column 3 is positive and significant, which suggests that an increase in foreign output will raise the exit hazard for domestic private firms. Hence, the dynamic crowding out effect also seems to be confirmed.

*UpFDI* and *DownFDI* reflect the impact of FDI from upstream and downstream sectors. The estimated coefficients show that they are somewhat larger (in absolute terms) than the replacement/competition effect of *HFDI*, but they have the opposite impacts. FDI in upstream sectors raises the exit hazard, but FDI in downstream sectors seems to reduce it. The finding that  $\beta_{DownFDI} = -0.408$  means that, ceteris paribus, a given 1 percentage point increase in the share of foreign presence in downstream sectors would lead to a decrease in the hazard rate by  $(1 - e^{-0.408}) * 100 = 33.5\%$ . By contrast, an increase in foreign presence in upstream sectors by 1 percentage point raises the exit hazard by nearly 60%.

While the positive impact of downstream FDI on the survival of DPFs could possibly be explained by demand creation (which may be particularly strong when foreign investors are export oriented) and the spillovers that come about when foreign firms buy local inputs and provide support for their local suppliers, it is more difficult to explain why upstream FDI seems to strongly reduce the life expectancy of DPFs. One possible channel of influence could be that foreign firms in upstream sectors are likely to crowd out local firms in the same sector, which in turn could harm the domestic firms in downstream sectors. This would be particularly serious if the

foreign firms in upstream sectors use technologies and manufacture intermediate goods that do not match the technologies and input requirements of local firms in later stages of the value chain.

Regarding the other survival determinants, it should be noted that international trade tends to lower exit hazards. The variable *EXPORT* has a large negative coefficient, and a higher export ratio for foreign-owned firms also tends to reduce the exit hazard. These results are as expected. The interaction variable *HFDI \* EXPRATIO* also records a negative sign. The interpretation is that the horizontal crowding out effect is weaker in sectors where foreign firms are more export oriented. However, it is somewhat surprising that the variable *IMPORT* also records a significant negative coefficient, given that import competition was hypothesized to raise the competitive pressure on DPFs.

It is possible that the relatively high correlation between imports and exports at the 3-digit level makes it difficult to disentangle the separate effects of these two variables—the fact that the signs of several of the trade-related variables change between the different estimations could indicate collinearity. It can also be hypothesized that a high import ratio is a characteristic of sectors where domestic firms have already learned to manage tougher competition. The DPFs in these sectors can perhaps be described either as firms that have survived import competition for some time or new entrants that are aware of the tough market conditions. To explore the impact of imports in closer detail, it would be interesting to check whether there are any differences between sectors depending on whether their imports consist of final goods or intermediate goods. Unfortunately, lack of data on the use of imports makes it impossible to examine this distinction.

Market concentration, proxied by the Herfindahl index reduces the exit hazard; the more concentrated the market, the lower the probability that domestic firms will have to exit the market. A likely reason for this result is that incumbents have some market power that allows them to respond positively to foreign entry. Since high concentration is often a sign of high entry barriers, it is possible that the number of vulnerable firms—newly established young firms that could easily be squeezed out from the market—is also relatively small. The variable *NBR*, which proxies local concentration, also seems to reduce the exit hazard. This could be an indication of an agglomeration effect. The geographic variable measuring diversity, *DIVER*, also appears to reduce the exit hazard.

The explanation for the negative coefficient estimate of the variable *MSCALE* is similar to that for market concentration. *MSCALE* has a positive effect on survival that is consistent for all three specifications, confirming the argument by Audretsch (1995) that firms in sectors with high minimum scale seem to enjoy higher price-cost margins due to high entry barriers, raising survival rates. At the same time, high minimum scale is likely to mean that exit costs are also high, and that firms will not respond quickly to negative demand shocks or cost increases.

Turning to the variable *ENTRY*, the results indicate that a high entry ratio raises the exit hazard. This finding is consistent with Backer and Sleuwaegen (2003) and Wang (2010) and confirms the replacement hypothesis stating that the entry of a new firm will force inefficient older firms out of the market. In addition, a high entry rate is an indicator of low sunk cost, which suggests not only low entry costs but also low exit costs.

Looking at firm characteristics, there are some interesting points to be noted. Capital intensity does not have any significant impact on firms' survival, which may appear counterintuitive: high capital intensity could be seen as an indication of relatively high barriers to entry and hence high price-cost margins that reduce the exit hazard. However, Viet Nam is a labor-abundant rather than a capital-abundant country. DPFs in general are not likely to have strong competitive advantages related to capital intensive technologies. It is also notable that the relative size of the firm seems to raise the exit hazard, despite the a priori expectation that larger firms would be more resilient. A possible reason is that larger firms may be more vulnerable, e.g., because of higher debt levels, but we do not have access to the financial data needed to explore this further. The variable *AGE* has the expected positive impact on survival in all three estimations.<sup>1</sup>

### C. Do SOEs Matter?

As mentioned earlier, the economy of Viet Nam is distinguished by the dominance of SOEs in many sectors. SOEs are not only focused on the provision of public services, but they also hold prominent positions in many other industries. This motivates an analysis of the role of SOEs in determining the survival of DPFs. One obvious reason is that SOEs may influence the survival of DPFs in the same way as FDI does—SOEs can also be assumed to be larger and stronger firms that dominate the smaller and weaker private actors. Moreover, the presence of SOEs may have a conditioning impact on the relation between FDI and DPF survival. Hence, we define four variables—*H*SOE, *Down*SOE, *Up*SOE, and *G*SOE—to represent SOEs presence in horizontal, downstream, and upstream sectors, as well as the growth of SOE output.

The expected effects of the SOE variables on DPFs are similar to those of the FDI variables, but not necessarily identical. The reason is that unlike foreign firms, SOEs do not always exhibit higher efficiency or higher productivity than DPFs, and they have fewer unique technological assets that could spill over to local firms (see further Nguyen et al. 2006 and Tran 2013). The backward and forward linkages between DPFs and SOEs may also differ from those between DPFs and

<sup>1</sup>To test the robustness of the results, we have also estimated the hazard function with some parametric models that also have PH properties, including Weibull, Exponential, and Cox models. The results of these tests (available on request) indicate that the findings discussed above are fairly robust to alternative assumptions about the hazard function.

foreign firms. In particular, DPFs may be more likely to select SOEs rather than foreign firms as suppliers or customers due to lower technical requirements and the similarity in business culture. This means that the linkages may be stronger or more extensive, although the potential technological advantage of SOEs—and hence the potential for learning and spillovers—is likely to be weaker.

Furthermore, because SOEs have existed in the market longer than the foreign firms and because they hold substantial market power, the foreign firms may choose different entry strategies and operational strategies in different sectors, depending on the market share of SOEs. This suggests the hypothesis that the survival effects from FDI may vary with the share of SOEs in the sector. This hypothesis is tested by introducing some interaction terms between SOEs and FDI in the empirical model.

In Table 6, column (1) presents the estimation results in which only the presence of SOEs and control variables are included. Column (2) includes both SOEs and FDI. Column (3) focuses on the FDI variables but adds a dummy variable for the quintile of sectors with the highest SOE shares and interacts it with the FDI variables, while column (4) adds a corresponding interaction variable for the quintile of sectors with the lowest SOE shares. These interaction variables are introduced in order to explore how the presence of SOEs influences the impact of FDI on local firms.

The control variables are robust across estimations, but are not included in Table 6 to save space (results are available on request).<sup>2</sup>

The results in column (1) show that SOEs have a significant effect on the survival odds of DPFs. The variable *H*SOE has the expected positive coefficient, but *Up*SOE records a negative coefficient, suggesting that relations with SOEs in upstream industries may benefit local firms. This is in contrast to the results for upstream FDI, which was found to raise the exit hazard. The difference presumably reflects the smaller technology gap between DPFs and SOEs. The coefficient for *Down*SOE is positive but not significantly different from zero, which is also somewhat surprising, given that the coefficient of *Down*FDI in Table 5 was negative and significant.

Another surprising result is that increases in SOE output (*G*SOE) seem to have dynamic crowding in effects on DPFs. The coefficient of *G*SOE in column (1) is  $-0.208$ , indicating that the hazard of exit declines by 18.7% for a 1 percentage point increase in the growth of SOEs. This impact becomes even stronger when foreign presence is included in column (2). This result is not easily explained unless the growth of SOE output is highly correlated with overall demand growth. The result could also be connected to the fact that SOEs have lost market shares in several industries and gone through a gradual privatization process during the period under study, which means that there are many sectors where SOEs record negative growth.

<sup>2</sup>One exception is the variable *AGE*, which is insignificant in some of the estimations reported in Table 6.

Table 6. The Impact of SOEs and FDI

	SOE (1)	FDI & SOE (2)	High SOE Dummy (3)	Low SOE Dummy (4)
<i>HFDI</i>		0.394*** (9.63)	0.710*** (32.67)	0.753*** (18.61)
<i>UpFDI</i>		0.715*** (16.91)	0.774*** (20.06)	0.889*** (19.22)
<i>DownFDI</i>		-0.951*** (19.97)	-0.624*** (15.02)	-0.449*** (9.62)
<i>HSGE</i>	0.432*** (24.43)	0.381*** (11.54)		
<i>UpSGE</i>	-0.168*** (7.96)	-0.258*** (9.04)		
<i>DownSGE</i>	-0.060 (1.663)	0.333*** (9.67)		
<i>GFDI</i>		0.430*** (22.85)	0.390*** (18.49)	0.456*** (23.83)
<i>GSGE</i>	-0.207*** (13.80)	-0.354*** (23.50)		
<i>HFDI * SOE_DUM</i>			0.397*** (4.64)	-0.153*** (5.77)
<i>UpFDI * SOE_DUM</i>			-0.204*** (3.91)	-0.613*** (11.05)
<i>DownFDI * SOE_DUM</i>			1.232*** (6.00)	-0.288* (2.55)
<i>SOE_DUM</i>			2.530*** (4.88)	-2.857*** (7.50)
N	217,284	217,284	217,284	217,284
Log pseudo likelihood	-24,896.03	-24,530.54	-24,619.21	-24,539.41
Wald-test	3,697.232	5,518.01	4,521.25	4,537.00

\* = significant at the 10% level, \*\* = significant at the 5% level, \*\*\* = significant at the 1% level.

Note: Cloglog model, dependent variable: *dead1* (1 = firm exit, 0 = otherwise). All estimations are in coefficient form, not hazard ratios. Numbers in parentheses are z-values. Coefficients for regional/sectoral dummies are not shown. The High SOE dummy identifies the quintile of 3-digit sectors with the highest SOE shares of output. The Low SOE dummy marks the quintile with the lowest SOE shares. Coefficients for control variables are not shown to save space.

Source: Authors' computations.

Having established that SOEs do have an impact on local firms, it is interesting to examine whether the presence of SOEs may moderate or condition the survival effect of FDI. Column (2) adds the FDI variables to the estimation equation. The signs of the FDI variables remain unchanged, but the absolute size of the estimated coefficients increases: in particular, the vertical impacts of FDI appear to grow stronger. The impact of SOEs is also influenced by the inclusion of the FDI variables. The most notable change is that the coefficient linked to downstream SOEs becomes positive and significant, suggesting that the exit hazard increases if SOEs raise their share among the customers of DPFs. This result is not easily explained, and may be due to the gradual retreat of SOEs from some of the downstream industries. If so,

there could be a link between the coefficient estimates for *DownSOE* and *DownFDI*, although the correlation matrix in Appendix 3 suggests that they are not highly correlated.<sup>3</sup>

To explore the relations between the impacts of FDI and SOEs in somewhat closer detail (in a context where the possible correlation between the FDI and SOE variables is less of a concern), columns (3) and (4) add dummy variables for the 3-digit industries with the highest and the lowest (horizontal) SOE shares. In column (3), the dummy *SOE\_DUM* distinguishes the quintile of sectors with the highest SOE shares. The direct effect is an increase in the exit hazard for DPFs, as seen from the positive and significant coefficient for *SOE\_DUM*. All three interaction variables combining *SOE\_DUM* with *HFDI*, *UpFDI*, and *DownFDI* are also significant.

For *HFDI*, the results suggest that the strong direct effect of horizontal FDI is even stronger in industries with high SOE shares—DPFs that are already pressured by SOEs are particularly vulnerable to further competition from foreign-owned firms. For vertical FDI, the direct effects seem to be smaller or even reversed in sectors with high SOE shares. In particular, it appears that the beneficial effects of downstream FDI are absent in the sectors that are most strongly dominated by SOEs.

In column (4), where the dummy variable identifies the sectors with the lowest SOE shares, the effects are of a different nature. First, the coefficient of *SOE\_DUM* is negative and significant, suggesting that the exit hazard is smaller in these sectors. Second, the inclusion of the interaction term reduces the impact of *HFDI*. The direct effect of horizontal FDI is still an increase in the exit hazard, but this effect is somewhat weaker in the sectors with low SOE shares. Third, the effects of vertical FDI are less harmful (upstream FDI) or more beneficial (downstream) in the sectors with low SOE shares.

For the impact of horizontal FDI, the theoretical interpretation of the conditioning role of SOEs appears straightforward. The higher the share of SOEs, the tougher the baseline competition and the stronger the additional negative effect of *HFDI* on the survival odds of DPFs. It is more difficult to make any strong generalizations about how SOEs influence the vertical effects. The results for sectors with high SOE shares are unclear, both theoretically and empirically, and the results probably reflect differences in the capabilities of both DPFs and SOEs across industrial sectors. Further work is clearly needed to better understand these interactions. Yet, the observations that the presence of SOEs has an impact on the exit hazard for DPFs and that they also influence the impact of FDI on DPFs are important and have rarely been made in extant literature.

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<sup>3</sup>If the market share of SOEs in downstream industries falls, it is possible that this could be reflected in an increase in the market share of foreign-owned firms (although the SOEs could also be replaced by DPFs). If this shift in market shares has an impact on the exit hazards for DPFs, it would be recorded as opposite effects for the retreating (SOEs) and expanding (FDI) investor groups.

Table 7. Net Effect, Change in Hazard of Exit 2001–2008 (%)

		FDI			SOE		
		Low Export	High Export	Avg.	Low Export	High Export	Avg.
<b>Food processing</b>	Horizontal	-5.62	5.92	2.83	7.04	1.39	2.92
	Backward	-2.49	9.37	6.52	0.57	13.87	10.15
	Forward	-2.52	-35.72	-29.38	-0.32	-4.14	-2.61
	<b>Total</b>	<b>-10.63</b>	<b>-20.43</b>	<b>-20.03</b>	<b>7.29</b>	<b>11.12</b>	<b>10.46</b>
<b>Textile, leather, wood products</b>	Horizontal	0.43	-5.50	-4.23	1.78	0.50	0.77
	Backward	-0.31	7.61	5.66	-2.19	5.39	3.52
	Forward	2.50	-1.20	-0.33	-0.79	-1.82	-1.58
	<b>Total</b>	<b>2.62</b>	<b>0.91</b>	<b>1.10</b>	<b>-1.20</b>	<b>4.07</b>	<b>2.71</b>
<b>Metal products, machinery</b>	Horizontal	2.19	-0.40	0.26	-1.30	1.72	0.80
	Backward	2.27	1.41	1.61	-0.62	-3.68	-2.39
	Forward	1.41	-5.08	-2.84	-1.27	-3.21	-2.70
	<b>Total</b>	<b>5.87</b>	<b>-4.07</b>	<b>-0.97</b>	<b>-3.19</b>	<b>-5.17</b>	<b>-4.29</b>
<b>Electricity, energy</b>	Horizontal	-6.91	15.54	3.35	6.08	8.55	6.47
	Backward	-2.13	-1.26	-1.98	-2.71	-2.57	-2.69
	Forward	10.85	14.14	11.26	-0.19	-1.66	-0.50
	<b>Total</b>	<b>1.81</b>	<b>28.42</b>	<b>12.63</b>	<b>3.18</b>	<b>4.32</b>	<b>3.28</b>
<b>Other services</b>	Horizontal	-0.01	-0.56	-0.24	-4.05	6.96	0.33
	Backward	-2.08	3.61	0.40	-2.43	1.21	-0.87
	Forward	-5.79	-7.08	-6.15	-0.31	-3.18	-0.88
	<b>Total</b>	<b>-7.88</b>	<b>-4.03</b>	<b>-5.99</b>	<b>-6.79</b>	<b>4.99</b>	<b>-1.42</b>
<b>All industries</b>	Horizontal	-0.54	-0.13	-0.28	0.48	2.97	1.81
	Backward	-1.48	4.13	1.57	-1.95	5.55	2.03
	Forward	-1.43	-8.25	-4.68	-0.43	-2.90	-1.60
	<b>Total</b>	<b>-3.45</b>	<b>-4.25</b>	<b>-3.39</b>	<b>-1.90</b>	<b>5.62</b>	<b>2.24</b>

Source: Authors' computations.

#### D. Net Effects of Changes in FDI and SOE Shares

It should be noted that all discussions so far have focused on marginal effects. The results show that effects of foreign presence on the survival of DFPs are remarkably large, they vary depending on whether the foreign firms are in the same or upstream/downstream sectors, and they are influenced by the presence of SOEs. In particular, there seems to be a strong and robust crowding out effect of horizontal FDI and SOE presence. To compute the net effects of changes in FDI during the period under study, the estimated coefficients from the model must be combined with the actual changes in the various forms of FDI and SOEs included in the model.<sup>4</sup>

Table 7 illustrates these net effects based on the coefficients in column (2) of Table 6. The effects from changes in both FDI and SOEs on the survival of DFPs are calculated. To take into account the heterogeneity of DFPs, we present the effects for five major sectors as well as the average effect on the domestic industry.

<sup>4</sup>Although cloglog is a nonlinear model, its PH property allows us to compute the net effects to the hazard ratio.



Moreover, noting the significant impact of international trade on exit hazards, Table 7 also presents separate estimations for the quintiles of 3-digit industries with the lowest and highest export shares in each industry group. All estimations are based on FDI and SOE shares at the 3-digit level. To facilitate an overview of results, the table shows the change in exit hazards between 2001 and 2008, rather than data for individual years. Because of the relatively large changes in FDI and SOE shares between individual years, with increases as well as decreases, there is substantial variation over time and across more disaggregated sectors, which complicates interpretation.

A first point to note is that the estimated net effects on changes in hazard rates are relatively small, considering the large marginal effects found in Table 6. The main reason is that the changes in FDI shares over the whole period have not been very large—both FDI and domestic industry have grown substantially, and a large share of the year-to-year fluctuations disappears when we look at the end points in the dataset.<sup>5</sup> Second, although the average impact of FDI is relatively small—a reduction in the exit hazard by about 3%—there are differences between the broad industry groups, as well as differences between more and less export-oriented subgroups of industries.

Generalizing, it appears that FDI has contributed more to reduce exit hazards in relatively simple industries like food products, while there has been some crowding out of local firms in more advanced industries such as electricity and energy. The effects also seem more beneficial in the more export-oriented industry groups, with the exception of the electricity and energy sector. Third, the average impact of changes in SOE shares is a small increase in the hazard of exit, although there are differences across sectors. There does not seem to be any immediate relationship between the technical complexity of the sector and the net impact of SOEs, nor is there any obvious link to the export orientation of the industry. Although the results confirm that SOEs do have an impact on the exit hazards facing DPFs, it is clear that further work is needed to gain deeper insights into this relationship.

## VI. Conclusion

This paper has examined the survival effect of inward FDI on DPFs in Viet Nam. Recent literature suggests that the survival effects of FDI come from different sources that may sometimes have contradictory impacts. Firms that manage to absorb positive technological spillovers will face lower exit hazard thanks to improved productivity and efficiency. Positive effects also come from demand creation

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<sup>5</sup>It should be noted that we do not include the dynamic crowding out effect from growth in foreign production in these estimations. The dynamic effect is a short-term phenomenon, and aggregating growth rates over many years yields results that are obviously not realistic.

connected to the presence of foreign firms in downstream sectors. In such cases, domestic firms may gain from increased possibilities to exploit economies of scale. However, the most frequently noted effect in the survival literature is the negative competition effect that occurs as foreign firms take market shares and force local enterprises to reduce output or cut prices in order to maintain their market shares. In either case, less efficient DPFs are likely to be forced to exit the industry.

The paper makes the following four contributions to extant literature. First, we have examined the survival effects from both horizontal and vertical FDI, while most of earlier studies focus on the survival impact of horizontal FDI alone. The results confirm that horizontal FDI is likely to crowd out local firms, but also suggest that the vertical effects are important and that omitting these effects may result in inappropriate conclusions about the overall impact of FDI.

Second, unlike earlier studies that consider domestic firms as a homogenous group, we highlight the role of SOEs for industry dynamics. The presence of SOEs apparently has a direct effect on the survival of DPFs—which is not surprising, considering the significant market shares and market power of SOEs in Viet Nam—but they also seem to have a conditioning impact on the relationship between FDI and the survival of DPFs. These preliminary findings stress the need for further study on the interactions between FDI, SOEs, and DPFs, particularly in transition economies where SOEs still play an important economic role.

Third, we have explicitly tried to manage estimation problems related to the endogeneity of covariates. In particular, we have found indications that both foreign presence and entry ratios may be endogenous. Earlier studies have generally assumed that covariates are exogenous or used lagged variables to try to control for endogeneity.

Fourth, apart from pointing to the partly offsetting effects of horizontal and vertical FDI on the survival of DPFs, we also attempt to calculate the net effect of foreign presence. Although the marginal effects are large and vary by year and industry group, we find a surprisingly small net effect.

What policy conclusions does a finding about increased exit hazards imply? There are two general interpretations of the possible welfare effects of the changes in industrial structure generated by FDI. A first perspective focuses on the vulnerability of DPFs in Viet Nam. The findings show that DPFs can suffer from both a remarkably large short-term crowding out effect and negative longer term effects caused by changes in upstream and downstream sectors. An almost instinctive policy response is to call for measures to strengthen the competitiveness of DPFs, in order to maintain a strong domestic industry sector and a high level of employment in domestic firms.

However, an alternative interpretation is based on an industrial efficiency perspective. How should the structure of domestic industries develop if domestic enterprises are to become more competitive in an increasingly open and internationally oriented market? It seems clear that the strength of the local private sector is not only measured by the number of DPFs in individual industries, but also by

Table 8. Survival Time and Size (Employment)

Years of Survival	Relative Size
1	0.87
2	1.00
3	1.12
4	1.27
5	1.47
6	1.71
7	2.03

Note: Size relative to 3-digit industry average.

Source: Authors' computations.

the size, productivity, and competitiveness of these firms. Moreover, flexibility and dynamism are increasingly important characteristics in the internationalized market place. Entrepreneurs need to be able to respond to market signals, moving towards industries and activities where market conditions are favorable and away from sectors where the returns to investment and work effort are lower.

Seen from this perspective, it is not obvious whether an increased exit hazard due to inward FDI is good or bad for domestic industry. In fact, an increased exit rate could even be favorable if it is part of a dynamic restructuring process, where weak firms exit and leave room for more efficient and productive enterprises that are able to grow faster. This suggests that the key questions are “Who are the survivors?” and “Are there enough survivors to maintain a high level of employment?”

A detailed analysis of the survivors lies beyond the objectives of this paper, but Table 8 provides a quick glance at one of the characteristics of surviving firms—size. The table presents the relative size of firms (based on the number of employees) across firms with different survival times. There is a consistent pattern where surviving firms quickly grow larger: the typical DPF that has survived 7 years is more than twice as large as the average firm in its 3-digit industry. This suggests that survivors have an opportunity to grow stronger and larger over time, and that the restructuring process that is triggered by FDI inflows is perhaps not detrimental to the domestic economy as a whole. At the same time, it is appropriate to recognize that more detailed studies of the dynamic effects of FDI are needed to better understand the differences between failing and surviving firms, particularly on whether and how resources used in failing firms are transferred to surviving companies.

A final point relates to the theoretical consequences of the finding that there is a systematic crowding out effect from FDI. As noted earlier, studies of the technology spillovers from FDI have resulted in contradictory findings, with positive as well as negative results reported in the extensive literature (Blomström and Kokko 1998, Görg and Greenaway 2004). One reason could be that the analyses are performed on samples that include both surviving firms and firms that are crowded out because of the competition from FDI. It is possible that the spillover effects estimated in such samples are poor descriptions for both types of firms. The enterprises that are

crowded out per definition do not benefit from any positive technology spillovers, and their inclusion in the sample may also obscure the true impact on surviving firms. This suggests that estimations of spillovers should perhaps be performed in two stages, with a first stage estimating survival and a second stage estimating spillover effects for those firms that are not crowded out by foreign presence.

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Appendix 1: Recent Studies on Survival Effects of FDI

Authors	Countries	Models	Covariates (Firm Variables)	Controls for Endogeneity	Data	Results
Wang (2010)	Canada	AFT	FDI, Export, Import, Entry rate, Industry dummies, Cohort dummies (Size, Ownership dummy, Multi-plant dummy)	No	Manufacturing 1973–1996	(-) Horizontal (+) Backward (+) Forward
Ferragina, Pittiglio, and Reganati (2009)	Italy	Cox	Herfindahl, MES, FDI (Size, Age, Relative labor productivity, Ownership dummy)	No	Manufacturing and services 2005–2007	(+) Services, (?) Manufacturing
Iurchenko (2009)	Ukraine	Cox	FDI, Export, Concentration, Region dummies, Sector dummies, Time dummies (Size, Capital intensity, Wages, Number of subsidiaries, Profitability)	Lag(1) for Herfindahl	Manufacturing 2001–2007	+
Bandick and Görg (2010)	Sweden	Cloglog	Industry dummies, Time dummies (Ownership, Size, Age, Multi-plant dummies, R&D intensity, Exports)	Scoring propensity and IVs	Manufacturing 1993–2002	+/?
Kosova (2010)	Czech	Lognormal	FDI, Reform dummies, Industry dummies, Region dummies (Foreign capital share, Sales growth, Age, Size, Intangible assets, Technology gap, Solvency)	Dummies for time, region, sector	1994–2001	(-) Short term
Burke, Görg, and Hanley (2008)	UK	Cox	FDI, Concentration, Sectoral growth (Size)	No	Manufacturing 1997–2002	(+) Overall (-) Dynamic and (+) Static industries
Taymaz and Özler (2007)	Turkey	Cox	FDI, Entry rate, Growth, Prices, Imports, Exports, Herfindahl, MES, Time dummies, Industry dummies (Size, Employment growth, K/L, Advertising, Contracted input share, Contracted output share, Interest payments, Profit margin, Bonuses)	No	Manufacturing 1983–2001	(?)

Continued.

Appendix 1: Continued.

Authors	Countries	Models	Covariates (Firm Variables)	Controls for Endogeneity	Data	Results
Louri, Peppas, and Tsionas (2006)	Greece	Weibull, Cox, Exponential	FDI, Herfindahl (Inefficiency, Ownership, Age, K/L, Total assets, Leverage, Liquidity, Profit, Debt)	No	Manufacturing 1997–2003	(–)
Görg and Strobl (2003b)	Ireland	Cox	FDI, MES, Herfindahl, Employment growth (Size, Tech level, Age, Foreign dummy)	Sectoral dummies	Manufacturing 1973–1996	(+) All (+) High tech (–) Low tech
Backer and Sleuvaegen (2003)	Belgium	System (OLS) equation	Imports, Foreign entry, Foreign exit (Price cost margin, Sales growth)	No	Manufacturing	(–) Short run, (+) Long run
Alvarez and Görg (2005)	Chile	Probit	FDI, MES, Herfindahl (Size, Age, Productivity, Export dummy, Foreign dummy)	No	Manufacturing 1990–2000	(+) With productivity improvement
Girma and Görg (2003)	UK	Cox	Industry growth, Herfindahl, Region dummies (Age, Size, Ownership, Age at acquisition)	IV method	Electronic and Food industries 1980–1993 All firms 1983–1991	(–) Electronics (?) Food
Mata and Portugal (2002)	Portugal	Exponential Hazard	FDI, MES, Employment growth, Entry rate, Concentration, Industry growth (Labor quality, Size, Ownership form)	No		(?)
Dries and Swinnen (2004)	Poland	Probit	(FDI dummy, Vertical links, Size, Age, Education, Household characteristics)	Yes	Dairy farm data (1996–2000)	(+) Backward effect

AFT = accelerated failure time model, FDI = foreign direct investment, K/L = capital/labor, MES = minimum efficient scale, R&D = research and development, UK = United Kingdom.

Source: Authors' summary of the literature.

## Appendix 2: Survival Probabilities of Domestic Firms (%)

Year	OECD <sup>a</sup>	US <sup>b</sup>	UK <sup>c</sup>	UK <sup>d</sup>	Turkey <sup>e</sup>	Viet Nam
1	–	93	99.2	75	83	87
2	–	–	86.0	–	78	79
3	71	–	76.0	–	69	73
4	–	–	69.7	55	60	66
5	–	67	–	–	–	50
10	–	54	–	–	40	–

– = not available, OECD = Organisation for Economic Co-operation and Development, UK = United Kingdom, US = United States.

<sup>a</sup>OECD. 2011. Entry, Exit, and Survival. In *OECD Science, Technology and Industry Scoreboard 2011*. Paris: OECD Publishing; average for firms in the cohort 2004.

<sup>b</sup>Agarwal, Rajshree, and David Audretsch. 2001. Does Entry Size Matter? The Impact of the Life Cycle and Technology on Firm Survival. *Journal of Industrial Economics* 49(1): 21–43; for US in period 1906–1990.

<sup>c</sup>Helmets and Rogers (2010); for UK in the period 2001–2006.

<sup>d</sup>Saridakis, George, Kevin Mole, and David Storey. 2008. New Small Firm Survival in England. *Empirica* 35(1): 25–39; for small sample survey in 1996–2001.

<sup>e</sup>Taymaz, Erol, and Sule Özler. 2007. Foreign Ownership, Competition, and Survival Dynamics. *Review of Industrial Organization* 31(1): 23–42; for the case of Turkey for the period 1983–2001.

Appendix 3: Correlation Matrix for Variables Used in the Model (simple correlations)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1 <i>HFDI</i>	1.000																	
2 <i>UpFDI</i>	-0.471	1.000																
3 <i>DownFDI</i>	-0.366	0.392	1.000															
4 <i>HSEO</i>	0.385	0.048	-0.150	1.000														
5 <i>UpSOE</i>	-0.392	0.355	0.281	-0.138	1.000													
6 <i>DownSOE</i>	-0.185	0.457	0.331	-0.015	0.307	1.000												
7 <i>GFDI</i>	-0.144	0.106	0.041	-0.057	0.043	0.015	1.000											
8 <i>GSOE</i>	-0.213	0.228	0.165	0.008	0.090	0.088	0.289	1.000										
9 <i>EXPORT</i>	0.258	-0.051	-0.032	0.074	-0.185	0.020	-0.044	-0.060	1.000									
10 <i>IMPORT</i>	0.450	-0.338	-0.216	0.060	-0.274	-0.080	-0.140	-0.106	0.651	1.000								
11 <i>EXPRATIO</i>	0.528	-0.531	-0.206	0.012	-0.373	0.036	-0.120	-0.264	0.012	0.299	1.000							
12 <i>HERF</i>	0.213	-0.171	-0.253	-0.172	-0.170	0.015	-0.024	-0.048	0.073	0.160	0.191	1.000						
13 <i>NBR</i>	0.181	-0.124	-0.096	0.017	-0.107	-0.050	0.073	0.036	0.041	0.097	0.138	0.114	1.000					
14 <i>DIVER</i>	-0.045	0.006	0.034	-0.041	-0.051	0.018	-0.142	-0.042	0.025	0.046	-0.001	0.079	-0.507	1.000				
15 <i>MSCALE</i>	0.411	-0.271	-0.071	0.054	-0.258	-0.195	-0.159	-0.091	0.096	0.291	0.314	0.096	0.088	0.106	1.000			
16 <i>RELSIZE</i>	-0.130	0.068	0.028	-0.107	0.104	0.028	0.069	0.014	0.020	-0.037	-0.130	-0.012	0.072	0.133	-0.251	1.000		
17 <i>CAPINT</i>	-0.003	0.038	0.007	-0.014	0.012	0.060	0.012	0.039	0.024	-0.005	-0.018	0.059	0.090	-0.007	-0.058	0.075	1.000	
18 <i>AGE</i>	0.063	-0.028	-0.025	-0.014	-0.073	0.015	-0.013	-0.060	0.256	0.264	0.040	0.028	0.011	0.055	0.025	0.157	0.013	1.000
19 <i>ENTRY</i>	-0.295	0.282	0.318	-0.026	0.347	0.223	0.171	0.185	-0.122	-0.240	-0.244	-0.179	-0.012	-0.112	-0.146	0.091	0.026	-0.107

Source: Authors' computations.