Exit and Foreign Ownership: Evidence from Export-Oriented Firms in Sri Lanka

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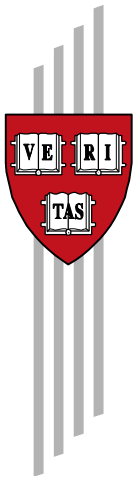

Working Papers

Center for International Development at Harvard University

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Abstract:

While foreign direct investment may play a transformative role in the development of economies, foreign-owned firms are also said to be more "footloose" than comparable local firms. This paper uses a semi-parametric approach to examine the link between firm ownership and exit rates, tracking a set of export-oriented firms operating in Sri Lanka in years between 1978 and 2017. We find that foreign firms are in fact 42-56% more likely to exit than local firms, but only for their first years of existence. In their later years, foreign firms are actually less likely to exit than local firms, though this late advantage is not statistically significant when conditioned on the firms' initial characteristics (such as employment size). This pattern supports the theory that foreign firms face a steeper early learning curve in adapting to local conditions.

I. Introduction

In countries around the world, foreign direct investment (FDI) is held to be a key ingredient for development, and policymakers expend real resources to pursue it. Countries often give tax incentives for foreign investment, if not direct subsidies (Blomström and Kokko, 2003). Significant amounts of government capacity are also expended on FDI, with most countries (and many regions and cities) having dedicated investment promotion agencies, investment fairs (both in the home country and abroad), dedicated investment attachés posted in embassies abroad, and international public relations campaigns aimed at investment. The World Bank, tasked with ending poverty, has embraced FDI as one means to do so, with dedicated FDI technical assistance department and funding, and at least two indices: one measuring regulatory barriers to FDI (World Bank Group, 2010), and another evaluating governments' administrative capacity to attract it (World Bank Group, 2012).

Yet on a superficial level, foreign investment brings the same benefits as investment in general: creating jobs, raising tax revenue, generating demand for local inputs, and (for export-oriented investors) bringing in foreign exchange. In fact, research suggests that foreign firms are on average larger employers, more productive, and more likely to export than local firms (Aitken and Harrison, 1999). Of course, the comparison is not an entirely fair one, as we would expect firms lacking these attributes to be less likely to invest abroad.

A better rationale for promoting FDI, then, may lie in its less tangible development benefits. FDI is often described as key for technology transfer, unlocking industrialization episodes by matching the knowledge and capital of high-income countries with new ideas and cheaper factors in lower- and middle-income countries. Less clear, however, are the specific mechanisms through which this transfer actually occurs. A number of studies have looked for productivity spillovers from FDI; for example, evidence shows these may come via backwards linkages (i.e. accruing to the suppliers of foreign firms – see Javorcik, 2004) and/or shared labor pools (see Rhee and Belot's study [1990] crediting initial employees of a Korean investor in Bangladesh with starting the modern garment export sector there). FDI may also be needed to unlock export markets, as global manufacturing becomes increasingly centered around tightly regulated global value chains and intrafirm trade.

On the other hand, such benefits are not guaranteed; they may only accrue under specific circumstances. For example, the same body of research that finds productivity spillovers through backwards linkages also suggests that spillovers do not occur in the same sector, or even that an increase in FDI in a sector is associated with a decrease in local firms' productivity in the same sector (Aitken and Harrison, 1999).[1] Policymakers in some countries have complained of "FDI enclaves" in which major foreign investors tightly guard their supply chains and intellectual property, thus failing to buy local inputs or hire skilled local workers, let alone transfer knowledge to local firms.

The other potential impediment to successful knowledge transfer through FDI is the relatively exit rate of foreign firms – the so-called "footloose" foreign investors (Rodrik, 1997). In some cases, especially for large, "anchor investors," exit can be devastating, undoing many of the benefits that the FDI had brought. In Costa Rica, for example, the loss of Intel meant the near complete collapse of the country's 20 billion U.S. dollar computer chip export sector (47% of all exports in 2013). If FDI has the potential to transform

[1] This may be due to increased competition, e.g. if foreign firms can offer higher wages for the sector's most productive workers.

the structure and the technology of an economy, yet is also relatively likely to leave, then policymakers pursuing an FDI-intensive growth strategy risk building their new growth models on unstable foundations.

In this paper, we seek to understand if and why foreign firms are more likely to exit than local firms: is it true that FDI is inherently more "footloose" than domestic investment? We use a semi-parametric approach to explore the effects of firms' initial characteristics and age to explore how the impact of foreignness might change as firms mature; this allows us to test different hypotheses of "foreign footlooseness" against each other. Crucially, we focus on a special set of large, export-oriented firms, following them for the entire existence of the incorporation category (from 1979 to 2017); this allows us to zero in on potentially transformative investors, and look for longer-term effects. We have two main results. First, we find that foreign firms are indeed more likely than local firms to exit in their early years, even controlling for initial characteristics like investment scale or employment size. Second, we find that foreign firms are actually less likely to exit in the years after that; however, this advantage is no longer statistically significant when including controls (as foreign firms are more likely to arrive with beneficial characteristics). This matches the "liabilities of foreignness" hypothesis, which predicts that foreign firms will have a steep initial learning curve.

II. Related literature

On the issue of firm survival and foreign ownership, the literature tends to fall into two sets of theories.[2]

The first class of studies posits that foreign firms are inherently more "footloose," especially after controlling for potentially beneficial initial characteristics (correlating with increased survival probability). Bernard and Sjoholm (2003) look at hazard rates for foreign manufacturers in Indonesia, using a Cox proportional hazard model (as we do here). They find that while firms with some degree of foreign ownership are, on average, less likely to exit in a given year, this advantage reverses when firm characteristics (such as firm size and productivity) are considered, i.e. suggesting that foreign firms have higher exit rates than local firms with similar characteristics. They also find that a foreign takeover of a domestic firm increases its exit likelihood. Similarly, Bernard and Jensen (2007) find that plants owned by U.S. multinationals are also less likely to exit than purely-domestic firms unconditionally, but more likely to exit when firm characteristics are controlled for.

One commonly-cited explanation tied to footlooseness is that multinationals have an "outside option" that purely local firms do not; these firms can leave the country without ending their business (and perhaps improving it, if conditions are relatively better in their other locations). This can be tested by comparing foreign versus local multinationals: if the "outside option" is driving higher exit rates, then local multinationals should have higher exit rates than purely local companies, but similar rates to those of foreign multinationals.[3] One study takes this approach and finds that local multinationals do have higher exit rates than pure locals, but still lower than foreign firms (Mata and Freitas, 2012). This may be in part due to a "hometown" preference, biasing them towards closing foreign locations rather than plants in the owners' or executives' own countries (Boddewyn, 1983). Regardless of the exact cause, the salient feature of the footlooseness theory is that it is an inherent feature of foreign investment: there is no obvious reason why foreign firms would have a reduced outside option as they grow in the host country, for example.

[2] See Mata and Freitas (2012) for an excellent overview of the literature.

[3] The data used in this study doesn't have information on whether local firms are multinationals or not, though we know anecdotally that many Sri Lankan firms have indeed expanded globally.

The other class of explanations for higher foreign exit rates is known as the "liabilities of foreignness" (LOF). This term was first proposed by Zaheer (1995), who studied foreign exchange brokers in Tokyo and New York, finding that profits were greater for foreign-owned brokers. A follow-up study (Zaheer and Mosakowski, 1997) found that the likelihood of exit was also higher for the foreign brokers, especially in their first years of operations. They posit a few different sources of LOF: foreign firms may be less familiar with local markets, including local suppliers, service providers (e.g. logistics) and labor markets; they may also be bound by government preferences for better-connected local businesses (both *de jure* and *de facto*). In most cases, these disadvantages would diminish as foreign firms become more knowledgeable about local conditions, and more entrenched in the local economic ecosystem; this would result in a gradual decline in the foreign exit rate vis a vis the local rate.

Finally, there may also be advantages of foreignness, beyond the observable characteristics we can control for (such as initial size). It is possible that foreign firms may possess some less tangible advantages, such as better managerial techniques or connections to international distributors. However, unlike the LOF, these would not necessarily diminish over time; non-diminishing advantages of foreignness would thus serve to act as counterweights against the theoretical innate footlooseness effect.

Hypotheses

Going forward, we can set some formal hypotheses, based on the literature described above. First, a primer on terminology. We are interested in the difference between exit rates for foreign versus local firms, in a given year of their existence; thus, all hypotheses will be expressed in terms of *hazard ratios*: specifically, the ratio of the hazard rate for foreign firms versus the hazard rate for local firms. A hazard ratio greater than one means that foreign firms are more likely to exit than locals (for the year in question).

Our first hypothesis is that foreign firms have unobserved qualities that purely local firms do not (such as an "outside option" in their location), and that these qualities result in more "footloose" behavior by otherwise similar firms (i.e. after controlling for beneficial observable characteristics), over the firm's entire lifespan. We can call this the "inherent footlooseness" hypothesis. If foreign firms are inherently footloose, then we would expect (i) hazard ratios for foreignness to be significantly greater than one, and (ii) no significant decrease in this disadvantage as firms grow older, i.e. no negative relationship between hazard ratios and the interaction (in some form) of firm age and foreignness.

The alternative to the inherent footlooseness hypothesis is the liabilities of foreignness (LOF) hypothesis. In the LOF world, foreign firms face a steeper learning curve, in which they are initially more likely than locals to exit as they tackle adaption issues that local investors do not face; it is assumed that this learning curve will flatten over the lifespan of the firm, meaning that foreign survival rates would converge with local rates as firms age (or even surpass them). If the LOF hypothesis is valid, then we would expect (i) hazard ratios for foreignness to be significantly greater than one for firms' initial years of existence, and (ii) a significant, negative relationship between the hazard ratio and the interaction of firm age and foreign ownership, such that the foreign hazard ratio approaches one as firms age.

Finally, of second-order interest is the effect of controls for firm characteristics: we expect to find that foreign firms are more likely to be born with "beneficial" attributes, correlated with lower exit rates (e.g. large size, or high productivity). As a consequence, we anticipate that the conditional hazard ratios for foreign firms (controlling for observable initial characteristics) will be higher than the corresponding unconditional hazard ratios (without any controls).

III. Data description

The dataset we use comes from the Board of Investment of Sri Lanka (BOI). It tracks the universe of a specific type of Sri Lankan company, BOI Section 17 projects (henceforth "BOI firms"), longitudinally from 1978 to 2017. BOI firms incorporate under Section 17 in order to access certain incentives.[4] To be incorporated under Section 17, firms need to be large (current threshold is initial investment of 500 thousand USD, with some exceptions) and export-oriented (pledge to export at least 80% of sales, for all years that Section 17 status is retained). Some minor exceptions apply, including for specific sectors (such as lower thresholds for the ceramics industry), and the thresholds change over time (e.g. to match inflation). All BOI firms are greenfield investments; the dataset does not capture expansions (into new locations or sectors) or takeovers. This is not a problem for this study, as we condition only on the initial characteristics of the investment. Observations are at the level of firms, not plants; data is given on the number of plants and their locations, but not as individual plant statistics (such as employment per plant).

The major caveat in using this dataset is that it does not cover all companies in Sri Lanka, or even all manufacturers or exporters. Firms that are too small (in terms of initial investment) or that are not export-oriented are not eligible for BOI incentives, and would thus be excluded. However, the dataset does represent the vast majority of Sri Lanka's industrial exports and industrial FDI. According to the BOI, Section 17 companies are responsible for a relatively stable average of 82% of industrial exports in a given year. The dataset accounts for a much smaller share of Sri Lanka's unprocessed agriculture, seafood and extractive materials exports (such as tea or gemstones); this means that the overall goods exports coverage is lower (70% in recent years, according to the BOI). Likewise, some service export categories are included in the dataset (IT, BPO, and logistics; not tourism), although service exports from BOI companies in these sectors also appear to account for a relatively low share of the national sector totals. Overall, it should be fair to characterize this dataset as the near-universal population of Sri Lanka's larger export-oriented manufacturers, including most manufacturers with foreign ownership. Firms in non-manufacturing activities are kept in the sample as well, though the results are robust to their exclusion (the early disadvantage is somewhat smaller but still highly significant – see Appendix D).

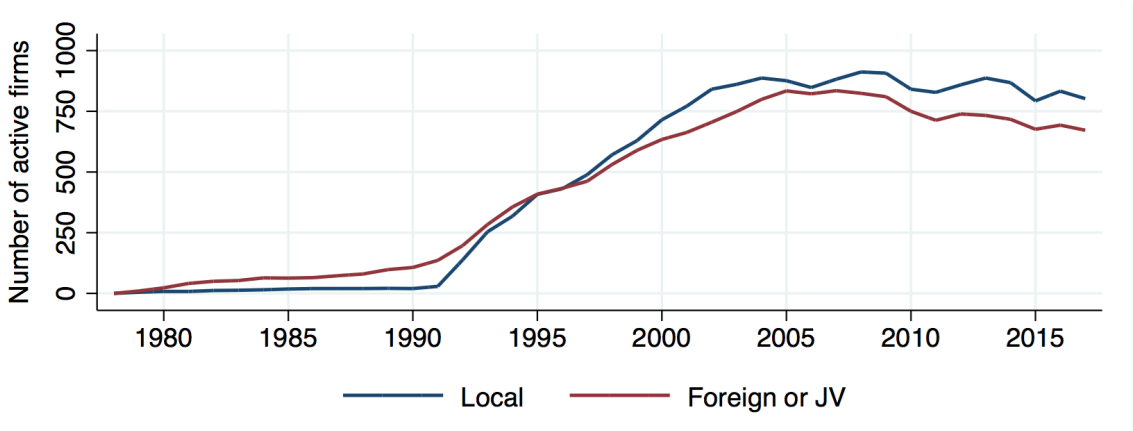
Firms in the dataset are classified active for years in which they are either (i) currently exporting, (ii) currently employing workers, or (iii) deemed "in commercial operations" by BOI (excluding firms which never export or employ workers during the years observed).[5] Thus, we define the year of entry (or birth) as the first full calendar year in which these conditions are true.[6] Likewise, we define firm exit (or death) as the final year firms are observed exporting or employing workers. Note that 2016 is the final year that we can define exit under this definition, since confirming an exit in 2017 would require data for the year 2018.

[4] Companies incorporate as BOI Section 17 projects to gain incentives (tax holidays and/or concessional tax rates) and other concessions (duty-free imports, easier visa applications for hiring foreigners, assistance with approvals). Note that corporate tax holidays ended in 2016; new tax incentives were introduced in 2018, though they are not related to BOI status. Thus, it is possible that the attractiveness of gaining BOI Section 17 status has since declined. That said, companies still gain non-tax incentives and services with BOI Section 17 status.

[5] This definition allows us to define entry as the earliest moment of activity observed for a firm, as the official BOI operational status lags behind first export or employment in some cases, and precedes it in other cases. See figures in Appendix A for the evolution of firm activity, according to different possible definitions of active status.

[6] Firms are included in the sample starting in their first full calendar year of existence. This removes 181 firms (4.9% of the sample) that are only observed once, either entering and exiting in the same calendar year, and/or entering in 2017 (the last full year in the sample).

Figure 1: Number of active firms in sample over time, by foreign ownership



Firms are deemed active for years in which they are either exporting, employing workers, or classified as operational by the Board of Investment.

Finally, the dataset includes three years, 1997-1999, in which there are no first-time employers recorded. We still classify firms as entering in these years, having observed them as first-time exporters or firms receiving "commercial operations" status. Still, these years are excluded from regressions (though including them does not affect any of the results described below).

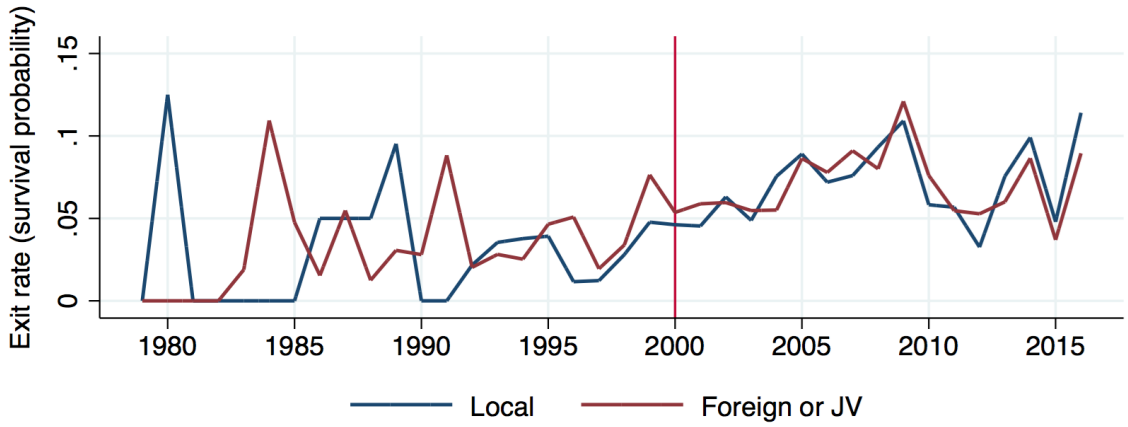
The main variable of interest is the firm's ownership: foreign or local. This status is determined by the BOI: firms are classified as local, foreign or joint venture according to the actual ownership structure described in the firms' investment application. For ease of interpretation, foreign firms and joint ventures are grouped together for the majority of this study; the two types are considered separately later.

Figure 1 shows the evolution of the sample, giving the number of active firms by year and ownership type. There are relatively few firms in the sample for the first decade (1978 to 1991); the sample grows from the mid-1990s to the mid-2000s, coinciding with the expansion of the scope of the BOI from an agency focusing on the Greater Colombo area to promoting investment for all of Sri Lanka (and with a special incentive scheme for firms locating outside of Colombo);[7] results are robust to excluding all years before 2000, meaning that neither the restricted regime of the late 1970s and 1980s nor the boom in the early to mid 1990s are driving the results presented (see Appendix D). The sample then decreases slightly in the remaining years (2005-2017); it is not clear why. Foreign firms dominate the sample for the first years, but are eventually overtaken by local firms. The overall sample (all firms ever active) is a nearly even split, with 1,831 of the firms (52.6%) locally owned.

In Figure 2, we can see the evolution of exit rates for foreign and local firms. Note first that the raw number of exits is quite small in the first half of the years given: 90% of exits are observed in the year 2000 or later. Focusing on this period, we can see two things. First, exit rates appear to change over time, with a steady increase from the mid-1990s to the late-2000s, and volatility in the years after that (and for the 10% of exits before 2000). Second, exit rates for foreign and local firms appear to comove (starting in the mid-1990s), meaning that we do not expect to see a differential impact of year on foreign versus local firms.

[7] The impact of this expansion (especially the incentive scheme, the "200 Garment Factory Programme") may be worthy of study in its own right.

Figure 2: Exit rate of firms in sample over time, by foreign ownership



Exit defined as final year in which firms are observed exporting or employing workers.
Note: sample is relatively small in first two decades; 90% of exits occur on or after 2000 (red line).

IV. Estimation framework

To estimate the survival "learning curve" of foreign firms, we use regressions in the form of the Cox proportional hazards model (Cox, 1972). The Cox model estimates hazard rates, defined in this context as the probability of firm exit in a given year *t* of the firm's existence, i.e. conditional on the firm reaching age *t*. The model produces this estimate with two components: (i) the current age of the firm, and (ii) the characteristics of the firm:

$$\lambda(t, X, \beta) = \lambda_0(t) \exp(X\beta) \quad (1)$$

where $\lambda(t, X, \beta)$ is the hazard rate for firms at age t with characteristics in vector X; β is the vector of parameters pertaining to the effects of X. The first component, $\lambda_0(t)$, is an unspecified, non-parametric baseline hazard function, estimating the impact of firm age on exit probability. The second component, $\exp(X\beta)$, estimates the impact of the variable(s) of interest (in this case foreign ownership) and the controls. Splitting the survival model into two components has advantages and disadvantages. Non-parametric estimation of the baseline hazard function is invaluable, as the relationship between firm age and firm survival is both strong and difficult to model (e.g. as a linear relationship). At the same time, separating the components requires that we assume the proportionality of hazards remains constant, i.e. that the coefficients β in do not vary as firms age. As we will see later, this assumption can be tested; in cases where the test is failed, we can introduce terms which interact the effects of firm age and firm characteristics.

Constructing the control variables

The first set of control variables measures firm characteristics. Note that each of the variables are initial characteristics: that is, firms are born that way. Focusing on initial characteristics avoids the possibility of endogeneity bias (when we suspect that the variable is correlated with survival probability), for example that low-employment firms are more likely to exit because their lower-than-expected employment size presages their death.

First, we would expect that larger firms are more likely to survive in a given year (see, for example, Dunne, Roberts, and Samuelson, 1989). Initial firm size is measured with either of two variables: the initial firms' employment and investment sizes. In both cases, data comes from investors' applications to the BOI, which are vetted and verified annually as part of the incentive-granting approvals process.[8] Using these initial estimated values allows us to condition on the full anticipated scale of the projects, as opposed to the very first year, in which firms may still be ramping up. The downside is that actual realized investment and/or employment levels may not always match the estimates. That said, actual and estimated levels are highly correlated, especially in the initial years: correlations between estimate versus actual levels (in logs) peak at three years of operations, with Pearson coefficients reaching 0.706 and 0.592 for employment and investment, respectively. In addition to initial size, taking the ratio of investment to employment lets us condition on initial "investment intensity." We expect that firms with higher initial investment per worker are more likely to survive.

Table 1: Summary statistics for select continuous variables

	Mean	p25	p50	p75	sd	N (firms)
Firm age at exit, log	0.766	0.602	0.778	1.041	0.352	2,056
Initial employment, log	1.995	1.556	2.000	2.477	0.593	3,457
Initial investment, log	6.207	5.742	6.146	6.615	0.660	3,478
Initial investment/worker, log	4.209	3.698	4.201	4.708	0.820	3,456

Investment in real USD, firm age in years. Logs are base 10.

Table 1 gives information on the distribution of these first variables. To begin, we can look at the age of firms as they exit (or at least the 59.0% of firms that exit by 2016). The median firm death occurs after six years of existence; this is not too far from that mean log age at exit, 5.83 years. Half of firm deaths occur within the interquartile range of ages four and eleven. Next, we can see that firms are quite large in terms of initial employment and investment; this is a consequence of the initial investment threshold for gaining Section 17 status. Initial employment has in inter-quartile range of 36 to 300 workers, with the mean log and median firm initially employment coming in at 98.9 and 100 employees, respectively. Initial investment's mean log and median values are 1.61 million and 1.40 million U.S. dollars (constant 2017), respectively; the interquartile range is 552 thousand to 4.12 million U.S. dollars. Finally, the investment intensities' mean log and median values come to 16.2 thousand and 15.9 thousand U.S. dollars per worker, respectively; the interquartile range is a full order of magnitude, meaning that a firm in the 75th percentile utilizes ten times as much investment per worker than one in the 25th percentile (at 51 thousand and five thousand U.S. dollars per worker, respectively). Note that all values here are in (base ten) logarithms, which appears to be justified by the rough equivalence of the median and mean log values, and the quartile breaks; the exception is initial investment, which may still be slightly skewed in logs.

Next, we can differentiate firms by their mode of export: direct or indirect. As mentioned above, all firms in the sample are exporters – their ability to sell in local markets is capped (usually at 20%). Yet this does not guarantee that they are direct exporters. In fact, 43% of firms are never observed with nonzero exports; these firms are indirect exporters, producing intermediate goods used by direct exporters. Is there

[8] Investment figures came as current Sri Lankan rupees, and were transformed into constant USD using the Sri Lankan GDP deflator and the present-day exchange rate.

a survival premium on exporting to markets directly? We predict that there is, and can estimate such a premium for firms that are "exporters at birth". The direct exporter (initial year) term is a binary variable set to one if the firm is seen with nonzero exports within its first full calendar year of existence. Though we have data on export quantities, these are available for direct exports only, and in any case would be highly correlated with employment. For these reasons, we use a binary indicator for any direct exports (including a mix of direct and indirect), rather than the direct export amount. As before, using the exporter status from the initial year allows use to avoid endogeneity issues (e.g. we would expect firms to be more likely to exit when direct exports cease). While some changes do occur, most eventual direct exporters already directly export by their first year (66.4%),[9] suggesting that this is indeed a deeper firm characteristic, i.e. direct exports to a foreign market were part of their original business model.

We can also explore the relationship between firms' survival and locations. First, we construct a simple binary variable indicating that a firm has more than one plant location when it begins operations – a relatively rare characteristic (13% firms). We would expect these firms to have lower hazard rates, since it could be argued that they are (i) likely to be more sophisticated than single-plant firms, and (ii) can spread risk across different contexts.

The next two variables capture the locations of the firms' plants. The first gives the firm's share of plants outside of the Western Province (the economic center of the country, containing the capital Colombo and the main international seaport and airport). The second gives the share of plants in the BOI's export processing zones (hereinafter referred to as "zones").[10] Compared to local firms, foreign firms are 64% less likely to locate outside of the Western Province, and more than twice as likely to locate in zones; both are statistically significant differences. The two dimensions are interrelated, as a majority of the zones are located in the Western Province (especially of the oldest and largest zones). However, this alone does not drive foreign firms' higher rate of locating in zones: restricting the sample to firms completely located in the Western Province yields a similar ratio located in zones (11.4% of local firms compared to 23.6% of foreign firms, again statistically different).

Sector-level control variables

We can also condition firms' survival on sector-level characteristics, asking how much of their exit likelihood is explained by the types of activities that they engage in. The dataset gives sector definitions as four-digit ISIC codes (revision 3.1); here we aggregate to the two-digit level, to increase the number of firms per sector and to ease merging of data from other sources and ISIC revisions. At the two-digit level, there are thirty-six categories with at least one active firm in the sample. The biggest sector is ISIC 18, wearing apparel, representing 22% of firms and nearly half of firms (48%) when weighing by initial employment. However, results are robust to the exclusion of wearing apparel producers (though non-apparel firms appear to have a somewhat bigger disadvantage in their early years, and smaller advantage in later years – see Appendix D).[11]

[9] By the third year of operation, 81.4% of eventual direct exporters are exporting directly; this means that of the 3,482 firms in the sample, 1,494 are never direct exporters, 1,620 are direct exporters within their first three years, and only 368 (10.6%) commence direct exports in their fourth year or later.

[10] These variables are "nearly binary," as shares between 0% and 100% exist for only 3.0% and 1.7% of firms for the non-Western and zones variables, respectively.

[11] See Appendix B for the distribution of firms by sector and ownership. Of the largest-sample sectors, nearly all have a relatively comparable number of foreign and local firms (33% to 67% foreign firms); interestingly, the exceptions

The first sector-level variable measures intra-sector concentration. We use the Herfindahl-Hirschman index (HHI), calculated using firm labor shares as inputs. The HHI is calculated by taking the square of each firm's share of the sector's labor force, and summing these values across each sector-year. The resulting index can range from near zero (perfect equality) to one (complete monopoly). For ease of interpretation, the values are then standardized before inclusion in regressions; this means that that hazard ratio coefficients give the effect of a one-SD increase. (Raw, non-standardized values are given in Table 2). We would expect sector concentration to have a mixed effect – we could imagine it hurting new entrants, but benefitting mature, entrenched firms.

The next sector-level variable, startup time, approximates each sector's average amount of time needed to undertake all the tasks associated with launching a business. It is calculated as the number of days between two official BOI statuses for each firm: the submission of the investment application and the commencement of commercial operations. The final sector-level variable is "implied sector entry costs," defined as one minus the minimum of the average entry rate or average exit rate of the sector in that decade. This measure was first introduced by Bernard and Jensen (2007), who in turn thank Marc Melitz for suggesting it. The authors motivate this implied measure as a reflection of the theoretical link between sectors' cost structures and entry rates, noting that "recent equilibrium models of industries with heterogeneous firms predict that, in steady state, entry and exit rates will covary exactly as sunk entry costs change." As with the concentration measure, implied entry cost values are then standardized before inclusion in the regressions (though not in Table 2) for ease of the hazard ratios' interpretation. For both measures of entry cost (startup time and implied costs), we expect to find a strong link between low entry barriers and high exit rates, as firms tend to follow an "easy in, easy out" pattern (see Dunne et al., 1989). The effect of the implied measure should be especially strong, as it is essentially a sector-decade fixed effect (i.e. firms in sectors with relatively high average exit rates should be more likely to exit).

As a final sector-level control, we look at the age of the sector itself, i.e. the number of years that have passed between the first time we see an economic activity appear in our dataset (at the four-digit level of ISIC)[12] and the firm's commencement of operations. Our hypothesis is that the novelty of a sector to Sri Lanka may be related to the LOF: while foreign firms are new to the Sri Lankan business environment (and local firms are not), a new activity would in theory be new to everyone. As with the other controls, we use the logarithm of this measure, as we would expect the impact to diminish: the difference between a sector in its first and fifth year of existence is likely to be greater than its twenty-first and twenty-fifth years.

Table 2 gives the sample means of the variables described above, split into foreign and local firms. The means are statistically different for most variables: foreign firms are more likely to have larger initial investments and investment per worker, more likely to enter as direct exporters, more likely to locate in the Western Province and in zones (as described above). On the other hand, there is no significant difference in foreign and local firms' initial employment, nor in their likelihood of starting operations with multiple locations. Sector characteristics are mixed: foreign-owned firms are more likely to engage in high-concentration sectors (HHI) and "newer" sectors, though less likely to engage in activities characterized by longer startup times, and equally likely to engage in sectors with higher implied entry costs. Finally, foreign firms are slightly more likely to be observed exiting during the period studied (i.e. before 2017); of the

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are all nontradable activities that can only export indirectly (i.e. by providing services to exporters): construction, utilities, and transport services (22% to 32% foreign firms).

[12] Of course, it is possible that the birth of a sector can predate its first appearance in the dataset; that said, we are fairly certain that the vast majority of export-oriented firms are captured here (as described above). So it is perhaps more accurate to say that we are measuring the age of the sector as an internationally-competitive export activity.

Table 2: Means of characteristics, by foreign ownership

	Local firms	Foreign firms	Pr(|Δ| > |∂|)
Initial firm characteristics			
Initial employment, log	2.008	1.981	
Initial investment, log	6.168	6.251	***
Initial investment/worker, log	4.157	4.267	***
Direct exporter	0.351	0.411	***
Multiplant	0.131	0.127	
Plants outside Western Prov.	0.420	0.270	***
Plants in zones	0.090	0.187	***
Sector characteristics			
Sector concentration (HHI)	0.090	0.121	***
Startup time (days), log	2.656	2.620	***
Implied entry costs	0.943	0.944	
Sector age (years), log	1.142	1.056	***
Firm survival outcomes			
Exit during period studied	0.576	0.606	*
Firm age at exit (years), log	0.795	0.735	***

Investment is in real USD. Logs are base 10. Final column refers to two-sided *t*-test of whether difference between means (∂) is drawn from random variable centered at zero (Δ):
*** p<0.01, ** p<0.05, * p<0.1

exiting firms, locals tend to survive somewhat longer (difference between mean ages is 14.8%, or less than a one-year differential). Lastly, we often include sector fixed effects, again at the two-digit level. We drop the sector-level terms in these cases.

One final note: in rare cases (less than 1% of firms for any variable), the variables described above have missing values, or zeroes where they would not be expected (e.g. initial investment). We take the "missing flag" approach for these cases, to avoid bias from differential samples: the missing values are set to one, and a dummy variable is created to signal these cases, letting the regression fit them optimally.[13]

V. Results

Table 3 presents the first results: the unconditional effect on firm survival associated with foreign ownership. Column (1) gives the most basic setup, controlling only for firm ownership; Column (2) adds controls for time[14] and sector fixed effects (at the 2-digit level of ISIC revision 3.1).[15] In both cases, there appears to be no significant effect on survival linked to the ownership of the firm: foreign firms are as likely to exit as locally-owned firms (hazard ratios are not significantly different from unity).

[13] There is one exception: observations that are missing both investment and employment statistics are dropped from the regressions containing the investment to employment ratio (see column 4 of Table 5). This affects only 26 firms, or 0.7% of the sample.

[14] In this regression (and all that follow), time fixed effects are represented by initial decade dummies (i.e. the decade cohort in which the firm entered). Normal time fixed effects (i.e. current year instead of initial year) cannot be used with a Cox regression framework, as the impact of time increments are already captured via the $\theta_0(t)$ function. We use decades instead of individual years because adding a large number of variables – one for each of the 39 birth years in the sample – risks biasing the regression results (Allison, 2009); regardless, using the individual year dummies (instead of decade dummies) does not alter the results described here (see Appendix D).

[15] An alternate approach to using fixed effects controls is the stratification of the underlying hazard function (e.g. by decade and sector); this is the approach that Bernard and Sjöholm (2003) use, for example. The benefit would be a significant reduction of the number of variables (which may bias the regression results, as previously mentioned); it would also add flexibility to how we model the lifecycles of different types of investment. However, stratification does not appear to impact the results given here (see Appendix D).

Table 3: Regressions of firm survival on foreign ownership (unconditional)

Cox regressions of firm survival rates	(1)	(2)	(3)	(4)
Foreign firm	1.006	1.067		
	(0.045)	(0.050)		
Foreign firm, t≤5			1.423***	1.492***
			(0.097)	(0.103)
Foreign firm, t>5			0.779***	0.834***
			(0.046)	(0.051)
Observations	29,654	29,654	29,654	29,654
Firms	3,482	3,482	3,482	3,482
Initial decade FE	No	Yes	No	Yes
Sector FE	No	Yes	No	Yes

Coefficients reported as hazard ratios. Standard errors corrected for clustering by firm.
*** p<0.01, ** p<0.05, * p<0.1

However, recall that the use of the Cox regression model requires a strong assumption: independent variables have the same proportional effect on firms' survival in any given year of a firm's lifespan. That is, if a variable is associated with higher survival rates in new firms, it should have an equally high association with survival for more mature firms. To test the validity of this assumption, we can test the null hypothesis that the foreign ownership variable's scaled Schoenfeld residuals are uncorrelated with firm age. In fact, the null hypothesis is soundly rejected (Table 4, top); this strongly suggests that we cannot unconditionally ask the question "does foreign-ownership have a harmful or beneficial impact on survival?" since the answer may change depending on the age of the firm.

The left panel of Figure 3 provides further evidence for this possibility. When the proportional hazards assumption holds, lines in a log-log plot will appear parallel, i.e. the difference between the two categories' hazard rates will not vary significantly between years.[16] In the figure, this appears to be true for firms' first five or six years: in this period, local firms seem to have a consistent survival advantage over foreign firms. However, the advantage appears to rapidly diminish after that, with the lines eventually intersecting; this would mean that foreign firms are more likely to survive in their later years, relative to local firms of the same age. This would then appear to support the LOF hypothesis.

Table 4: Test of proportional hazard assumption

	rho	chi^2	df	Prob>chi^2
Foreign firm, t≤5	-0.11	24.68	1	0.000
Global test		24.68	1	0.000

	rho	chi^2	df	Prob>chi^2
Foreign firm, t≤5	0.01	0.08	1	0.780
Foreign firm, t>5	0.00	0.01	1	0.910
Global test		0.10	2	0.952

Time interacted as log(t). Robust variance-covariance matrix used.

[16] The graph in Figure 3 is also referred to as a Weibull plot, since a straight line implies that the hazard function can be modeled using a Weibull distribution (i.e. parameterized using the Weibull proportional hazard model). We can see that firm age appears to be Weibull-distributed for local firms, but not necessarily for foreign firms.

Figure 3: Log-log survival plots for foreign ownership (left) and interaction of foreign ownership and firm age greater than five years (right)

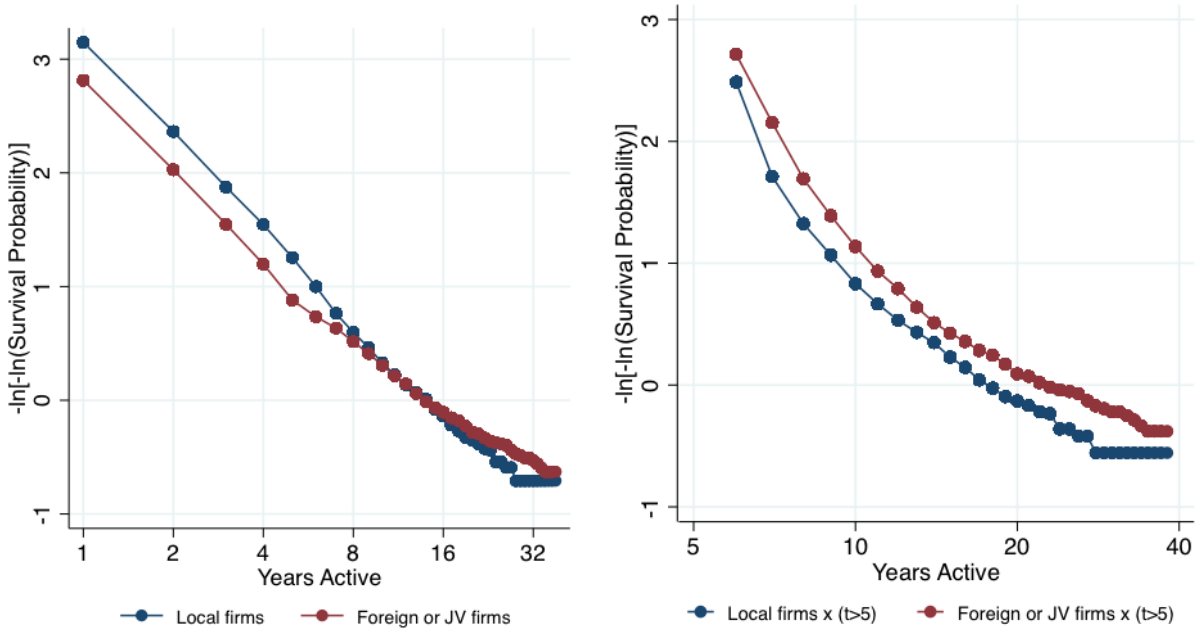

Table 5: Hazard rates by firm age and ownership

Years active	Hazard rate		Hazard ratio	N observations	
	Local	Foreign		Local	Foreign
1	4.2%	5.8%	1.39	1,594	1,460
2	5.0%	6.9%	1.39	1,483	1,372
3	5.7%	7.8%	1.35	1,358	1,223
4	5.8%	8.5%	1.47	1,169	1,065
5	6.9%	10.6%	1.53	1,053	917
6	8.0%	6.4%	0.80	990	827
7	9.3%	4.9%	0.52	947	823
8-9	7.9%	6.4%	0.82	1,740	1,551
10-12	7.9%	6.6%	0.84	1,896	1,770
13-16	6.6%	6.1%	0.93	1,634	1,537
17+	6.4%	4.1%	0.63	1,411	1,834
All	6.6%	6.6%	0.99	15,275	14,379

Table 5 directly lays out this relationship between the hazard ratios and firm age. We can see that average hazard rates of foreign and local firms are nearly identical: both types of firm face a 6.6% risk of exit in any given year (bottom row). Yet this average obscures important information: for their first five years of operations, the hazard for foreign firms is consistently close to 40% greater; in the years that follow, however, foreign firms appear to face lower hazard, though at a much less consistent degree (ranging from half the local hazard rate in year seven to 93% of local hazard in years 13 through 16). This indicates that there is an interesting relationship between firm age, hazard and ownership, and that this relationship shifts after the first five years of operations.

We can test for this possibility by interacting a firm's age with its ownership status, using the cutoff of $t > 5$ for the interaction term. Besides the apparent inflection in Table 5 and Figure 3, this cutoff is also appealing because $t = 6$ is median firm age for exiting firms (that is, just under half of firms exit in their first five years of activity) and the median age of all firm-years in the sample. That said, the results below are also robust to the use of $t>4$ or $t>6$ as cutoffs, or a continuous model (see Appendix D); the overarching

point is that we want to test if the impact of foreign-ownership is different in "early years" more generally (and not to identify the exact age when the difference diminishes).

Column (3) of Table 3 introduces the new term interacting (t>5) with foreign ownership. As suggested in Figure 3, foreign firms are more likely to exit in any of their first five years, and less likely to do so in their later years. These effects are both highly significant ($p < 0.01$), with large coefficients.[17] Both effects also persist when sector and time effects are included (column 4), with a relatively small increase in the early-year disadvantage and decrease in the later-year advantage. A new test of the proportional hazard assumption (Table 4, bottom) strongly rejects the possibility of further age-related effects, both for the individual terms and the regression globally ($p = 0.952$). Again, we can also visually examine the effect of the new t>5 term in the log-log survival plot: the lines in Figure 3 (right side) appear parallel, with a roughly equal difference between the survival rates of local firms and foreign firms in any given firm age greater than five years. Note also that the position of the lines flips between the left and right plots of Figure 3: local firms are more likely to survive than same-aged foreign firms in early years, but less likely in later years.

Thus, it appears that there is something special about foreign-owned firms: they are perhaps more likely to exit (or less resilient) than local firms in their early years, while the opposite is true for their later years. But to make a fairer comparison, we need to verify that these effects are not artifacts of differences in the characteristics of the individual firms. That is, if characteristic X makes firms more likely to survive in later years, and foreign firms are more likely to be born with characteristic X, then we cannot safely attribute the later-year survival effect to foreign firms' foreignness alone.

Table 6 examines the impact of firm-level characteristics on firm survival. The first column in Table 6 gives the baseline results, controlling only for time effects (decades). Under this specification, foreign firms estimated to be 46.7% more likely to exit in any of their first five years, and 18.9% less likely to exit in one of the following years. Column (2) adds the first control: the initial estimated employment of the firm. Interestingly, there is no statistically significant effect, nor does it impact the coefficients on younger and older foreign firms. Column (3) gives the next control: the initial estimated investment level of the firm. Unlike initial employment, the impact of initial investment is highly significant and large: a firm coming in at one million U.S. dollars is 27% more likely to survive in any given year compared to a similar firm investing five hundred thousand dollars. Adding the initial investment size control also increases foreign firms' initial survival disadvantage by 2.5 percentage points and decreases their later advantage by 2.7 percentage points; this makes sense, as foreign firms are more likely to be born at higher investment levels (around 21% higher – see Table 2). Column (4) looks at investment intensity, i.e. the ratio of initial investment and employment. The term is also significant, though with a smaller effect than investment level alone. The next regression examines the impact of firms' initial exporting status (direct or indirect exports, as all firms in the sample are required to export in some way), finding no evidence that it impacts hazard.

Column (6) looks at multiplant firms, i.e. companies that started operations with multiple locations. While multiplant status is relatively rare (12.9% of firms in the sample), it appears to have a big impact on survival, with multiplant firms 66.8% less likely to exit in a given year; this matches our prediction. The effect also remains unchanged after the inclusion of the other controls (columns 10 and 11), suggesting that its impact is not being driven by firm size, for example; this suggests that having multiple locations could possibly be beneficial to firms of all sizes.

[17] See Appendix for a note on the estimation of the coefficient, significance asterisks and standard errors presented for the interaction term ("Foreign firm, t>5").

Table 6: Regressions of firm survival on foreign ownership and initial characteristics

Cox regressions of firm survival rates	(1)	(2)	(3)	(4)	(5)	(6)
Foreign firm, t≤5	1.467***	1.468***	1.492***	1.511***	1.468***	1.462***
	(0.100)	(0.100)	(0.102)	(0.103)	(0.100)	(0.100)
Foreign firm, t>5	0.811***	0.814***	0.838***	0.838***	0.812***	0.820***
	(0.049)	(0.049)	(0.050)	(0.050)	(0.049)	(0.049)
Initial employment, log		0.963				
		(0.038)				
Initial investment, log			0.734***			
			(0.026)			
Initial investment/worker, log				0.840***		
				(0.023)		
Direct exporter					0.981	
					(0.045)	
Multiplant						0.332***
						(0.029)
Plants outside Western Prov.						
Plants in zones						
Observations	29,654	29,654	29,654	29,348	29,654	29,654
Firms	3,482	3,482	3,482	3,456	3,482	3,482
Sector FE	No	No	No	No	No	No

Coefficients reported as hazard ratios. Standard errors corrected for clustering by firm.

All regressions include decade fixed effects and missing flags. *** p<0.01, ** p<0.05, * p<0.1

Next, columns (7) and (8) look at another two measures of firm location: whether or not the firm's plants are located in an export processing zone, and whether or not they are located in the country's economic center, the Western Province. In both cases, we find the expected effect. There is a survival premium associated with locating in the zones: firms with all their plants in zones are 19% more likely to survive than firms without any zone-based plants. Likewise, we find a disadvantage associated with locating outside of the Western Province, equivalent to a 15% lower survival rate for firms with all plants outside the province (compared to one completely located in Western Province). Column (10) looks at both variables together. They both remain highly significant and retain similar coefficients. As with the initial investment size control, firm location also helps explain the older-age advantage for foreign firms, and exacerbates the early-age disadvantage.

The remaining columns of Table 6 look at the combined effects of the initial firm characteristics. In column (10), we see that the magnitude and significance of the initial investment size control is mostly unchanged (and initial employment size is still insignificant). Interestingly, the direct export variable's coefficient is now significant as well, with a fairly large (beneficial) effect; this suggests that firms born as

Table 6 (continued): Regressions of firm survival on foreign ownership and initial characteristics

Cox regressions of firm survival rates	(7)	(8)	(9)	(10)	(11)
Foreign firm, t≤5	1.498***	1.487***	1.512***	1.524***	1.560***
	(0.103)	(0.102)	(0.104)	(0.105)	(0.108)
Foreign firm, t>5	0.822***	0.824***	0.832***	0.858**	0.888*
	(0.049)	(0.050)	(0.050)	(0.051)	(0.054)
Initial employment, log				1.070	1.097
				(0.049)	(0.065)
Initial investment, log				0.767***	0.743***
				(0.029)	(0.036)
Initial investment/worker, log					
Direct exporter				0.870***	0.851***
				(0.046)	(0.050)
Multiplant				0.356***	0.351***
				(0.032)	(0.031)
Plants outside Western Prov.	1.154***		1.135***	1.086*	1.129**
	(0.055)		(0.055)	(0.054)	(0.066)
Plants in zones		0.811***	0.831**	0.918	0.941
		(0.059)	(0.060)	(0.067)	(0.073)
Observations	29,654	29,654	29,654	29,654	29,654
Firms	3,482	3,482	3,482	3,482	3,482
Sector FE	No	No	No	No	Yes

Coefficients reported as hazard ratios. Standard errors corrected for clustering by firm.

All regressions include decade fixed effects and missing flags. *** p<0.01, ** p<0.05, * p<0.1

direct exporters are more likely to survive, but only conditional on other initial characteristics. On the other hand, the magnitudes of the zones and Western Province variables' coefficients are closer to one, and only the latter is somewhat significant; this suggests that some of their impact is correlated with information found in the other controls (e.g. larger investments tending to locate in Colombo, or splitting plant locations across provinces). Finally, column (11) of Table 6 looks at the combined firm characteristic variables plus sector fixed effects controls. As before, initial investment size, direct exporter status and (to a less extent) location within the Western Province are all associated with higher survival rates.

Most interestingly, there appears to be a change in the relative survival rate of foreign firms when the controls are included. Specifically, the initial survival disadvantage of foreign firms grows from 47% to 56%, while the later survival advantage of foreign firms drops from 19% to 11% -- enough to make it significant only at the 90% level. Thus, making apples-to-apples comparisons of foreign firms and local firms with similar initial characteristics is important: these characteristics can help explain foreign firms' later survival advantage, but not their initial disadvantage; if anything, a "fair comparison" only exacerbates the initial disadvantage.

Until now, we have included initial firm characteristics as separate effects. Could interactions between initial characteristics and foreign ownership also help explain foreign firms' early disadvantage or later advantage? We can pose a hypothetical example focusing on initial firm investment size. Suppose that firms face a cost structure with fixed component and a variable component, and only choose to enter at scales in which average cost per product is less than or equal to the global market price. Suppose also that there is an additional fixed cost component for foreign firms, e.g. reflecting a one-time adjustment cost (adjusting to local conditions). We would then tend to observe only larger foreign firms, since their minimum entry scale would be larger than that of a comparable local firm. (As noted before, we do in fact find that foreign firms are 21% larger than local firms on average; in terms of employment, however, foreign firms are not statistically larger or smaller than local firms on average.) In such a world, the effect of investment size on survival would be capturing a selection effect: smaller foreign firms might be "weeded out" in their first five years, unable to overcome the initial adjustment cost and thus exiting at a higher rate than similar local firms. Larger firms would be safer from the "weeding out" phenomenon, since the fixed adjustment cost would be a smaller share of their total costs.

Table 7: Regressions with sample split by initial investment size

Cox regressions of firm survival rates	(1) All firms	(2) Firms with high initial investment	(3) Firms with low initial investment	(4) Firms with high initial employment	(5) Firms with low initial employment
Foreign firm, t≤5	1.512***	1.817***	1.336***	1.374***	1.581***
	(0.105)	(0.199)	(0.123)	(0.142)	(0.152)
Foreign firm, t>5	0.840***	0.831*	0.881	0.765***	0.956
	(0.051)	(0.079)	(0.072)	(0.065)	(0.087)
Observations	29,654	15,553	14,080	16,013	13,067
Firms	3,482	1,739	1,739	1,719	1,693

Coefficients reported as hazard ratios. Standard errors corrected for clustering by firm. All regressions include decade, sector and location fixed effects. Samples split at median value.
*** p<0.01, ** p<0.05, * p<0.1

Table 7 tests this possibility, splitting the sample by median initial investment size (2.9 million constant USD) and by median initial employment level (100 employees). Column (1) gives the baseline: the full sample, with decade, location and sector fixed effects. Columns (2) and (3) present results for large and small initial investments, respectively. The results are striking: not only does the initial "learning curve" remain for the larger foreign firms, but it actually increases (relative to the smaller firms): large foreign firms are over 80% more likely to exit in their first five years than large local firms. The results are more mixed when splitting by initial employment: larger firms are somewhat less disadvantaged than smaller foreign firms in early years, but still much more likely to exit than comparable local firms. This does not support the selection story – we find no strong evidence that the initial five-year period is mainly characterized by a weeding out of the smaller foreign firms.

Perhaps the most comprehensive way to control for initial firm characteristics is through propensity score matching. If we suspect that foreign firms are biased towards certain sectors or regions, and/or more

likely to be born larger,[18] then our regressions might not be making fair comparisons (even with variables controlling for all these factors). To test this hypothesis, we can focus on a subsample of foreign and local firm pairs: firms in the same two-digit sector, same region (Western Province or otherwise), and highly similar initial employment and investment.[19] Table 8 gives the results of this exercise. Our normal sample

Table 8: Regressions with sample restricted to matched foreign and local firms

Cox regressions of firm survival rates	(1)	(2)	(3)	(4)
	All firms	Matched firms	All firms	Matched firms
Foreign firm, t≤5	1.512***	1.683***	1.560***	1.681***
	(0.105)	(0.189)	(0.108)	(0.189)
Foreign firm, t>5	0.840***	0.893	0.888*	0.885
	(0.051)	(0.081)	(0.054)	(0.080)
Initial employment, log			1.097	1.026
			(0.065)	(0.105)
Initial investment, log			0.743***	0.734***
			(0.036)	(0.069)
Direct exporter			0.851***	0.806**
			(0.050)	(0.073)
Multiplant			0.351***	0.313***
			(0.031)	(0.047)
Plants in zones			0.941	1.054
			(0.073)	(0.133)
Observations	29,654	11,823	29,654	11,823
Firms	3,482	1,378	3,482	1,378

Coefficients reported as hazard ratios. Standard errors corrected for clustering by firm.
Regressions include decade, sector, location fixed effects. *** p<0.01, ** p<0.05, * p<0.1
Foreign and local firms matched by sector, region, initial employment and investment.

of 3,482 firms is now down to 1,378, keeping only the foreign firms with a match as described above. Columns (1) and (3) give results with the full set of firms, for reference. Column (2) gives the unconditional results (controlling only for decade, sector and location). Compared to the full-sample results, foreign firms' hazard ratios are somewhat higher now, both in their initial and later years. When we control for firms' initial characteristics as well (column 4), the initial disadvantage is increased, but there is no major change in the later-life advantage (other than a further deterioration of significance). Thus, restricting the sample

[18] See Table 2 for region and initial size by firm ownership, and Appendix B for sector distribution by ownership.
[19] Specifically, we first run a probit regression estimating the probability of a firm being foreign based on its initial log employment and log investment. As expected, the regression indicates that firms entering with larger initial investments are somewhat more likely to be foreign. Then for each foreign firm, we look for a local firm that is (i) in the same sector and region and (ii) has the closest estimated foreign probability value within 0.1% of the foreign firm's value (i.e. very similar initial size).

to the most highly comparable pairs of foreign and local firms appears to result in an even steeper learning curve than before.

The next regressions (Table 9) add the sector-level variables, aiming to answer two questions. First, they examine the impact of the sector-level variables on firms' overall hazard rates. At the same time, they also assess whether these sector-level effects can help explain the hazard rate differential between foreign and local firms. This baseline differential is given in column (1), repeating the baseline results of Table 6's column (7) – that is, including the main variables of interest (foreign ownership), and the controls for time (decade) and location (Western Province), but not sector fixed effects.

Table 9: Regressions of firm survival on foreign ownership and sector characteristics

Cox regressions of firm survival rates	(1)	(2)	(3)	(4)	(5)	(6)
Foreign firm, t≤5	1.498***	1.497***	1.472***	1.506***	1.500***	1.491***
	(0.103)	(0.103)	(0.101)	(0.103)	(0.103)	(0.102)
Foreign firm, t>5	0.822***	0.822***	0.814***	0.832***	0.823***	0.825***
	(0.049)	(0.049)	(0.049)	(0.050)	(0.049)	(0.049)
Sector concentration		1.008				0.979
		(0.083)				(0.081)
Startup time, log			0.528***			0.548***
			(0.066)			(0.070)
Implied entry costs				0.636***		0.628***
				(0.025)		(0.026)
Sector age (years), log					1.052	1.115
					(0.071)	(0.080)
Observations	29,654	29,654	29,654	29,654	29,654	29,654
Firms	3,482	3,482	3,482	3,482	3,482	3,482

Coefficients reported as hazard ratios. Standard errors corrected for clustering by firm. Regressions include decade and location fixed effects and missing flags. *** p<0.01, ** p<0.05, * p<0.1

Column (2) adds our measure of a sector's concentration, the standardized HHI; we find that it has no discernable impact on firm survival. Next are the two measures of sectoral barriers to entry: startup time and implied entry costs. Both appear to have large, highly significant effects resulting in lower exit rates. Halving startup time from 600 to 300 days (not too far from the 75th and 25th percentiles, respectively) translates to an 89% increase in the hazard ratio. Likewise, a decrease of one standard deviation in the implied entry costs measure yields a 57% hazard ratio increase. These results match our expectations, i.e. that sectors with low barriers to entry would have higher rates of firm exit. Finally, column (5) tests the impact of the "age" of the sector, i.e. the number of years since a firm first engaged in that activity. Our hypothesis is not supported: controlling for firm age has no impact on the foreign firm effect.[20]

[20] We also used the split sample approach as before, running the regression with new or old sectors only; doing so did not affect the foreign firm effect.

We consider all sector variables together in column (6). The two barriers-to-entry variables remain highly significant, with their coefficients virtually unchanged; the other sector-level controls are insignificant, as before. Crucially, it should be noted that the foreign ownership variables remain virtually unchanged in each of the regressions just described: the sector-level variables explain neither the initial survival disadvantage nor the later advantage ascribed to foreign firms. This was expected, as we had previously seen that sector fixed effects also failed to impact the foreign ownership effect, and had also seen that the foreign ownership effect persisted even when firms were matched by sector (amongst other attributes). In other words, we fail to find evidence that foreign firms are less likely to survive in early years and/or more likely to survive in later years because they predominate in sectors with helpful (or harmful) characteristics.

Disaggregating by foreign ownership share

Until now, we have grouped together all companies with any degree of foreign ownership. Yet there may be reason to believe that investments mixing local and foreign ownership, or joint ventures (JVs), may perform differently than wholly-foreign ventures. One hypothesis is that firms with a lower share of local ownership might have a steeper learning curve, i.e. a higher hazard rate in the initial years. Of the 3,482 firms in the sample, the BOI classified 1,831 as local, 936 as foreign and 715 as JVs. We can further split the JV group according to the foreign share of the initial investment: 371 firms were born with more than 50% of the estimated investment from foreign sources, or "majority-foreign JVs"; this leaves a remaining 344 with "majority-local JVs."[21]

Table 8: Regressions of firm survival on foreign ownership shares and initial characteristics

Cox regressions of firm survival rates	(1)	(2)
JV, majority local, t≤5	1.348**	1.432***
	(0.160)	(0.170)
JV, majority local, t>5	0.810**	0.891
	(0.085)	(0.093)
JV, majority foreign, t≤5	1.839***	1.943***
	(0.191)	(0.203)
JV, majority foreign, t>5	0.935	1.020
	(0.098)	(0.109)
Foreign, t≤5	1.458***	1.478***
	(0.116)	(0.118)
Foreign, t>5	0.820***	0.848**
	(0.060)	(0.062)
Initial employment, log		1.101
		(0.066)
Initial investment, log		0.740***
		(0.036)
Direct exporter		0.851***
		(0.051)
Multiplant		0.350***
		(0.031)
Plants in zones		0.938
		(0.073)
Observations	29,654	29,654
Firms	3,482	3,482

Coefficients reported as hazard ratios. Standard errors corrected for clustering by firm. All regressions include decade, location and sector fixed effects.
*** p<0.01, ** p<0.05, * p<0.1

Table 8 repeats the previously-presented regressions, now using the three definitions for foreign firms (both in firms' early and later years). Both regressions include sector fixed effects, as well as the usual location and time controls. In column (1), we can see some developments in the unconditional results. The

[21] Note that an investor can still control an investment with a minority share of the initial investment, i.e. "majority-local JVs" as defined here are not necessarily controlled by local investors (and vice-versa).

majority-local and wholly foreign firms mimic the earlier results, with a higher hazard ratio in early years and a lower ratio in later years (both compared to wholly local firms). In fact, both sets of coefficients are not significantly different. As in the earlier results, this late-year hazard premium also disappears when accounting for initial firm conditions, and the early-year elevated hazard remains (and again with effects that are statistically undifferentiated between wholly foreign and majority-local JVs).

The results differ somewhat for majority-foreign JVs, however. First, the unconditional regression in column (1) does not suggest that they enjoy a later-year survival advantage (compared to local firms). The biggest difference, however, is their hazard rate in the first five years: in these years majority foreign firms are 84% to 94% more likely to exit than local firms (with or without the controls, respectively); these hazard rates are significantly higher than those of the than wholly foreign or majority local firms ($p < 0.05$ in all cases). This suggests that the "learning curve" effect may be strongest in young, majority-foreign investments, and that this effect is not explained by the firm-level controls used here (or any sector-level effects). Thus, it is not clear that lower shares of local ownership necessarily translate to a steeper learning curve (or that they make firms less anchored and more footloose). Finally, it should be noted that the regressions with joint ventures still pass the proportional hazards test.

VI. Discussion

In this paper, we set out to uncover the differences between the exit rates of foreign-owned and local export-oriented firms in Sri Lanka. Our main finding is that the exit rates of the two types of firm appear similar at first, but differ when we separate firms by their life stages. This difference is central to our formal approach, in which we test two main hypotheses from the literature: the "inherent footlooseness" hypothesis, which predicts that that foreign firms will always be more likely to exit (e.g. because they have an outside option), and the "liabilities of foreignness" (LOF) hypothesis, which posits that foreign firms are only initially disadvantaged (e.g. due to low familiarity with local conditions), and will eventually resemble local firms in their survival likelihood.

Early in the paper, we were able to reject the inherent footlooseness hypothesis, as our tests strongly suggest that the impact of foreignness varies over time. That is, foreign firms are more likely to exit in their early years, and less likely to exit in later years. This pattern fits the LOF hypothesis well, as we observe that the interaction of early firm age and foreignness is consistently and significantly correlated with higher exit ratios. This early-life disadvantage can be quite high: in the most extreme example, majority-foreign joint ventures are over 114% more likely to exit than local firms in their first five years (after applying controls and sector fixed effects). We also find that while controlling for beneficial characteristics of foreign firms reduces their later-year survival advantage, the early-year disadvantage remains, and is not explained by any approach attempted here. In fact, controls raise the hazard ratios for both younger and older foreign firms. This affirms our final hypothesis: foreign firms appear to enter with more beneficial attributes, meaning that the conditional hazard ratio is higher than the unconditional ratio.

Our main findings contribute to the literature documenting the LOF. This literature tends to take a managerial perspective, asking what strategies can foreign investors (usually in financial services) take to minimize their LOF, putting them on a more equal playing field with local competitors in the same domestic market. Our point of view is different: we take a macro perspective, asking how governments can maximize the benefits of FDI, i.e. by preventing premature exit of potentially transformative export-oriented firms. The closest related study is that of Mata and Freitas (2012), which explicitly compares the LOF and inherent footlooseness hypotheses for Portuguese firms (from the full set of sectors). They reject the possibility LOF,

finding that the foreign disadvantage does not decrease as firms age. However, their estimation setup is different: it is fully parametric (probit), with a linear age x foreignness term. They also consider all firms, while we focus on larger, export-oriented firms. Likewise, Portugal is an OECD economy, designated as "high-income" by the World Bank; in lower- and lower-middle-income countries like Sri Lanka, the LOF may be more likely to be offset by foreign investors' technological advantage.

Our findings may have some relevance for governments, especially for policy related to FDI attraction and retention. If the LOF interpretation is correct, then it may motivate the use of investor "aftercare" policies aimed at addressing difficulties in adapting to local conditions. This could include facilities like translation services, or assistance connecting with pre-cleared local suppliers (see UNCTAD, 2007, for typical examples of investment aftercare policies). It may even be true that such services can be offered to all firms (both local and foreign), but have a relatively larger impact on foreign firms' survival. Future research is needed to confirm that adaptation difficulties are in fact driving the early-life disease, and that aftercare programs could be an effective antidote.

To fully maximize the policy relevance of our findings, we would ideally provide a clear picture of why this initial LOF exists. As previously mentioned, the literature has suggested some possible explanations, from information asymmetry to a lack of a local network of suppliers and service providers. It would be useful to formally test these possibilities. One approach could be to exploit variation from external conditions. This could come from BOI initiatives and regulations (such as the aforementioned 200 Garment Factory Programme, or changes in the minimum investment threshold), national events (such as the start or end of the most recent civil war), global or regional variation in FDI flows, trade agreements (e.g. preferential agreements with India or the EU, or the start and end of the international Multi Fibre Arrangement), or relative changes in wages and other costs (especially large minimum wage increases, or large exchange rate fluctuations). Many of these would provide ample time and sector variation. Finally, we could also further explore differences in the initial disadvantage as explained by firm and sector characteristics already tested here. For example, results discussed above suggest that the learning curve may be especially steep for large initial investments, and for majority-foreign joint ventures (as opposed to majority-local or fully foreign firms); we could thus test the possibility that the LOF are especially intensive in these types of investments. Knowing more about why the LOF occur could motivate policy solutions to address them, ensuing that the benefits of FDI do not unduly slip away.

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APPENDIX A: NUMBER OF FIRMS AND ENTRANTS BY ENTRY DEFINITION

Figure A1: number of firms by active definition

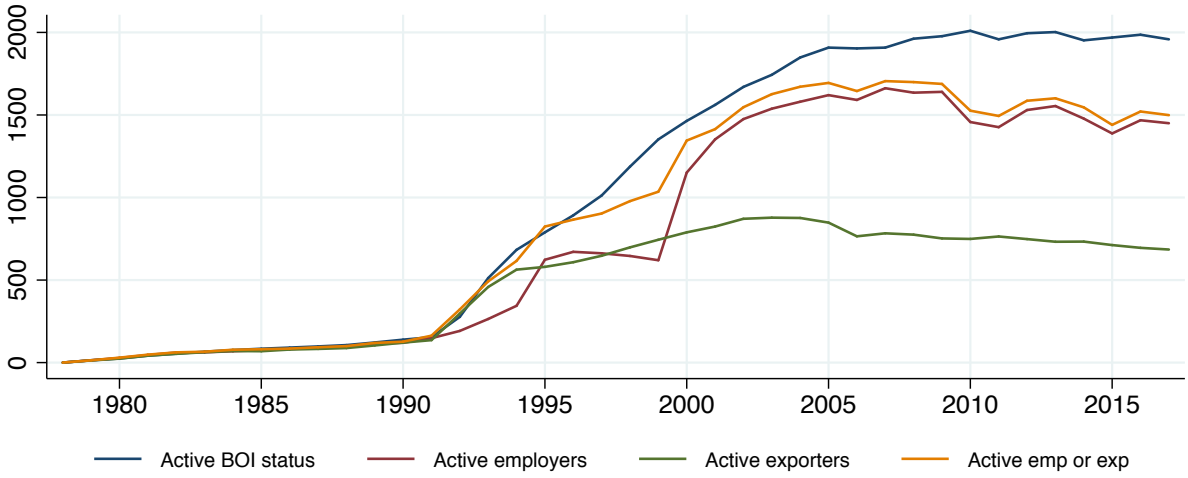


Figure A1 shows the number of active firms in the sample, according to different types or definitions of activity. "Active exporters" are companies that export directly; it can be assumed that nearly all non-exporters are indirectly exporting via other firms. Note that while there are many firms that employ workers

but do not (directly) export, there are few cases in which the reverse is true (direct exports without employment). Also note that there are many firms with "in commercial operations" BOI status but no observable activity in terms of employment or export (starting in the mid-1990s); we only include firms in the sample if they are seen employing or exporting at least once, and we define exit as the last year in which they do so.

Figures A2 and A3 show the annual number of entrants and exits, respectively. Note that there are three years (1997-1999) in which there are no first-time employers recorded, followed by a spike in first-time employers entering the sample. We believe that this is a reporting error; to be safe, those years are excluded from the sample.

Figure A2: number of entrants by entry definition

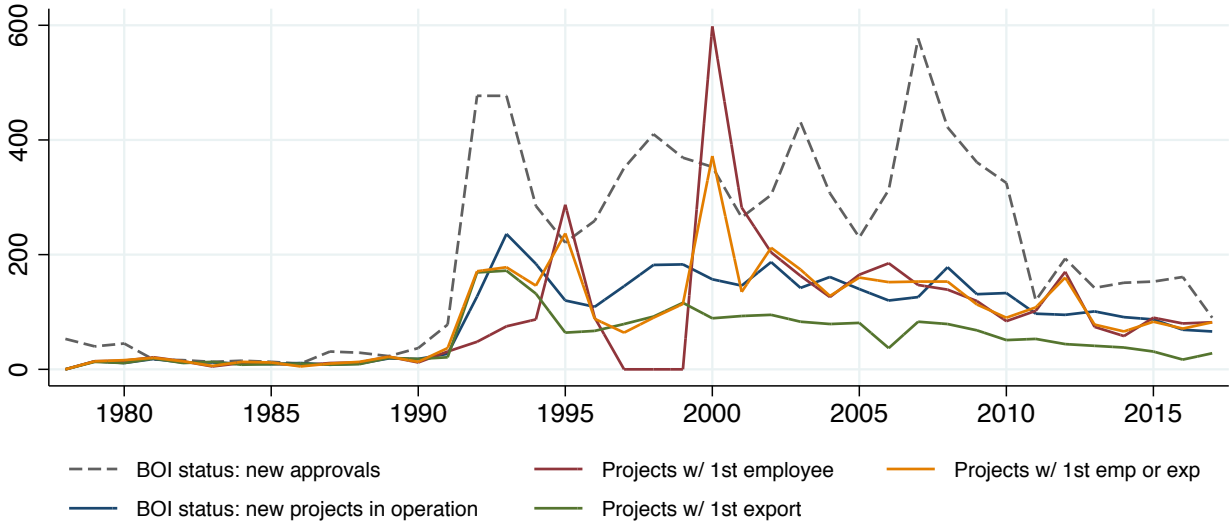
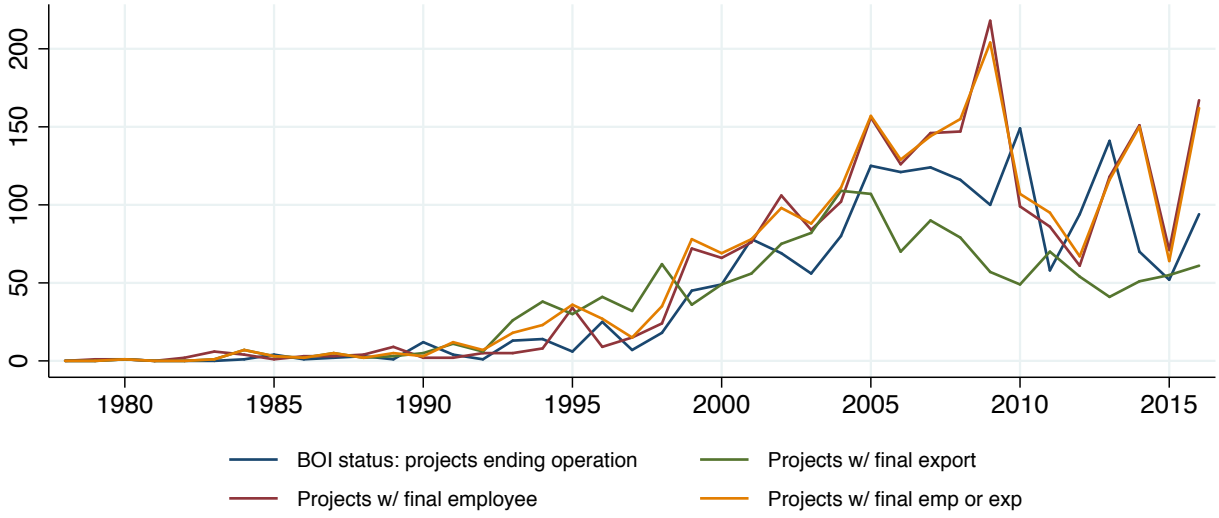


Figure A3: number of exits by exit definition



Finally, Figure A4 gives the number of active firms (right Y-Axis) and entering or exiting firms (left Y-Axis), according to the final definitions used in this study, and Figure A5 gives entry rates.

Figure A4: number of entrants, exits and active firms, using final definitions

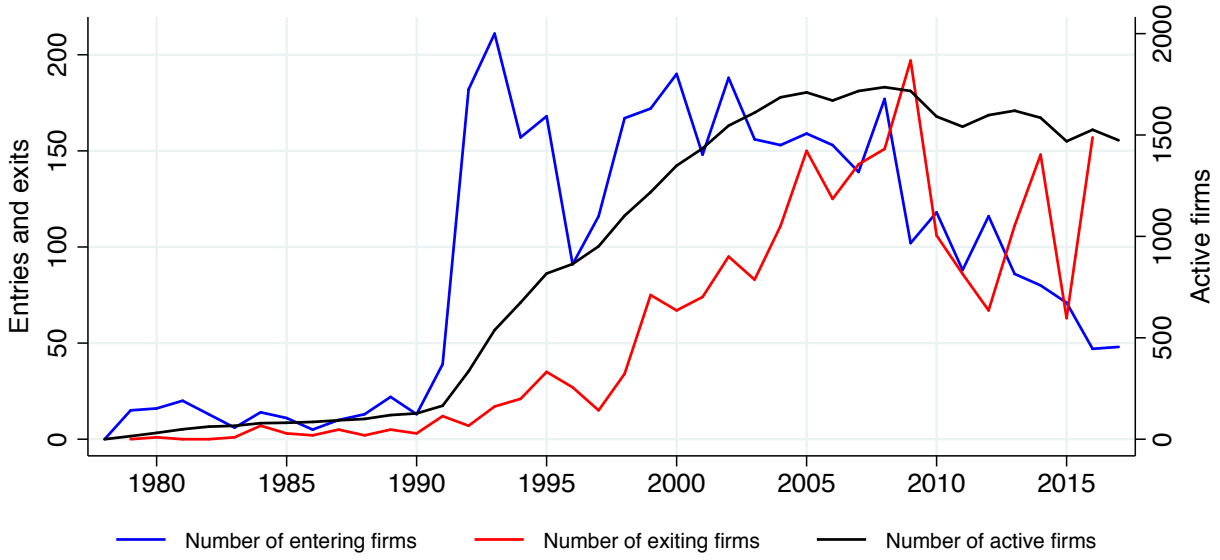


Figure A5: Entry rates

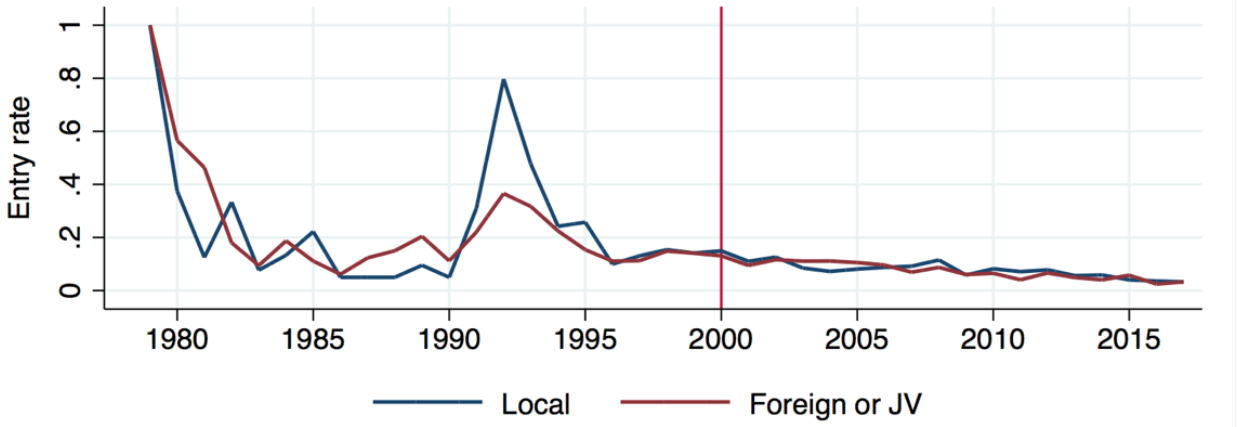
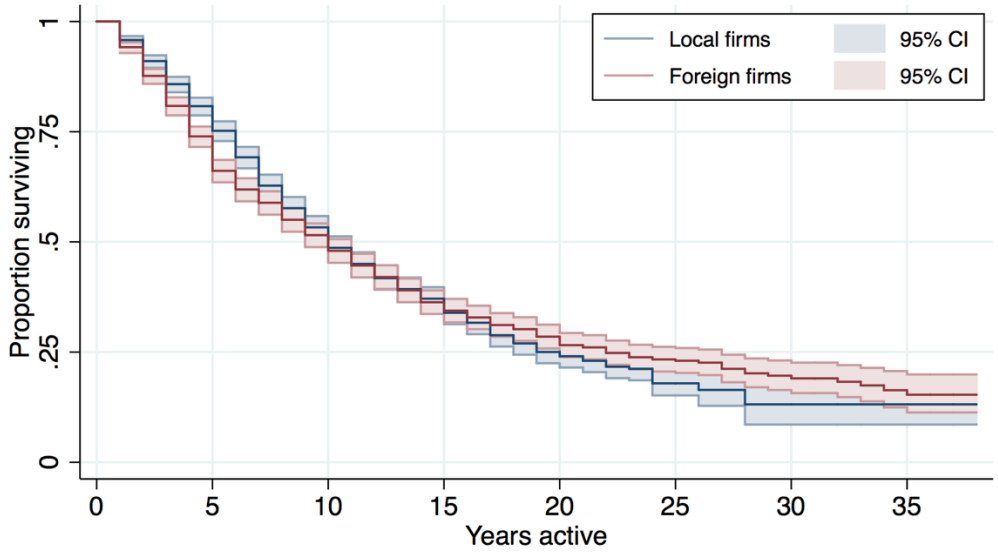


Figure A6 applies the Kaplan-Meier approach, comparing survival rates of foreign and local firms. The result is akin to that of the log-log plot: the cumulative survival rate of foreign firms is lower in the initial years (significantly so, in fact), though this reverses in later years, with foreign firms' average survival rates surpassing local firms' rates sometime between ten- to fifteen-year mark (though the difference is not highly significant).

Figure A6: Kaplan-Meier survival estimates, by firm ownership



APPENDIX B: DISTRIBUTION OF FIRMS BY SECTOR

Table B1: Distribution of active firms by sector and foreign ownership

Industry (ISIC rev. 3.1)	N	Foreign		Industry (ISIC rev. 3.1)	N	Foreign	
01 Agriculture & related	115	57	50%	29 Machinery & equipment	24	17	71%
02 Forestry, logging & related	7	3	43%	31 Electrical machinery	47	32	68%
05 Fishing, aquaculture & related	97	38	39%	32 Communication equipment	34	27	79%
14 Other mining & quarrying	1	0	0%	34 Motor vehicles & related	16	11	69%
15 Food products & beverages	187	87	47%	35 Other transport equipment	24	15	63%
16 Tobacco products	5	3	60%	36 Furniture; other manufacturing	295	183	62%
17 Textiles	92	58	63%	40 Electricity, gas, water	156	34	22%
18 Wearing apparel	758	265	35%	45 Construction	187	59	32%
19 Leather; bags; footwear	48	33	69%	50 Motor vehicle sales, repair, fueling	1	1	100%
20 Wood & wood products	24	17	71%	55 Hotels & restaurants	205	84	41%
21 Paper & paper products	38	20	53%	60,61,62 Land, water, air transport	27	12	44%
22,74 Publishing; printing; other	108	54	50%	63 Transport & logistics support	79	20	25%
23 Refined petroleum & other fuels	1	1	100%	64,72 Telecomm; computer & related	247	161	65%
24 Chemicals & chemical products	45	25	56%	80 Education	92	42	46%
25 Rubber & plastics products	191	113	59%	85 Health & social work	45	13	29%
26 Non-metallic mineral products	79	50	63%	90,37 Sewage, sanitation, recycling	5	2	40%
27 Basic metals	29	23	79%	92 Recreational & cultural activities	43	20	47%
28 Fabricated metal products	66	44	67%	93 Other service activities	64	27	42%
				Total	3,482	1,651	47%

APPENDIX C: CORRELATION BETWEEN VARIABLES STUDIED

Table C1: Correlations of firm and sector characteristics

	Foreign firm	Initial employ-ment, log	Initial inves-tment, log	Initial invest-ment / worker, log	Direct exporter (initial year)	Multi-plant	Plants outside Western Prov.	Plants in zones	Sector concentr-ation (HHI)	Startup time, log	Implied entry costs
Foreign firm	1.000										
Initial employment, log	-0.023	1.000									
Initial investment, log	0.063*	0.142*	1.000								
Initial investment/worker, log	0.067*	-0.609*	0.698*	1.000							
Direct exporter (initial year)	0.061*	0.395*	-0.178*	-0.427*	1.000						
Multiplant	-0.007	0.067*	0.182*	0.097*	-0.018	1.000					
Plants outside Western Prov.	-0.159*	0.121*	-0.095*	-0.163*	0.052*	-0.046*	1.000				
Plants in zones	0.143*	0.203*	0.109*	-0.057*	0.165*	0.068*	-0.176*	1.000			
Sector concentration (HHI)	0.100*	-0.125*	0.119*	0.188*	-0.075*	0.002	-0.174*	0.112*	1.000		
Startup time, log	-0.095*	-0.199*	0.366*	0.433*	-0.268*	0.064*	0.199*	-0.049*	-0.033	1.000	
Implied entry costs	0.009	0.170*	0.015	-0.113*	0.114*	0.017	0.027	0.064*	0.013	0.022	1.000
Exit during period studied	0.031	0.044	-0.183*	-0.178*	0.081*	-0.222*	-0.002	-0.015	0.026	-0.193*	-0.069*
Firm age at exit, log	-0.086*	0.166*	0.017	-0.107*	0.152*	0.063*	-0.003	0.096*	0.034	-0.051	0.276*

Pairwise Pearson correlation coefficients reported. * p<0.01

APPENDIX D: CORRELATION BETWEEN VARIABLES STUDIED

Table D1: Robustness checks (subsamples and fixed effects)

Cox regressions of firm survival rates	(1)	(2)	(3)	(4)	(5)	(6)
	Baseline	Excluding apparel	Manuf-acturing	Entry year ≥ 2000	Cohort year FE	Stratified
Foreign firm, t≤5	1.512***	1.743***	1.353***	1.493***	1.498***	1.425***
	(0.105)	(0.140)	(0.124)	(0.120)	(0.103)	(0.102)
Foreign firm, t>5	0.840***	0.915	0.761***	0.818**	0.822***	0.829***
	(0.051)	(0.066)	(0.060)	(0.081)	(0.050)	(0.052)
Observations	29,654	22,174	18,567	13,797	29,654	29,654
Firms	3,482	2,724	2,011	2,080	3,482	3,482

Coefficients reported as hazard ratios. Standard errors corrected for clustering by firm. All regressions include decade, sector and location fixed effects. *** p<0.01, ** p<0.05, * p<0.1

Table D1 gives results for different robustness checks. See the main text for a discussion of each.

Table D2: Robustness checks (firm-age interaction)

Cox regressions of firm survival rates	(1) Baseline (T=5)	(2) T=4	(3) T=6	(4) Foreign x $\log_2(t)$
Foreign firm, t≤T	1.512***	1.481***	1.401***	
	(0.105)	(0.115)	(0.090)	
Foreign firm, t>T	0.840***	0.917	0.836***	
	(0.051)	(0.052)	(0.054)	
Foreign firm				1.729***
				(0.186)
Foreign firm x log2(t)				0.831***
				(0.032)
Observations	29,654	29,654	29,654	29,654
Firms	3,482	3,482	3,482	3,482

Coefficients reported as hazard ratios. Standard errors corrected for clustering by firm. All regressions include decade, sector and location fixed effects. *** p<0.01, ** p<0.05, * p<0.1

Table D2 gives our headline results using different approaches to the interaction of firm age and foreignness. First, column (1) gives the baseline: comparing the first five years of existence to the remaining years. Columns (2) and (3) look at the adjacent cutoffs. Both still show a highly significant early-year disadvantage, though it is diminished somewhat in both cases (40-48% higher exit rates, instead of 51%). Using a cutoff of four years also significantly decreases the later-year advantage; this makes sense, as Table 5 implies that the fifth year is still a relatively dangerous one for foreign firms.

Another common treatment of terms violating the proportional hazard assumption is to interact it with *t* itself, or with log(*t*). This continuous approach avoids the use of arbitrary cutoffs, but is less straightforward to interpret than a simple two-stage division of firms' lifecycles (as we use in the rest of the paper). Such an interaction also still makes assumptions about the correct parameterization of the foreign-age interaction effect, namely that it is continuous; Table 5 in fact seems to suggests discontinuity.

Column (4) employs this continuous approach. The same story emerges: the main effect is significantly greater than one, while the interaction term is significantly below one. We use the base-two logarithm for ease of interpretation: in the first year, the foreign disadvantage is estimated with a hazard ratio of 1.729 (i.e. foreign firms are 73% more likely to exit); for each doubling of the firm's age, the hazard ratio decreases by a factor of 0.831 (i.e. the disadvantage decreases by 17%). This means that the foreign disadvantage of two-year old foreign firms is estimated to be 43.7%, eight-year-old firms are at roughly equal[22] footing (with the hazard ratio equaling 0.992); in years after the eighth year, foreign firms less likely to exit than local firms. However, we have no evidence that log-time is the most accurate parametrization of the effect (or any more accurate than the two-stage approach).

[22] The implied age of equal risk for foreign and local firms (i.e. the inflection point under a logarithmic rate of decreasing foreign disadvantage) can be solved as 7.77 years.

APPENDIX E: REGRESSION STATISTICS FOR INTERACTION TERMS

This paper presents multiple terms which interact a variable with a time condition (namely t>5). To estimate this effect, we have used regressions of the form:

$$\lambda(t, X, \beta) = \lambda_0(t) \exp(\alpha + \beta_1 foreign + \beta_2 foreign * (t > 5)) \quad \text{(E1)}$$

However, the β_2 estimated here is not the actual hazard effect for firms aged five years or greater; the correct value of such a coefficient would be given as $\tilde{\beta}_2 = \beta_1 + \beta_2$ (and the correct hazard ratio would be $\exp(\beta_1 + \beta_2)$).

For significance testing, an augmented standard error must also be calculated:

$$\tilde{s} = \sqrt{\text{var}\,\beta_1 + \text{var}\,\beta_1 + 2\,\text{cov}(\beta_1, \beta_2)} \quad \text{(E2)}$$

We then calculate the usual two-tailed t-test on $\tilde{\beta}_2/\tilde{s}$, to test the null hypothesis that the new coefficient is equal to zero (or to test whether the hazard ratio is equal to unity). It is these adjusted coefficients and significance statistics that are given in regression tables.