THE SURVIVAL OF NEW DOMESTIC AND FOREIGN-OWNED FIRMS

JOSÉ MATA[1]* and PEDRO PORTUGAL[2]
[1] *Faculdade de Economia, Universidade NOVA de Lisboa, Lisboa, Portugal*
[2] *Banco de Portugal and Faculdade de Economia, Universidade NOVA de Lisboa, Lisboa, Portugal*

We compare the survival of new domestic and foreign-owned firms. We analyze the determinants of the survival of new firms and investigate whether foreignness accounts for significant differences in the survival of new foreign and new domestic firms. We find survival to be determined by ownership advantages, size and growth strategies, the internal organization of firms, and by industry characteristics such as economies of scale, and industry entry and growth. After controlling for these characteristics, we find that domestic and foreign firms do not exhibit different chances of survival, that they respond in similar fashions to the determinants of survival and display identical time patterns of exit. Copyright © 2002 John Wiley & Sons, Ltd.

INTRODUCTION

This study compares the survival of domestic and foreign-owned entrants. Recent work on the survival of new firms has revealed that these firms experience high failure rates (Romanelli, 1989; Dunne, Roberts, and Samuelson, 1989; Brüdel, Preisendörfer, and Ziegler, 1992; Mata and Portugal, 1994; Sharma and Kesner, 1996), and this finding is largely shared by those studies which have focused specifically on the survival of new foreign firms (Li, 1995; Chen and Wu, 1996; Mitchell, Shaver, and Yeung, 1994; Yamawaki, 1997; Barkema, Bell, and Pennings, 1996; Mc-Cloughan and Stone, 1998; Shaver, 1995, 1998; Mata and Portugal, 2000). To our knowledge, no study has ever compared the survival of foreign and domestic entrants. Earlier attempts to compare exit by foreign and domestic firms (e.g., Li and Guisinger, 1991), reporting lower exit rates for foreign companies than for domestic ones, fail

to control for many factors that are known to affect survival including age.

This paper provides a first comparison between the survival patterns of foreign and domestic entrants, seeking to answer the following questions. Do foreign and domestic firms experience different chances of survival? If they do, what are the characteristics associated with the survival of firms that differentiate foreign from domestic firms? Do these characteristics account for the whole difference in survival between domestic and foreign firms, or is there anything left that has to be attributed to foreignness?

We identify firms that were created in Portugal during the period 1983–89 and follow their paths during the first years of their lives. We use hazard models to test a number of hypotheses concerning the determinants of their survival. We follow an eclectic approach, the hypotheses to be developed later in the paper being drawn from different strands of the literature, such as the Resource-Based View of the Firm, the Organizational Ecology, the Industrial Organization, as well as from a literature on legal structures.

The topic is not merely of academic interest. First, it has considerable interest for practitioners. Managers considering going into international markets are interested in evaluating their chances of success, and should be interested in knowing which factors promote or decrease their prospects of survival, and how the effects of these factors are altered by the decision to start up operations at home or abroad. Moreover, they should also be interested in knowing what to expect when faced with entry by a new foreign competitor and, in particular, whether foreign entrants will stay in the market for a longer or shorter period than comparable domestic entrants. Second, the topic also has some important public policy implications. Many countries pursue active policies for attracting foreign direct investment (FDI). These policies are based on the belief that FDI brings benefits to the economy which are not brought in by domestic investment. Obviously, these benefits will be more relevant the higher the rates of survival of foreign direct investment and the greater the difference between the ability of foreign and domestic firms to overcome the obstacles to survival.

The article is structured as follows. In the next section we will start by reviewing the relevant literature, and by establishing the hypotheses to be tested. We will then proceed to presentation of the data and the statistical model that will later be used to analyze the survival patterns of foreign and domestic firms. At this point, we will present the patterns of survival of foreign and domestic firms, and compare the two samples in terms of their observable characteristics. Next, we will present and discuss the results. Finally, some closing comments will be offered.

THE PROBLEM AND RELATED LITERATURE

One of the findings of the literature that has examined the survival of entrants is that the effects of the determinants of survival are different depending on whether entry is attempted by a new or by an already established firm (Dunne *et al.*, 1989; Audretsch and Mahmood, 1994; Mata, Portugal, and Guimarães, 1995; Mitchell, 1994). Being owned by an already existing firm may give the new venture several types of advantage. These entrants may have better access to finance since, unlike newborn firms, they have had time to

develop a reputation with banks (Brito and Mello, 1995). Their parent firms may also be able to supply expertise in management, which may help the entrant in developing a successful entry strategy. Indeed, studies on learning transfer within organizations suggest that being part of a chain may improve chances of survival of individual businesses (Ingram and Baum, 1997).

This kind of difference is also likely to hold when we compare foreign and domestic entrants. While most domestic firms are independent companies, foreign-owned firms typically have strong connections with other firms. The observed characteristics of these firms may thus underrepresent their potential in terms of ownership advantages, and foreign-owned firms may be in a better position to compete than their observed characteristics suggest. Therefore, they may have greater longevity than domestic firms with identical observed characteristics. Besides shifting the chances of survival, these improved capabilities may alter the impact that a number of obstacles to entry and survival exert upon the survival of new firms. In fact, in one of the few studies comparing the determinants of entry by domestic and foreign firms, Shapiro (1983) found that foreign entrants are much less sensitive to entry barriers than are domestic ones.

Also, the notion that multinational networks have an option value, because they allow multinational firms to shift production from one location to another (Kogut and Kulatilaka, 1994), suggests not only that foreign-owned firms are less likely to be shut down than domestic firms but also that the exit of these two groups of firms is likely to be governed by different forces. In particular, if multinationals keep subsidiaries because of their option value, these subsidiaries should be less affected by the factors that determine survival than domestic firms, whose destiny is decided on their own merits alone.

All of these advantages may translate into different choices made when starting a new business. Discussing stylized facts about multinational enterprises, Mark Casson (1987: 132) states that they

predominate in industries with high R&D/sales ratios and high advertising/sales ratios ... in industries with high ratios of salaried/weekly paid staff, and of administrative staff/production workers, and with high five-firm concentration ratios in the host country. ... Within an industry, MNEs appear to have the characteristics typical of the industry, only

more so. They undertake more R&D, have a relatively high proportion of administrative staff, and . . . pay higher wages.

The reason why foreign firms typically use these types of factors more intensively has been identified since the work of Hymer (1976) as residing in the fact that firms have inherent disadvantages in doing business abroad. They do not know the foreign market and its *modus operandi* as well as local firms do, which increases their costs of doing business relative to local firms. In addition, they incur increased costs of coordinating business units across distance. To compensate for these disadvantages, firms that go abroad must possess some type of asset that gives them some other sort of advantage, known in the theory of multinational enterprises as 'ownership advantages.' These include financial advantages, product differentiation and marketing advantages, and advantages accruing from economies of common governance or from the ability to exploit economies of scale at the plant level (Dunning, 1993: 162–163).

The hypotheses

The goal of this subsection is to discuss the firm and industry characteristics which are likely to affect the survival of new firms and to develop a set of specific hypotheses about their expected effects. We hypothesize that foreign firms use those factors which are associated with the success and viability of firms more intensively than do their domestic counterparts in order to compensate for their disadvantage in doing business abroad. One point of interest is to know whether these characteristics are sufficient to explain the differences in survival. That is, we would like to know if, after properly controlling for these firm- and industry-specific characteristics, there remain any significant differences in survival that can only be attributed to foreignness.

Ownership advantages

The Resource-Based View of the Firm has long stressed that the ability of firms to survive and to compete successfully is largely determined by the extent to which firms develop distinct capabilities. Successful firms are those which develop firm-specific assets, which cannot be imitated by competitors and provide the basis for their competitive advantage (Wernerfelt, 1984; Barney, 1991).

The development of these firm-specific assets is largely dependent on the firms' ability to innovate and market their products, the possession of such assets often being associated with the fact that those firms conduct R&D activities and spend considerably on advertising. These activities may have considerable spillovers to the whole firm (Klette, 1996), and transform the firms' capabilities and competences in other areas (Geroski, Machin, and Van Reenen, 1993). Consequently, they tend to form the basis of the abilities of firms to adapt to new circumstances (Teece, Pisano, and Shuen, 1997).

Although activities such as R&D may involve substantial spending on physical facilities and equipment, a number of authors have pointed out that it is human capital rather than physical capital that provides the basis for sustained competitive advantage (Youndt *et al.*, 1996). Indeed, the observation that competitive advantage tends to be associated with being in the technological forefront is complemented by evidence that the ability of firms to use advanced technologies relies heavily on the presence of a highly educated workforce (Autor, Katz, and Krueger, 1998).

The reason why the competitive advantage of firms cannot be based on physical capital alone is that 'physical technology, whether it takes the form of machine tools or robotics or complex information management systems, is by itself imitable' (Barney, 1991: 110), and assets that can be imitated or traded cannot be the basis for superior performance, as other firms have the means of gaining access to them. Authors such as Teece (1998) have argued that one of the few classes of assets that are not tradeable today are knowledge assets, which puts the ultimate source of competitive advantage of a firm in its employees.

Knowledge assets are hard to imitate because of the complex and tacit nature of knowledge (Polanyi, 1966). To the extent that it is tacit, knowledge is not amenable to be codified, but is embodied in the organization's routines and processes (Nelson and Winter, 1982; Coff, 1997; Teece, 1998). However, as Grant (1996) notes, knowledge exists only in individuals, and an important way of acquiring knowledge and developing the ability to generate new knowledge is through formal education. Although the evidence suggests that a number of managerial decisions, ranging from on-the-job training

programs to human resources selection procedures, can change the stock of human capital in the firm (Snell and Dean, 1992; Youndt *et al.*, 1996), there is also evidence that investments in firm-specific human capital are more productive if the workforce has large endowments of general human capital, of the type provided by formal education (Altonji and Spletzer, 1991). This suggests that schooling may be seen as an indicator of the quality of the land where the seed of human resource management is to blossom. Education is also a necessary, although not sufficient, condition to the adoption of a number of managerial practices that require large levels of employee discretion, such as TQM. All of this suggests that the level of education of a firm's workforce can be regarded as a measure (albeit imperfect) of ownership advantages.

The existence of assets that cannot be traded is a key factor in the theory of the multinational firm, and explains how these firms are able to compensate for the disadvantages inherent in doing business abroad. In fact, in Dunning's (1993) eclectic theory of the multinational corporation, these firms exist because they have ownership advantages due to firm-specific assets, which are difficult to trade. In the words of Caves the origin of such firm-specific assets 'might rest on a set of skills or repertory of routines possessed by the firm's team of human (and other) inputs' (Caves, 1996: 3). In the context of the international business literature, a number of empirical studies have measured the intensity of ownership-specific advantages by using different measures of the educational level of the workforce as proxies for human capital in the firm (Pugel, 1978; Lall, 1980; see Dunning, 1993: 150 and 161–162 for other references). Also, recent studies on entry, postentry penetration, and survival show that the ability to develop and exploit such assets is crucial for the postentry performance of firms (Burgelman, 1994; Bogner, Thomas, and McGee, 1996; Chang, 1996). Thus, we hypothesize that

Hypothesis 1: New firms with a better educated workforce experience a lower probability of exit.

Firm size

The literature on new firm entry has emphasized that new firms are, in general, small, and has suggested several reasons for this to be so.

First, new firms may be small in order to avoid incumbents' aggressive behavior (Scherer and Ross, 1990: 394). This type of strategy has been coined 'judo economics' by Gelman and Salop (1983), owing to the fact that one uses the opponent's strength in order to defeat him. By choosing to enter at a small scale, entrants increase the incumbents' cost of aggressive behavior relative to its expected benefit and thus reduce the likelihood that such actions are taken. Second, they may want to be small because the initial uncertainty about their own efficiency gradually disappears (Jovanovic, 1982). Firms may choose to start small to avoid incurring big losses in case experience reveals that they are not efficient enough to survive—a strategy that is particularly appropriate if entry costs are sunk (Cabral, 1995). Finally, new firms may be small not because they wanted to be small, but because they lacked the funds to be larger. Indeed, liquidity constraints were found to be binding for investment decisions by Fazzari, Hubbard, and Petersen (1988) and, in particular with respect to firm creation decision, by Evans and Jovanovic (1989).

Regarding survival, the three different explanations for small entry sizes do not have unequivocal predictions. While the cash constraints and uncertainty explanations predict that smaller firms will experience lower survival, such prediction does not arise from the judo explanation. If the judo strategy were successful, smaller entrants would face lower aggressive behavior from incumbents and experience higher survival rates. Regardless of the reasons that might have led to the choice of the entry scale, the truth remains that, *ex post*, the sunk costs incurred by entrants that have chosen to enter at large scale are normally greater than the corresponding costs incurred by small entrants. Therefore, *ex post* small entrants should be more likely to exit than large ones (Sharma and Kesner, 1996). Previous evidence on the effect of firm size on the survival of firms suggests a very robust negative effect. This result has been found in samples of firms of all ages (Evans, 1987; Hall, 1987) and in samples of new firms (Dunne *et al.*, 1989; Audretsch and Mahmood, 1994; Mata and Portugal, 1994; Mitchell, 1994; Haverman, 1995; Sharma and Kesner, 1996).

All of the aforementioned reasons are less appealing in the case of foreign than in the case of domestic firms. On the one hand, the nature of the

entry process is different for domestic and foreign-owned companies, as entry in foreign markets requires a firm to incur considerably higher entry costs than entry in the domestic market. These incremental costs are, to a large extent, costs of acquiring information about that particular market, as foreign firms will need to learn about the *modus operandi* of the new market. Because these costs are largely fixed, they create economies of scale which affect foreign but not domestic firms. This leads foreign-owned firms to be larger than domestic businesses. On the other hand, as foreign firms are normally owned by already existing firms they are less subject to the 'liability of newness' than are genuine market newcomers. Consequently, a strategy of starting small in order to acquire information about its own potential is less likely to be attractive. Moreover, the fact that foreign firms are normally owned by already existing firms also means that they typically have deeper pockets than do their domestic competitors (Dunning, 1993: 150). This has obvious implications for the availability of funds to finance entry at a large scale. Foreign parent firms, which are normally large, possess the required funds. This also has implications for the need to avoid incumbents' aggressive behavior, as incumbents tend to be less aggressive towards entrants which they know to be financially strong.

Although the earliest studies that have analyzed the effect of size on survival have used initial size as the relevant measure, some more recent studies have focused on the effect of current size (see Hannan *et al.*, 1998, and the references therein). There are, indeed, good reasons to think that current size should be a more appropriate variable to include in studies of survival. For example, Levinthal (1997) emphasizes the ability of firms to adapt to changing environments as being crucial to shape the process of selection and survival. Mata *et al.* (1995) follow a different line of argument. They argue that current size should be a better predictor of exit than initial size even if the landscape does not change, as the current size of firms includes information on the reaction of firms to their market success over time. Mata *et al.* (1995) have specifically compared the power of current vs. initial size as predictors of survival and, indeed, they have found that models using current size are better predictors of survival than those including start-up size. Thus, we hypothesize that

Hypothesis 2: The probability of exit decreases with firm current size.

Growth

Basic economic theory says that firms exit when they incur losses and stay in markets when they are profitable, and several studies have shown that profitability has a positive impact upon the survival of firms (Hambrick and D'Aveni, 1988; Silverman, Nickerson, and Freeman, 1997). A positive association between survival and performance measures has been found for foreign firms, in the sense that the same type of firms that exhibit better performance also tend to experience higher rates of survival (Makimo and Beamish, 1998; Pan and Chi, 1999). While profits seem to be a natural measure of performance to include in a model of survival, there are also reasons that suggest caution. For example, it has been argued that each firm has an idiosyncratic level of profits, depending on the opportunity cost of its owners, that determines its decision of exit (Gimeno *et al.*, 1997). The use of profit becomes even more problematic when one analyzes multinational firms, due to the transfer pricing problem (Pan and Chi, 1999). An alternative is to use an indirect measure of economic performance, such as the observed growth rate.

In stylized models of industry evolution (e.g., Jovanovic, 1982), the current size of firms at each moment is a sufficient statistic for predicting survival. At each moment, observing all their past outcomes, firms adjust their sizes. Firms which have experienced good outcomes will grow, while those which have bad times will contract, or ultimately exit. However, if there are adjustment costs in the process of growth (Penrose, 1959), firms will find it optimal to adjust only partially, and to converge gradually to their desired size (Bogner *et al.*, 1996). For example, the current size of growing firms will be an underestimate of the firm's desired size. The fact that a firm has grown in the past signals that it has been performing well and would wish to be larger than it currently is. Thus, it should have lower exit probabilities than its current size indicates (Mata *et al.*, 1995). The fact that a firm has grown can also be seen as an indication about its expectations of success. Frank (1988) makes the point that different entry sizes signal different expectations about success. Larger firms have more optimistic expectations of success

and, consequently, are apt to endure poor performance for a longer time. To the extent that recent growth signals that firms are optimistic about their performance, one should also observe a positive relationship between recent growth and survival. Therefore, we formulate our next hypothesis as

Hypothesis 3: The probability of exit decreases with firm growth.

Legal structure

Only limited work has analyzed the effects of legal structure upon the survival of firms. *A priori*, one would expect that only a minority of foreign-owned firms will assume an unlimited liability legal form, as these firms would have to be directly owned and run by foreign individuals. Li and Guisinger (1991) hypothesized that foreign firms owned by MNE would have greater chances of survival than those owned by foreign individuals, but they did not find much support for this hypothesis in their data. Brüdel *et al.* (1992) and Harhoff, Stahl, and Woywode (1998) found the company legal form to be associated with the chances of success. Harhoff *et al.* (1998) found that limited liability companies are more likely to go bankrupt, but less likely to be voluntarily liquidated, than are other firms. These authors argue that since the owners of limited liability firms are not accountable for the firm's debts, they will prefer to go bankrupt (i.e., to fail with losses to creditors) as compared to the case where these losses have to be paid for from their personal wealth. We will not be able to distinguish between exit by liquidation and by bankruptcy. However, since when a firm exits voluntarily, it does so before going bankrupt, the argument of Harhoff, Stahl, and Woywode also implies that limited liability firms will exit later than will those of unlimited liability. Thus, we hypothesize that

Hypothesis 4: Firms operating under limited liability face lower probabilities of exit than those of unlimited liability.

Age

In general, we expect the probability of exit to decline with the age of firms, a pattern which has been widely established by research on new firm survival (Mitchell, 1994; Mata and Portugal, 1994; Dunne *et al.*, 1989). This pattern has been attributed to the 'liability of newness', which characterizes the first years in business (Stinchcombe, 1965). During the first years of their lives, firms go through a process of legitimation, either by learning about their abilities to be in business (Jovanovic, 1982) or by developing new organizational capabilities (Nelson and Winter, 1982). To a large extent, legitimation occurs as institutions develop a taken-for-granted attitude towards day-to-day operations and feel the initial uncertainty to have largely disappeared. As Hannan and Carroll (1992: 37) put it, 'legitimation eases the problem of maintaining flows of resources from the environment and enhances the ability of organizations to fend off challenges.'

A number of studies have found that the probability of exit may increase with age. These patterns have been termed as liabilities of 'adolescence' and of 'senescence' depending on whether this trend reverses after some point or not. Three main reasons have been suggested for these patterns (see Hannan, 1998). The first is that firms are protected from failure by their initial endowments of resources. As firms age, time erodes these endowments and mortality rises. The second reason is that the state of the environment at the time of birth largely determines the strategic choices of firms. As firms age and the environment changes, the initial choices of firms become less and less adequate to the new environments, and firm mortality increases. The third reason is that the routines developed by firms during their lives may ease the tasks of dealing with the firms' daily operations, but may create rigidities that make the firms ill suited to cope with changes in the firms' environments. Recent studies have reported that these patterns may vary according to different environments (Ranger-Moore, 1997) and strategies (Henderson, 1999). However, given that our observations are concentrated in the earlier years of the firms' lives, we do not expect to observe these liabilities of adolescence and senescence and hypothesize that

Hypothesis 5: The probability of exit decreases as entrants age.

Foreign firms are also subject to this liability of newness, to the extent that they are operating in an environment which is new to them, and they have not developed those routines which are most suited

to it. Indeed, foreign firms have been observed to gradually overcome this initial 'liability of foreignness' and to catch up with domestic competitors (Zaheer, 1995). However, part of the legitimation process is related to the overall company, rather than to any specific market. With respect to this aspect of legitimation, foreign-owned firms are in an advantageous position, as their parent companies have already gone through this process of legitimation in their home country. A different aspect of the liability of newness arises from young firms having little social capital, in the sense of not being recognized as legitimate players by the remaining social actors. In the case of Portugal during the 1980s, this does not seem to translate into an additional disadvantage of foreign firms. On the contrary, one might even argue that foreign firms enjoyed a greater legitimacy due to the reputation of creation of good jobs and the widespread efforts made by the government to attract foreign capital. All of these reasons make foreign firms less likely to exit during their early infancy than domestic firms.

This prediction is reinforced by the fact that the costs associated with entry in foreign markets are largely irrecoverable in the case of exit. Indeed, a result that emerges from a new literature in finance which analyzes the impact of irreversible entry costs on exit (Dixit and Pindyck, 1994) is that the greater the amount of irrecoverable costs, the greater is the value of waiting before making an exit decision. Therefore, if two otherwise identical firms face the same operational loss and entry by one firm implies that some costs must be sunk while entry by the other does not, it may be in the first firm's best interest to stay in business, while it may be optimal for the second firm to exit. This leads us directly to the next hypothesis to be tested:

Hypothesis 6: The time patterns of exit by foreign and domestic entrants is such that foreign entrants are less likely than domestic firms to exit during their early infancy.

Control variables

Finally, although we will not develop specific hypotheses about the effect of multiplant operations, we will control for this aspect. Most studies focusing on foreign entry have emphasized the impact of parent firm diversification on the choice of entry mode and a few have analyzed

its impact on exit (Li, 1995; Yamawaki, 1997). The subsidiary's internal organization has received much less attention. To our knowledge, only Bane and Neubauer (1981) have analyzed this topic, finding that narrowly focused subsidiaries have experienced a lower failure rate than have more diversified ones. Romanelli (1989) also found that specialist firms experience a greater chance of success during their first years than do more diversified firms, although her work did not distinguish between foreign and domestic firms. Finally, Mata and Portugal (1994) found the number of plants operated by the firm to have a positive impact on a firm's prospects of survival.

Industry environment

On top of these firm-specific characteristics the survival of entrants is also likely to be affected by the competitive environment which firms enter. We will use a number of variables to account for the differences in the industry environments.

Concentration   Two types of argument can be made about the effect of the degree of competition in the market on survival prospects. On the one hand, Organizational Ecology scholars (e.g., Hannan and Carroll, 1992) maintain that competition is a force which increases mortality. At low levels of the number of firms, an increase in the number of actors in a market (density, in the Organizational Ecology terminology) translates into increased legitimacy and may favor survival. After a certain point, however, further increases in the number of firms lead to increased competition and this leads to increased mortality. While economists certainly agree that competitive markets (that is, those populated by a large number of firms) exert a strong disciplinary effect and drive inefficient firms out of the market, the Industrial Organization literature emphasizes a different point. It argues that market concentration facilitates collusion and that, in highly concentrated markets, incumbents are more likely to retaliate against entrants (Bunch and Smiley, 1992). A branch of this literature, however, emphasizes that entry barriers exert different effects depending on the particular characteristics of the entrants (Caves and Porter, 1977). To test this theory, Shapiro (1983) formulated the hypothesis that entry barriers would exert different effects on the flows of entry and exit by domestic and foreign firms, finding a much

greater effect on domestic entry and exit than on the corresponding foreign flows. The available evidence relating the survival of firms to market concentration is inconclusive. Audretsch and Mahmood (1994) report a negative and statistically significant effect of market concentration on the survival of new firms, but Romanelli (1989), and Mata and Portugal (1994) found this effect to be insignificant. Sharma and Kesner (1996) also found an insignificant effect of concentration on survival, but found that the (negative) effect of concentration increases with the scale of entry. Focusing on foreign firms, Li (1995) and Mitchell *et al.* (1994) found a positive (although barely significant) effect of concentration on new firm survival.

Entry   Another element of the competitive structure of a market is the extent of entry in that market. Organizational Ecology and Industrial Organization here agree that markets with high entry rates are those in which the highest exit rates are to be expected. The Organizational Ecology argument is that large entry flows signal a low level of legitimation in the market and one should therefore expect high exit rates. Industrial Organization arguments, on the other hand, emphasize that entry barriers are exit barriers, and that the magnitude and irreversibility associated with investments, which deter entry, also hinder exit (Eaton and Lipsey, 1980). There is plenty of evidence that industries where entry is easy are also industries where exit is more likely. Dunne, Roberts, and Samuelson (1988) found that there is a very strong positive correlation between the flows of entry and exit across markets, many studies (surveyed in Siegfried and Evans, 1994) reported similar findings for the determinants of entry and exit, while Mata and Portugal (1994) observed that this is due, in large part, to the early exit of entrants in industries characterized by high entry flows. Shaver (1995) found that chances of survival of foreign entrants were negatively affected by the subsequent entry of other foreign firms.

Industry growth   Industries which are growing quickly are likely to be environments in which the probability of exit of new firms is lower. One of the stylized facts established by Schmalensee in his survey of empirical work on Industrial Organization (Schmalensee, 1989: 972) is that profits are in general larger in growing than in otherwise identical industries. This makes survival easier, as new firms do not have to attract customers away from incumbents. Both Audretsch and Mahmood (1994) and Mata and Portugal (1994) found a positive and significant effect of industry growth on the survival of new firms, and Shaver (1995) found this effect to hold specifically for foreign firms.

Economies of scale   We also want to control for the extent of economies of scale in the industry. According to Audretsch (1995), one of the reasons why so many firms fail is that their entry size is smaller than the minimum efficient scale (MES) in the industry, and they experience a cost disadvantage *vis-à-vis* the most efficient firms in the market. Controlling for size, we would therefore expect that firms in industries where the MES is larger face lower survival rates.

Foreign presence   We also control for the extent of foreign presence in the industry where entry is attempted. The impact of previous presence of foreign firms on the survival of the new foreign-owned firms has been under scrutiny in many studies (e.g., Mascarenhas, 1992; Mitchell, 1991; Mitchell *et al.*, 1994; Shaver, Mitchell, and Yeung, 1997). Most of the arguments developed in this line of research are of a time-series nature, comparing the positions of first-movers with that of late-movers. For example, Mitchell *et al.* (1994) claim that foreign survival at the earlier stages of foreign presence should be more difficult due to lack of market knowledge, while at the latter stages it should again be more difficult due to congestion effects. This argument is developed in a time-series context, in which the same market is observed over time. In our case, we have in essence cross-sectional variation. We thus expect previous foreign presence to signal the presence of those characteristics, such as advertising and technological intensity, which make foreign survival more likely. These are characteristics which we are not able to observe directly, but which are also related to the previous presence of foreign firms in the market (Caves, 1996; Dunning, 1993). We include previous foreign presence in the industry as a means of controlling for these unobserved industry characteristics, which may be related to the survival of foreign firms.

METHODS

Data

The data used in this paper were obtained from an annual survey (*Quadros de Pessoal*, hereafter *QP*) which has been conducted by the Portuguese Ministry of Employment since 1982. Unlike most databases employed in the analysis of foreign direct investment, our data are not restricted to the largest companies, and include firms of all sizes, as the survey covers all firms employing paid labor in Portugal. We worked with the original raw data files from 1982 to 1992, which include over 100,000 firms in each year.

Among other information, the survey records the share of equity held by nonresidents, which allows us to compute estimates of the importance of foreign-owned firms in the Portuguese economy. Moreover, the survey has a longitudinal dimension; i.e., firms are identified by a unique number which allows them to be followed over time. All these characteristics make this data set a unique source for comparing entry and survival of domestic firms with that of foreign-owned companies.

There are also limitations in the database that should be made clear from the outset. One such limitation is that we cannot tell mergers and acquisitions from true exits. What typically happens when a movement of this nature occurs is that one of the identifiers of the firms involved in the merger is transmitted to the resulting firm, while the others disappear, and are thus counted as exits in our data. There are no published data on mergers for Portugal. However, one can obtain a crude estimate of the extent to which mergers account for liquidations by using the Firms Register file. This comparison reveals that fewer than 1% of the total number of liquidations are due to merger/acquisition. We therefore maintain that our inability to trace mergers in our data set is not likely to have an impact upon our results.

Because we were able to work directly with raw files, we were able to compute entry and survival measures ourselves. This could be done easily because firms are identified in the survey by numbers, which are assigned sequentially when firms first report to the survey. New firms were identified by comparing firms' identifiers with the highest identification number in the file in the previous year. This enabled us to track 124,249 new firm start-ups during the period 1983–89. These starting and ending dates were chosen on the basis of the available data. We started in 1983 because our data begin in 1982 and we need to know the largest number in the previous year file. We stopped in 1989 because, as we are interested in measuring survival, we need to have data on a latter date.

We classified new firms as foreign or domestic using the data on equity held by nonresidents. Classifying as foreign owned those firms having a foreign participation greater than 10 percent, we were able to identify 613 new firms as foreign owned. All of these firms were included in our sample. The 10 percent threshold is the one usually employed to distinguish foreign direct investment from portfolio investment, as this is the threshold that normally grants the right to designate one board member. However, a 10 percent stake in a firm does not necessarily grant control over the decisions to be made. To investigate whether the patterns of survival differ between minority, majority and wholly-owned subsidiaries, we used alternative definitions of what constitutes a foreign firm. Using the 50 percent and 90 percent foreign ownership thresholds, we obtained samples of 458 and 348 firms, respectively. All the estimations were also run using these restricted samples, but results did not change qualitatively. Aside from this, we also included a sample of 593 new domestic firms as a control group. These firms were randomly selected from the population of domestic entrants, in order to form a sample of a similar size to the population of foreign entrants. The reason we decided to use samples of a similar size was to guarantee that the results obtained with the pooled sample of domestic and foreign entrants would not be decisively determined by one of the two subsamples. Below we report on additional sampling procedures designed to guarantee that our results are not biased due to the choice of our sample of domestic firms.

Our definition of entry involves the creation of a new legal entity. As we have only limited information on the firms' owners, we are not able to identify entry by acquisition for domestic entrants. We are able to distinguish greenfield and acquisition entrants for foreign entrants and we analyze entry and exit modes elsewhere (Mata and Portugal, 2000). As our goal in this article is to compare foreign and domestic entrants, we restrict our attention to greenfield entrants.

To compute our duration measures we located the moment when firms exit by searching the files for the first year the firm ceases to report to the survey. To be on the safe side in computing life-spans with such a large database, we performed additional controls before classifying the absence of report as a firm exit. Namely, we required that a firm be absent from the file for at least 2 years in order to be classified as an exit. For this reason, in our subsequent analysis we use data only until 1990, although our data files go up to 1992. Using this methodology we determined the duration of new firms which started during the period 1983–89 and ceased before 1991. For the remaining firms started during the same period, all we know is that they were still active in 1991, thus making our duration measure right-censored.

Statistical model

Because of this censoring, in our analysis of the survival of new firms, we need to employ a statistical model which is capable of accommodating such incomplete durations. Although a variety of such models exists, we employ a semi-parametric hazard model, because such models provide a spectrum of analysis tools that enable us to characterize the exit process more rigorously than is possible with the conventional approaches, such as ordinary least squares. In particular, this methodology enables us to study how the exit rates evolve over time and the way in which such rates are affected by both firm and sectoral characteristics.

As explained above, our data on the duration of firms come from an annual survey. This means that we only know whether or not a firm is active at the survey dates and, therefore, our measured durations are grouped into yearly intervals. For firms that exited during the survey period, all we know is that their durations are expressed in increments of 1 year length. For those that were still operating at the end of the survey period, the relevant information is that their duration exceeded the lower limit of the last observed duration. Such a sampling plan is properly accommodated in the framework of discrete duration models (Lancaster, 1990, provides a rigorous exposition of those models). Our empirical model is then a semi-parametric discrete hazards model, which is fully described in the Appendix.

For our purposes here, it suffices to say that our model can be formally represented by

$$\log h(t|X_{t-1}) = \lambda_t + \beta X_{t-1}, \quad t = 1, \ldots, K$$

where the left-hand side variable is simply the logarithm of the hazard rate, that is, the log of the probability that the firm exits at time t, given that it survived until $t - 1$. The parameters λ_t identify the baseline hazard function providing the yearly exit rates for a firm whose covariates X_{t-1} assume a zero value. In the regression, we define all explanatory variables as deviations from their sample means at birth, so that the baseline reflects the exit pattern of a firm with the average characteristics. The β vector denotes the regression coefficients and gives the impact of the explanatory variables included in X measured, obviously, at time $t - 1$.

Data description

Entry of foreign and domestic firms is evenly spread throughout our observation period of 7 years, although a somewhat pro-cyclical pattern seems to emerge. The year 1985, a recession year, accounts only for 9.8 percent and 9.3 percent of the total number of domestic and foreign entrants during the period, respectively. The maximum of these figures is attained in the year 1989, which is an expansion year, with 20.8 percent and 19.1 percent, respectively.

Survival rates

Figure 1 displays the survival and hazard rates for our two samples of entrants. The hazard rate, plotted in the right panel of the figure, is defined as the probability that a firm exits during one particular period, given that it has survived until the beginning of that particular period. The survival rate at each moment (in the left panel) is the probability that a firm will have exited at any time until that moment. By definition, the survival rate is always decreasing.

New foreign and domestic firms confront very different chances of survival. The number of domestic entrants that exit during the first year of activity as a proportion of the total number of domestic entrants is almost twice as much as the corresponding figure for foreign entrants. Moreover, while it takes more than 5 years for one third
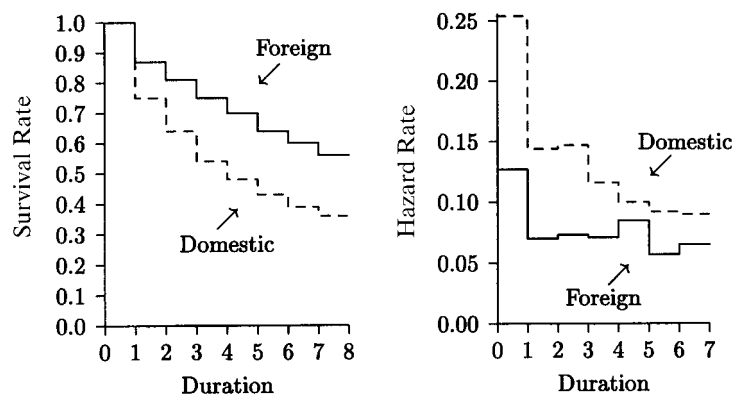
Figure 1.   Exit of foreign and domestic entrants

of the foreign entrants to exit, the same figure is achieved before the third year for new domestic firms.

An inspection of the hazard rates in the right panel of Figure 1 provides a number of interesting points. First, it makes it clear that the differences between the two groups of firms hold true throughout the time span considered. At any time during the time span covered here, domestic entrants experience a higher risk of failure than do foreign, although the initial difference seems to decrease over time. Second, in both cases, the hazard rates exhibit a decreasing pattern over time. Third, the chances of failure are remarkably higher during the first year than from the second period onwards.

Independent variables

To test the hypotheses previously outlined we use the variables in Table 1. This table contains the average values of the variables for the two samples

Table 1.   Comparison of samples

	Foreign	Domestic	Statistic	p-Value
College graduates	0.129	0.009	277.33	0.0001
Employment	28.800	5.730	164.89	0.0001
Limited liability	0.928	0.430	343.62	0.0001
Plants	1.259	1.027	28.04	0.0001
Concentration	0.041	0.012	264.21	0.0001
Industry growth	0.063	0.049	1.56	0.2121
Entry	0.086	0.096	61.55	0.0001
MES	56.000	36.690	32.49	0.0001
Foreign presence	0.142	0.038	325.61	0.0001

Note: The computed statistics refer to the Wilcoxon rank test.

of domestic and foreign entrants as well as tests on the comparison of the two samples.

We measure the propensity to develop firm-specific assets by computing the share of college graduates among the firm's labor force. The conventional measurement of human capital relies on different measures of the educational levels of the individuals (Mincer, 1974), college being a threshold sometimes employed (e.g., Phan and Lee, 1995). A key factor for the existence of the multinational firm is the presence of ownership advantages, which are difficult to trade. Because of this, we would expect foreign firms to be endowed with greater amount of this type of asset than domestic firms. Indeed, the proportion of college graduates in foreign firms is almost 10 times higher than in domestic firms.

Size was measured here by the number of persons in the firm. As expected, the entry scale of domestic and foreign entrants is clearly different; while domestic firms started by employing on average six persons, foreign firms employed 28.

Firms in our data set may operate under either limited or unlimited liability. Domestic and foreign firms are likely to differ widely with respect to the legal form adopted. Being at a distance requires more formal legal structures as a means of controlling one's own interests. Moreover, while domestic firms can be started as sole proprietorships or partnerships, to the extent that the foreign owner is an incorporated firm itself, there is little choice for the legal structure of the subsidiary. Thus we expect foreign firms to be mostly limited liability firms. And, indeed, the differences between foreign and domestic firms are striking. While domestic firms are mostly of unlimited liability, the share of this legal form among

foreign-owned firms is only 7%. Foreign firms are also significantly more likely to operate multiple plants in Portugal than their domestic counterparts.

The five remaining rows of Table 1 compare the characteristics of the industries entered by domestic and foreign entrants. Concentration was measured by the Herfindahl index on concentration, Industry Growth by the employment growth rate in the industry, Entry by the share of employment in new firms in total employment in the industry, Foreign Presence by the share of employment in foreign-owned firms in the industry and the Minimum Efficient Scale (MES) by the proxy suggested by Lyons (1980), which is defined as the average number of workers in firms that, on average, operate 1.5 establishments.

The samples of domestic and foreign firms are also quite different with respect to the industries they enter. Foreign firms enter more concentrated markets, those with lower entry rates, with larger MES, and with greater previous foreign presence. All of these differences are clearly significant in our sample and conform well to our expectations that, due to their intrinsic advantages, foreign entrants are typically in a better position to overcome the obstacles posed by entry barriers. Industries entered by foreign firms also present a higher growth rate than do those entered by domestic firms, but the difference is not statistically significant.

Sample correlations between the independent variables are shown in Table 2. The correlation coefficients are low and no serious collinearity problems were detected in the regression estimation.

As we observe firms over time, we are also able to control for the evolution of firms' characteristics. Most of the average characteristics of firms do not change much over the time period we cover, the most significant exception being the size of firms, which exhibits a marked increase as firms age. The average sizes during the first 7 years of life and the corresponding growth rates are displayed in Table 3. While both types of firm experience significant increases in size, growth rates are typically much higher for foreign firms than for domestic ones. Of course, this huge growth can stem from two different reasons. On the one hand, this can be a statistical artifact, due to the selection process. If smaller firms exit with a higher probability, as we hypothesize, the remaining sample will be composed of firms which are, on average, larger than the average firm in the original sample. On the other hand, it can be due to a genuine growth of the survivors. To disentangle these two aspects we computed firm size and growth rates

Table 2.   Correlations

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Foreign	(1)									
College graduates	(2)	0.35								
Log of employment	(3)	0.38	−0.03							
Limited liability	(4)	0.53	0.17	0.33						
Log of plants	(5)	0.14	−0.02	0.38	0.07					
Concentration	(6)	0.18	0.07	0.11	0.10	0.08				
Industry growth	(7)	0.05	0.06	0.08	0.01	−0.01	0.18			
Entry	(8)	−0.12	−0.03	−0.00	−0.07	0.03	0.16	0.45		
Log of MES	(9)	0.17	−0.03	0.43	0.08	−0.02	0.03	0.03	−0.23	
Foreign presence	(10)	0.40	0.23	0.24	0.25	0.14	0.30	0.17	−0.02	0.21

Table 3.   The evolution of foreign and domestic entrants

Variable	Ownership	Years						
		1	2	3	4	5	6	7
Size	Domestic	5.73	7.41	9.83	10.37	14.71	20.50	30.23
	Foreign	28.80	40.53	52.81	63.96	72.64	75.52	74.02
Growth	Domestic	—	0.100	0.015	0.011	0.048	0.037	0.055
	Foreign	—	0.346	0.173	0.067	0.042	0.140	0.013

for constant samples of firms which survive for 7 years. The results (not reported here) indicate that firms in these restricted samples continue to grow significantly, which indicates that there is a genuine growth process among survivors. However, selection played different roles in shaping the growth of domestic and foreign entrants. While the accumulated growth between birth and the age of 7 observed in Table 3 for domestic firms is found to be largely produced by the exit of small units, selection does not play such an important role for foreign firms.

Growth is particularly important during the initial years of life. This is true for both domestic and foreign entrants, and it may correspond to the installment phase of a new venture. However, foreign firms exhibit higher growth rates than do domestic firms, for most of the periods observed, but especially during their early infancy. This life cycle profile of growth is consistent with the idea that firms may enter smaller than their projected size (when the project reaches the cruise speed) due to uncertainty and liquidity constraints. As time goes by and the uncertainty becomes resolved, firms having fewer cash constraints are more able to finance the growth process.

The differences between foreign and domestic firms, however, are particularly striking, as foreign firms are much larger than domestic ones and a negative size–growth relationship has been consistently established in the postentry literature (Geroski, 1995). This clearly indicates that the growth dynamics of foreign and domestic firms are quite different, possibly because the cash constraint for financing growth is less binding for foreign firms.

REGRESSION RESULTS

Our empirical strategy will go through three steps. First, we will control for heterogeneity among firms by including in our model those variables described above, which measure the relevant characteristics that are expected to affect survival. At this stage, a binary variable will enable us to discriminate the marginal effect of being foreign. Second, we will run separate regressions for domestic and foreign firms, in order to determine whether foreign and domestic firms respond in different fashions to a given set of factors. Finally, we will

Table 4. The determinants of firm exit

	(1)	(2)	(3)
Foreign	−0.710[a]	0.073	0.076
	(0.097)	(0.127)	(0.135)
College graduates		−1.019[b]	−0.902[b]
		(0.405)	(0.399)
Log of employment		−0.372[a]	−0.429[a]
		(0.051)	(0.055)
Growth		−0.542[a]	−0.495[a]
		(0.131)	(0.132)
Log of plants		−0.096	−0.026
		(0.255)	(0.259)
Limited liability		−0.529[a]	−0.464[a]
		(0.118)	(0.120)
Log of MES			0.189[a]
			(0.055)
Entry			2.8167[a]
			(0.722)
Concentration			0.854
			(0.585)
Industry growth			−0.306
			(0.197)
Foreign presence			−0.357
			(0.458)
Log-likelihood	−1401.85	−1326.90	−1315.43
χ^2	54.84	204.76	227.76
Number of firms	1203	1203	1203
Number of observations	4420	4420	4420

Notes: Figures in parentheses are asymptotic standard errors. Superscripts a, b and c indicate that the coefficients are significant at the 1%, 5%, and 10% significance levels, respectively. Estimation includes dummies identifying the firm's age and year of birth. The degrees of freedom in all χ^2 tests are the number of reported coefficients.

compare the temporal evolution of the chances of survival of the two types of entrants.

Exit of new firms

The results of estimating several specifications of our first model are reported in Table 4. The first column displays the estimate of the unconditional impact of being foreign upon the probability of exit, i.e., the estimate of this impact when we do not control for the characteristics of firms other than foreignness. This estimate is presented for reference purposes mainly, and shows a very strong effect of being foreign on both qualitative and quantitative grounds. The estimate of −0.710 indicates that foreign firms experience a hazard rate which is about 51 percent lower than domestic ones, which conforms well to the

pattern in Figure 1. For example, if domestic firms experience a 15 percent chance of failure, the corresponding figures for foreign firms would be about 7.4 percent. Moreover, the null hypothesis of no effect of being foreign is soundly rejected with a level of confidence that is quite high indeed, as the *t*-statistic is above 7.

Column (2) includes the firm-specific variables discussed above. Except in one case, they are all statistically significant and carry the expected sign. Ownership advantages are clearly important for the prospects of new firm survival, as the proportion of college graduates in total employment attracted a negative and significant coefficient. Larger firms experience lower chances of failure, our estimates indicating that if a firm is 10 percent larger than another, but identical in all other respects, it has a 3.7 percent lower chance of exit. The number of plants operated by firms is the only one of the firm characteristics which does not appear to be significantly related to the survival of firms. Legal structure has the expected effect. Unlimited liability firms are more likely to exit than limited liability ones and this effect is statistically significant. Finally, the effect of firm growth is also negative and clearly significant.

Results with respect to the estimate of the effect of being foreign owned change dramatically from column (1) to column (2). After controlling for the characteristics of firms included in column (2), the impact of being foreign on the exit probability totally vanishes. Indeed, the regression coefficient becomes positive although it is not estimated with sufficient precision to be statistically significant.

This coefficient does not change much as we move to column (3), which also includes the industry-level variables. That is, after controlling for the characteristics of firms and industries, the effect of foreign ownership on survival appears to be negligible. With respect to the effect of the industry variables themselves, no surprises emerge from the results. Economies of scale and entry increase the chances of failure, while industry growth reduces them. In contrast, no significant effect from concentration or from previous foreign presence is detected.

As explained in the 'Data' section above, we were concerned with the possibility that these results might have been decisively affected by the broadness of our definition of foreign firm. Accordingly, we ran the same regressions as above using stricter thresholds to define a firm as foreign owned. Specifically, we used the 50 percent and 90 percent thresholds, which correspond to including only majority and wholly owned foreign subsidiaries. Results are reported in Table 5 and were qualitatively identical to those reported in columns (1) and (3) of Table 4.

We know from the description of our data that foreign and domestic entrants enter in industries with rather different attributes. In fact, from the 581 industries where there are firms in operation in the period, there are only 172 where entry by foreign firms is observed. From these, there are 29 industries where entry by domestic firms is not observed, leaving us with 143 industries where both foreign and domestic entry was observed. This may raise doubts on whether our sample of domestic entrants forms a valid control group to which foreign entrants can be compared. As a robustness check, we ran the same regressions using a sample that included only firms in the industries where there is both foreign and domestic entry, which reduced our sample of foreign entrants to 562 observations. This restriction had a more dramatic effect on the size of our sample of domestic entrants and we had to generate another random sample of domestic entrants. The results in Table 5, columns (8) and (9) are qualitatively identical to our previous results.

Exit of new domestic and foreign firms

The models we have been dealing with until now assume that the chances of survival of foreign and domestic entrants differ only by a proportional factor. With this modeling, we have found that we have been able to explain the differences between foreign and domestic entrants, in terms of their survival. Of course, this may be too restrictive, as it rules out the possibility that the difference between the two groups of firms lies elsewhere. A more flexible approach would not impose equal effects of the independent variables across the two groups, nor a common baseline hazard function. This amounts to estimating the model separately for domestic and foreign entrants.

The results of such an estimation (shown in Table 6) show that the determinants of domestic and foreign firms survival are fairly similar. The estimates of the effects of the covariates have the same sign in both equations and are broadly of the same magnitude. In order to test the equality of

Table 5.   The determinants of firm exit: alternative samples

	Majority subsidiaries		Fully owned subsidiaries		Industries with foreign entrants	
	(4)	(5)	(6)	(7)	(8)	(9)
Foreign	−0.755[a]	0.010	−0.678[a]	0.095	−0.715[a]	−0.026
	(0.109)	(0.144)	(0.119)	(0.152)	(0.099)	(0.132)
College graduates		−0.943[c]		−1.174[b]		−0.740[c]
		(0.484)		(0.526)		(0.396)
Log of Employment		−0.379[a]		−0.387[a]		−0.334[a]
		(0.059)		(0.062)		(0.056)
Growth		−0.496[a]		−0.383[b]		−0.698[a]
		(0.142)		(0.153)		(0.128)
Log of plants		−0.135		−0.073		0.086
		(0.329)		(0.333)		(0.263)
Limited liability		−0.527[a]		−0.520[a]		−0.413[a]
		(0.123)		(0.123)		(0.120)
Log of MES		0.172[a]		0.167[a]		0.035
		(0.059)		(0.062)		(0.060)
Entry		2.403[a]		2.463[a]		2.993[b]
		(0.880)		(0.918)		(1.173)
Concentration		1.246[c]		0.989		1.296
		(0.659)		(0.818)		(0.887)
Industry growth		−0.289		−0.308		−0.150
		(0.210)		(0.211)		(0.164)
Foreign presence		−0.425		−0.141		−0.373
		(0.517)		(0.550)		(0.549)
Log-likelihood	−1219.62	−1149.03	−1118.61	−1056.37	−1333.81	−1263.26
χ^2	51.30	192.80	35.86	145.02	53.21	194.30
Number of firms	1051	1051	941	941	1224	1224
Number of observations	3760	3760	3292	3292	4108	4108

Notes: Figures in parentheses are asymptotic standard errors. Superscripts a, b and c indicate that the coefficients are significant at the 1%, 5%, and 10% significance levels, respectively. Estimation includes dummies identifying the firm's age and year of birth. The degrees of freedom in all χ^2 tests are the number of reported coefficients.

the coefficients in the two equations, it might be useful to consider an equivalent way of estimating the coefficients in Table 6. This alternative is to run a regression using the whole sample and the complete set of variables in Table 6 plus a set of interactive terms between each one of these variables and the foreign dummy. The coefficients on each variable will be identical to those in column (10) while the coefficients on each interaction term will be the difference between the coefficients in columns (10) and (11). The hypothesis that each of the coefficients in column (10) is identical to its counterpart in column (11) can be tested simply by means of a *t*-test on the corresponding interaction term, while a joint test of equality of several coefficients can be performed with a likelihood ratio test. The results of this testing indicate that, jointly considered, the difference between the two sets of estimates is not statistically significant at conventional levels, as indicated by a computed $\chi^2(10)$ statistic of 6.2, and the same qualitative result applies

to each one of the coefficients without exception. These results thus suggest that foreign and domestic entrants are not different in the way they respond to variations in the independent variables.

Finally, to test the hypotheses regarding the evolution of firm mortality over time, we analyze the coefficients of the age dummies. These coefficients are not reported in the tables. Rather, we present them in Figure 2. This figure depicts the evolution of the probability of exit, conditional on the covariates considered. We are mostly interested in two aspects. First, we are interested in the evolution of these probabilities. Second, we are interested in comparing the levels of these probabilities between foreign and domestic entrants. A meaningful comparison between foreign and domestic entrants may be difficult due to the fact that firms in the two samples have different attributes. In order to achieve such a comparison, we estimate the time pattern of the exit probabilities of two firms (one foreign and

Table 6.   The determinants of domestic and foreign firm exit

	(10) Domestic	(11) Foreign
College graduates	−0.250	−0.874[b]
	(1.231)	(0.425)
Log of employment	−0.374[a]	−0.469[a]
	(0.087)	(0.073)
Growth	−0.225	−0.651[a]
	(0.212)	(0.163)
Log of plants	0.069	0.048
	(0.669)	(0.293)
Limited liability	−0.572[a]	−0.252
	(0.144)	(0.265)
Log of MES	0.203[a]	0.165[c]
	(0.072)	(0.092)
Entry	2.646[a]	2.959[a]
	(1.086)	(1.072)
Concentration	1.703	0.741
	(1.470)	(0.660)
Industry growth	−0.385	−0.270
	(0.270)	(0.302)
Foreign presence	−0.654	−0.373
	(1.303)	(0.518)
χ^2	81.44	101.78
Log-likelihood	−774.53	−573.99
Number of firms	593	610
Number of observations	1923	2497

Notes: Figures in parentheses are asymptotic standard errors. Superscripts a, b and c indicate that the coefficients are significant at the 1%, 5%, and 10% significance levels, respectively. Estimation includes dummies identifying the firm's age and year of birth. The degrees of freedom in all χ^2 tests are the number of reported coefficients.
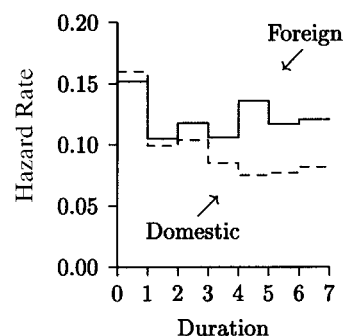

Figure 2.   Baseline hazard rates

Such estimates (plotted in Figure 2) show that the baseline hazard rates are lower for foreign than for domestic firms only during the first year of life. If a difference between the exit patterns exists, our results indicate that, except for the first year, a foreign firm will be *more* likely to exit than a comparable domestic firm. During the first year, the foreign firm will exit with lower probability—perhaps because it has a greater value of waiting, owing to greater entry costs—but this effect vanishes after the first year. From the second year on, the foreign firm will exit more easily. This may reflect the fact that multinationals are also often observed to exploit the opportunities for arbitrage between locating in different countries more easily than domestic firms. Indeed, foreign divestment may not indicate problems either in the parent firms or in the subsidiary, but rather changes in the strategic orientation of the parent company and the perception that the subsidiary no longer fits with the parent, as indicated, for example, by Tsetekos and Gombola (1992) and Ghertman (1988). This explanation, however, is highly speculative, as the differences between the baseline hazard rates displayed in Figure 2 are only minor. In particular, this plot compares with the right panel of Figure 1 at the beginning of the paper, which shows the empirical hazard rates, i.e., before controlling for the effect of the covariates.

While this figure reveals a very clear difference between the exit patterns of foreign and domestic firms, the conditional exit rates in Figure 2 are very similar. Using a procedure identical to that described above for testing equality of the coefficients in Table 6, we can test the similarity of the two hazard functions. This test is performed by means of a likelihood ratio test on the null hypothesis that the two sets of rates (foreign vs. domestic)

the other domestic) that would be identical in every observable attribute other than foreignness. To obtain these figures we use the results of our regression models to estimate the exit rates of two hypothetical firms, which would maintain the same characteristics (say, the sample's average at start-up) during their whole lifetime. These estimates are obtained directly from the estimates of the baseline hazard functions after taking into account the effects of the covariates given by the coefficients in Table 6. The estimated probabilities for domestic entrants are smaller than those that we typically observe among domestic entrants, because the average domestic entrant does not possess the characteristics of the average firm. For the same reasons, the estimated probabilities for foreign-owned entrants will be larger than those observed among these entrants. This procedure affects only the levels, not the relative evolution of these probabilities.

are identical. The computed $\chi^2(7)$ statistics for both the equality of empirical hazard functions (that is, the parameters of baseline hazard function without covariates) and the conditional hazard functions (that is, the parameters of the baseline hazard function with covariates) are 58.6 and 4.0, respectively. These values lead to the rejection of the null hypothesis in the first case but not in the second. Therefore, our evidence suggests that foreign and domestic entrants do not differ in their pattern of exit over time, after controlling for the observed characteristics.

CONCLUSION

Do foreign and domestic firms experience different chances of survival? If they do, can the differences in these survival rates be explained by their different observed attributes?

In this paper we provide answers to the two questions above. We analyze the survival patterns of two samples of domestic and foreign owned firms that started their operations in Portugal during the 1980s. Firms in the two samples differ widely in a number of respects. Foreign firms are larger, employ a larger proportion of college graduates, adopt more formal legal structures and operate a larger number of plants. The industries they choose to enter are more concentrated, have more significant economies of scale, experience less entry and have a greater share of employment in foreign firms than industries entered by domestic firms. At the same time, we observe much higher survival rates among foreign-owned firms than we do among domestic ones. However, after controlling for a relatively limited number of firm and industry characteristics, we did not find significant differences in the failure probabilities of the two types of firms. Being foreign does not decrease the chances of failure, does not imply different effects of the variables affecting survival, and does not translate into different time patterns of survival. Therefore, we do not have a strong basis for supporting the hypothesis that foreign ownership by itself implies significant changes in the chances of survival experienced by firms.

These results are important from different perspectives. The first is to recall a well-known (but sometimes forgotten) methodological point. The fact that foreign and domestic entrants display very different characteristics and exhibit disparate empirical patterns of survival does not necessarily imply that they follow different dynamics of survival. Conclusions about dynamics of entry and postentry competition should not be based on foreignness alone. Care is also required in deriving strong implications from our study. This is the first study to systematically compare the patterns of survival by foreign and domestic firms and confirmation of our findings for other samples is advised before generalizing. This is a general methodological point, as there are no *a priori* reasons to think that our results are specific to the particular circumstances experienced in Portugal during the period under scrutiny. The period includes recession and expansion years. During the period under analysis Portugal joined the European Union, which may be regarded as a clear expression of the country's integration in the world market. Our results thus indicate that the impact of the globalization of markets may be such that, for an economy well integrated in the world market, there is no difference in the way foreign and domestic firms respond to a given stimulus, at least as far as survival is concerned. However, researchers should also be well aware of the fact that foreign and domestic entrants are, indeed, very different. A careful investigation of the causes behind the observed differences of foreign and domestic entrants seems to be in order for a deepening of our understanding of the process of entry in international markets.

These results also have implications for the manager and the policy-maker. The implications of the results for the manager are that, if one is confronted with entry by a new firm, one should not assume that the new competitor will stay in the market longer just because it happens to be foreign. Depending on the circumstances, longer-lived entrants might signal fiercer competition or, on the contrary, indicate improved chances for cooperation. Our results, however, indicate that foreign firms exit as much as domestic firms do, provided that we are able to make the proper comparison. Foreignness may be a summary measure for a number of characteristics, but if one is able to observe these characteristics, namely the level of human capital in the firm, its projected size and growth strategy, one may be able to get a better estimate of the longevity of the competitor than by relying solely on whether the firm is foreign owned.

For the policy-maker concerned with FDI, our results mean that there is no reason to give

different treatment to domestic and foreign investment, based on different expectations about survival performance. Clearly, there are reasons for supporting foreign investment and our results do not imply that there is no point in encouraging it. To a large extent, these reasons lie in the fact that foreign and domestic firms are different and that foreign firms may bring to the country resources that would not otherwise be available. For example, the firm-specific advantages associated with foreign ownership normally translate into the use of more advanced technologies. One argument in favor of supporting FDI is that foreign investment may have spillover effects, thereby contributing to the dissemination of these new technologies. When subsidizing FDI, governments typically assume that these effects will last for a certain number of years, during which the economy will benefit from the investment. Our results show that it is not reasonable to expect that foreign firms will experience greater chances of survival than otherwise comparable domestic firms. One should keep in mind, however, that finding such comparable domestic firms may not be an easy task.

ACKNOWLEDGEMENTS

REFERENCES

Audretsch D. 1995. Innovation, growth and survival. *International Journal of Industrial Organization* **13**: 441–457.

Audretsch D, Mahmood T. 1994. The rate of hazard confronting new firms and plants in U.S. manufacturing. *Review of Industrial Organization* **9**: 41–56.

Autor D, Katz L, Krueger A. 1998. Computing inequality: have computers changed the labor market? *Quarterly Journal of Economics* **113**: 1169–1213.

Altonji J, Spletzer J. 1991. Worker characteristics, job characteristics, and the receipt of on-the-job-training. *Industrial and Labor Relations Review* **45**: 58–79.

Barkema H, Bell J, Pennings J. 1996. Foreign entry, cultural barriers, and learning. *Strategic Management Journal* **17**(2): 151–166.

Barney J. 1991. Firm resources and sustained competitive advantage. *Journal of Management* **17**: 34–56.

Bane W, Neubauer F-F. 1981. Diversification and the failure of new foreign activities. *Strategic Management Journal* **2**(3): 219–233.

Bogner W, Thomas H, McGee J. 1996. A longitudinal study of the competitive positions and entry paths of European firms in the U.S. pharmaceutical market. *Strategic Management Journal* **17**(2): 85–107.

Brito P, Mello A. 1995. Financial constraints and firm post-entry performance. *International Journal of Industrial Organization* **13**: 543–566.

Brüdel J, Preisendörfer P, Ziegler R. 1992. Survival chances of newly founded organizations. *American Sociological Review* **57**: 227–242.

Bunch D, Smiley R. 1992. Who deters entry? Evidence on the use of strategic entry deterrents. *Review of Economics and Statistics* **74**: 509–521.

Burgelman R. 1994. Fading memories: a process theory of strategic business exit in dynamic environments. *Administrative Science Quarterly* **39**: 24–56.

Cabral L. 1995. Sunk costs, firm size and firm growth. *Journal of Industrial Economics* **43**: 161–172.

Casson M. 1987. Multinational firms. In *The Economics of the Firm*, Clarke R, McGuiness T (eds). MIT Press: Cambridge, MA; 133–164.

Caves R. 1996. *Multinational Enterprise and Economic Analysis* (2nd edn). Cambridge University Press: Cambridge, U.K.

Caves R, Porter M. 1977. From entry barriers to mobility barriers: conjectural decisions and contrived deterrence to new competition. *Quarterly Journal of Economics* **41**: 241–261.

Chang S. 1996. An evolutionary perspective on diversification and corporate restructuring: entry, exit and economics performance during 1981–89. *Strategic Management Journal* **17**(8): 587–611.

Chen T-J, Wu G. 1996. Determinants of divestment of FDI in Taiwan. *Welwirtschaftliches Archiv* **136**: 172–184.

Coff R. 1997. Human assets and management dilemmas: coping with hazards on the road to resource-based theory. *Academy of Management Review* **22**: 374–402.

Cox D. 1972. Regression models and life tables (with discussion). *Journal of the Royal Statistical Society*, series B **34**: 187–220.

Dixit A, Pindyck R. 1994. *Investment under Uncertainty*. Princeton University Press: Princeton, NJ.

Dunne T, Roberts M, Samuelson L. 1988. Patterns of firm entry and exit in U.S. manufacturing industries. *Rand Journal of Economics* **19**: 495–515.

Dunne T, Roberts M, Samuelson L. 1989. The growth and failure of U.S. manufacturing plants. *Quarterly Journal of Economics* **104**: 671–698.

Dunning J. 1993. *Multinational Enterprises and the Global Economy*. Addison-Wesley: Reading, MA.

Eaton B, Lipsey R. 1980. Entry barriers are exit barriers: the durability of capital as a barrier to entry. *Bell Journal of Economics* **11**: 721–729.

Evans D. 1987. Tests of alternative theories of firm growth. *Journal of Political Economy* **95**: 657–674.

Evans D, Jovanovic B. 1989. An estimated model of entrepreneurial choice under liquidity constraints. *Journal of Political Economy* **97**: 808–827.

Fazzari S, Hubbard R, Petersen B. 1988. Financing constraints and corporate investment. *Brookings Papers on Economic Activity* **11**: 41–206.

Frank M. 1988. An intertemporal model of industrial exit. *Quarterly Journal of Economics* **103**: 333–344.

Gelman J, Salop S. 1983. Judo economics: capacity limitation and coupon competition. *Bell Journal of Economics* **14**: 315–325.

Geroski P. 1995. What do we know about entry? *International Journal of Industrial Organization* **13**: 421–440.

Geroski P, Machin S, Van Reenen J. 1993. The profitability of innovating firms. *Rand Journal of Economics* **24**: 198–211.

Ghertman M. 1988. Foreign subsidiary and parents' roles during strategic investment and divestment decisions. *Journal of International Business Studies*, Spring 47–67.

Gimeno J, Folta T, Cooper A, Woo C. 1997. Survival of the fittest? Entrepreneurial human capital and the persistence of underperforming firms. *Administrative Science Quarterly* **42**: 750–783.

Grant R. 1996. Toward a knowledge-based theory of the firm. *Strategic Management Journal*, Winter Special Issue **17**: 109–122.

Hall B. 1987. The relationship between firm size and firm growth in the United States manufacturing sector. *Journal of Industrial Economics* **35**: 583–606.

Hambrick D, D'Aveni R. 1988. Large corporate failures as downward spirals. *Administrative Science Quarterly* **33**: 1–23.

Hannan M. 1998. Rethinking age dependence in organizational mortality: logical formalizations. *American Journal of Sociology* **104**: 126–164.

Hannan M, Carroll G. 1992. *Dynamics of Organizational Populations*. Oxford University Press: Oxford.

Hannan M, Carroll G, Dobrev S, Han J. 1998. Age dependence in organizational mortality revisited, Part I: European and American automobile industries, 1885–1981. *European Sociological Review* **14**: 279–302.

Harhoff D, Stahl K, Woywode M. 1998. Legal form, growth and exit of West German firms. *Journal of Industrial Economics* **46**: 453–488.

Haverman H. 1995. The demographic metabolism of organizations: industry dynamics, turnover, and tenure distributions. *Administrative Science Quarterly* **40**: 586–618.

Henderson A. 1999. Firm strategy and age dependence in organizational mortality: a contingent view of the liability of newness, adolescence and obsolescence. *Administrative Science Quarterly* **44**: 281–314.

Hymer S. 1976. *The International Operations of National Firms*. MIT Press: Cambridge, MA.

Ingram P, Baum J. 1997. Chain affiliation and the failure of Manhattan hotels: 1898–1980. *Administrative Science Quarterly* **42**: 68–102.

Jovanovic B. 1982. Selection and evolution of industry. *Econometrica* **50**: 649–670.

Klette T. 1996. R&D, scope economies and plant performance. *Rand Journal of Economics* **27**: 502–522.

Kogut B, Kulatilaka N. 1994. Operating flexibility, global manufacturing, and the option value of a multinational network. *Management Science* **40**: 123–139.

Lall S. 1980. Monopolistic advantages and foreign involvement by U.S. manufacturing industry. *Oxford Economic Papers* **42**: 203–206.

Lancaster T. 1990. *The Econometric Analysis of Transition Data* Cambridge University Press: Cambridge, U.K.

Levinthal D. 1997. Adaptation on rugged landscapes. *Management Science* **43**: 934–950.

Li J. 1995. Foreign entry and survival: effects of strategic choices on performance in international markets. *Strategic Management Journal* **16**(5): 333–351.

Li J, Guisinger S. 1991. Comparative business failures of foreign-controlled firms in the United States. *Journal of International Business Studies*, 2nd Quarter: 209–224.

Lyons B. 1980. A new measure of minimum efficient plant size in U.K. manufacturing industry. *Economica* **17**: 19–34.

Makimo S, Beamish P. 1998. Performance and survival of joint-ventures with nonconventional ownership structures. *Journal of International Business Studies*, 4th quarter: 797–818.

Mascarenhas B. 1992. Order of entry and performance in international markets. *Strategic Management Journal* **13**(7): 499–510.

Mata J, Portugal P. 1994. Life duration of new firms. *Journal of Industrial Economics* **42**: 227–246.

Mata J, Portugal P. 2000. Closure and divestiture by foreign entrants: the impact of entry and post-entry strategies. *Strategic Management Journal* **21**: 549–562.

Mata J, Portugal P, Guimarães P. 1995. The survival of new plants: entry conditions and post-entry evolution. *International Journal of Industrial Organization* **13**: 459–482.

McCloughan P, Stone I. 1998. Life duration of foreign multinational subsidiaries: evidence from U.K. northern manufacturing industry 1970–93. *International Journal of Industrial Organization* **16**: 719–747.

Mincer J. 1974. *Schooling, Experience and Earnings*. National Bureau of Economic Research: New York.

Mitchell W. 1991. Dual clocks: entry order influences on incumbent and newcomer market share and survival when specialized assets retain their value. *Strategic Management Journal* **12**(2): 85–100.

Mitchell W. 1994. The dynamics of evolving markets: the effects of business sales and age on dissolutions and divestitures. *Administrative Science Quarterly* **39**: 575–602.

Mitchell W, Shaver J, Yeung B. 1994. Foreign entrant survival and foreign market share: Canadian companies' experience in United States medical sector markets. *Strategic Management Journal* **15**(7): 555–567.

Nelson R, Winter S. 1982. *An Evolutionary Theory of Economic Change*. Harvard University Press: Cambridge, MA.

Pan Y, Chi P. 1999. Financial performance and survival of multinational corporations in China. *Strategic Management Journal* **20**(4): 359–374.

Penrose E. 1959. *The Theory of the Growth of the Firm*. Wiley: New York.

Phan P, Lee S. 1995. Human capital or social networks: what constrains CEO dismissals? Academy of Management Best Papers Proceedings: 37–41.

Polanyi M. 1966. *The Tacit Dimension*. Peter Smith: Gloucester, MA.

Pugel T. 1978. *International Market Linkages and U.S. Manufacturing*. Ballinger: Cambridge, MA.

Ranger-Moore J. 1997. Bigger may be better, but is older wiser? Organizational age and size in the New York life insurance industry. *American Sociological Review* **62**: 903–920.

Romanelli E. 1989. Environments and strategies at start-up: effects on early survival. *Administrative Science Quarterly* **34**: 369–387.

Scherer F, Ross D. 1990. *Industrial Market Structure and Economic Performance* (3rd edn). Houghton Mifflin: Boston, MA.

Schmalensee R. 1989. Inter-industry studies of structure and performance. In *Handbook of Industrial Organization*, Schmalensee R, Willig R (eds). North-Holland: Amsterdam; 951–1010.

Shapiro D. 1983. Entry, exit and the theory of multinational corporation. In *The Multinational Corporation in the 1980s*, Kindleberger C, Audretsch D (eds). MIT Press: Cambridge, MA; 103–122.

Sharma A, Kesner I. 1996. Diversifying entry: some ex ante explanations for post-entry survival and growth. *Academy of Management Journal* **39**: 635–677.

Shaver J. 1995. The influence of industry growth and foreign entry rate on foreign direct investment survival. Academy of Management Best Papers Proceedings: 201–205.

Shaver J. 1998. Accounting for endogeneity when assessing strategy performance: does entry mode choice affect survival? *Management Science* **44**: 571–585.

Shaver J, Mitchell W, Yeung B. 1997. The effect of own-firm and other-firm experience on foreign direct investment survival in the United States, 1987–92. *Strategic Management Journal* **18**(10): 811–824.

Siegfried J, Evans L. 1994. Empirical studies of entry and exit: a survey of the evidence. *Review of Industrial Organization* **9**: 121–156.

Silverman B, Nickerson J, Freeman J. 1997. Profitability, transactional alignment and organizational mortality in the U.S. trucking industry. *Strategic Management Journal*, Summer Special Issue **18**: 31–52.

Snell S, Dean Jr J. 1992. Integrated manufacturing human resource manufacturing management: a human capital perspective. *Academy of Management Journal* **35**: 467–504.

Stinchcombe A. 1965. Social structures and organizations. In *Handbook of Organizations*, March J (ed.). Rand McNally: Chicago, IL; 142–193.

Teece D. 1998. Capturing value from knowledge assets: the new economy, markets for know-how and intangible assets. *California Management Review* **40**: 55–79.

Teece D, Pisano G, Shuen A. 1997. Dynamic capabilities and strategic management. *Strategic Management Journal* **18**(7): 509–533.

Tsetekos G, Gombola M. 1992. Foreign and domestic divestments: evidence on valuation effects of plant closings. *Journal of International Business Studies*, 2nd Quarter: 203–223.

Wernerfelt B. 1984. A resource-based view of the firm. *Strategic Management Journal* **5**(2): 171–180.

Yamawaki H. 1997. Exit of Japanese multinationals in U.S. and European manufacturing industries. In *Multinational Firms and International Relocation*, Buckley P, Mucchielli J-L (eds). Cheltenham: Edward Elgar; 220–237.

Youndt M, Snell S, Dean J, Lepak D. 1996. Human resource management, manufacturing strategy and firm performance. *Academy of Management Journal* **39**: 836–866.

Zaheer S. 1995. Overcoming the liability of foreignness. *Academy of Management Journal* **38**: 341–363.

Zaheer S, Mosakowski E. 1997. The dynamics of the liability of foreignness: a global study of survival in financial services. *Strategic Management Journal* **16**(6): 439–464.

APPENDIX: LIKELIHOOD FUNCTION

The formulation of our model starts by dividing time into K intervals, K depending on the number of survey points that we observe. In our case, the relevant intervals are equally spaced, except the last, which is open-ended.

The observed durations are realizations of a discrete random variable $T \in \{1, \ldots, K\}$, $T = t$ denoting failure within the tth interval.

The discrete hazard function, which plays a key role in the statistical analysis of discrete duration data, is expressed as

$$h(t) = P(T = t \mid T \geq t), \quad t = 1, \ldots, K$$

which is simply the conditional probability that an exit occurs in the tth interval (year), given that such interval was reached.

The corresponding probability of reaching such an interval is given by the survivor function

$$S(t) = \prod_{j=1}^{t-1}[1 - h(j)]$$

We employ a very flexible specification for the hazard function, in which the exit rates are assumed

to be constant within each interval but change between intervals. This can be interpreted as a piecewise linear approximation to a possibly complex parametric hazard function. In the jargon of the statistical duration literature, that is equivalent to saying that we assume a piecewise-constant hazard model. Thus, the hazard function in interval t is defined as

$$h(t) = e^{\lambda_t}, \quad t = 1, \dots, K$$

where the sequence of e^{λ_t} gives the yearly evolution of the exit rates. Hence, e^{λ_1} gives the probability of firm closure within the first year of activity, e^{λ_2} denotes the probability of closure during the second year, given that the firm did not exit during the first year, etc. Discrete survival rates can be obtained from the hazard rates according to the definition provided above.

In order to account for the effects of the covariates, we extend the previous hazard function to specify

$$h(t \mid X_{t-1}) = e^{\lambda_t} e^{(\beta X_{t-1})}, \quad t = 1, \dots, K$$

where β denotes the vector of regression coefficients measuring the impact of a set of explanatory variables included in vector X. The subscript $t-1$ indicates that values of these variables are updated yearly via the inclusion of their (1 year) lagged values. In this way we take into account the influence of time-varying explanatory variables on the prospects of survival, by modeling the probability of an event (firm closure) at time t as a function of firm and sectoral conditions observed at $t-1$.

It is clear from the equation that the ratio between the hazard rates for two firms that differ only with respect to a covariate is constant. This implies that the effect of a regressor is to change the hazard rate proportionally (Cox, 1972), which can easily be seen in the following reparameterization:

$$\log h(t \mid X_{t-1}) = \lambda_t + \beta X_{t-1}, \quad t = 1, \dots, K$$

The model is estimated by maximum likelihood methods. Note that in order to define the likelihood function we have to distinguish between censored and uncensored observations. Whereas in the case of a censored observation the contribution for the likelihood function is given by $S(t)$, i.e., the probability of survival at t, in the case of an uncensored observation such a contribution is given by $S(t) - S(t-1)$, i.e., the probability of exiting during the tth interval. We thus define the following log-likelihood function for a firm i:

$$LL = \delta_i \sum_{t=1}^{K-1} \delta_{t,i} \log[1 - e^{-\exp(\lambda_t + \beta X_{t-1,i})}]$$
$$- \sum_{t=2}^{K} \delta_{t,i} \sum_{j=1}^{t-1} \exp(\lambda_t + \beta X_{t-1,i})$$

where δ_i identifies an uncensored observation, and $\delta_{t,i}$ is an indicator that the duration falls in the t interval.