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Accounting for Endogeneity When Assessing Strategy Performance: Does Entry Mode Choice Affect FDI Survival?

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Firms choose strategies based on their attributes and industry conditions; therefore, strategy choice is endogenous and self-selected. Empirical models that do not account for this and regress performance measures on strategy choice variables are potentially misspecified and their conclusions incorrect. I highlight how self-selection on hard-to-measure or unobservable characteristics can bias strategy performance estimates and recommend an econometric technique that has been developed to account for this effect. Although this concern applies to a wide range of strategy questions, to demonstrate its effect I empirically examine if entry mode choice (acquisition versus greenfield) influences foreign direct investment survival. In specifications that do not account for self-selection, I find that greenfield entries have survival advantages compared to acquisitions. This confirms previous findings. However, the significance of this effect disappears once I account for self-selection of entry mode in the empirical estimates. The results confirm that estimates from models that do not account for self-selection of strategy choice can lead to incorrect or misleading conclusions.

(Endogenous Strategy Choice; Foreign Direct Investment; Survival; Entry Mode)

1. Introduction

One of the aims of research in business strategy is to identify firm strategies that lead to superior performance. As strategy researchers, our most common empirical approach has been to regress a measure of performance on the strategy choice of a sample of firms. The coefficient estimate of the strategy choice variable has then been used to identify superior strategies. Managerial implications drawn from these studies are that firms can increase their performance if they follow strategies suggested by significant positive coefficient estimates. A potential problem with applying this methodology and making this interpretation is that firms choose strategies based on their attributes and industry conditions; therefore, strategy choice is endogenous and self-selected. If firms choose the strategy that is optimal given their attributes and those of their industry, then empirical models that do not account for this choice pro-

cess are potentially misspecified and the normative conclusions drawn from them may be incorrect (Masten 1993).

In this paper I describe how and when firm strategy self-selection complicates the empirical estimation of strategy performance. I then recommend an econometric technique, which has been used largely in labor economics (Heckman 1979), that facilitates estimation of strategy performance when firms choose their strategies. In addition to addressing the econometric concerns that arise when strategy choice is endogenous and self-selected, an advantage of the recommended approach is that it incorporates firm choice and managerial strategic decision making into estimates of strategy performance. To a certain extent, this corrects an apparent contradiction in empirical strategy research. On one hand, we estimate strategy performance as if it occurs in an setting where firms randomly choose strategies.

On the other hand, we often highlight effective strategy choice and decision making by firms.

To demonstrate the importance of this effect, I show that accounting for strategy self-selection changes the interpretation of how entry mode choice affects foreign direct investment survival, distinguishing between greenfield entry and entry via acquisition. Although strategy self-selection occurs in many settings, this is a particularly good setting to examine how self-selection affects performance estimates for the following reasons. Entry mode is an important strategic choice that firms make when conducting foreign direct investments. Therefore, insights into how this choice affects foreign investment performance is important to researchers and practitioners alike. Moreover, a stream of research in international business has shown that entry mode choice affects foreign direct investment performance (Li and Guisinger 1991, Woodcock et al. 1994, Li 1995). At the same time, another stream of research has shown that firms systematically choose their entry mode when making foreign direct investments (Caves and Mehra 1986, Kogut and Singh 1988, Zejan 1990, Hennart and Park 1993).

Models that estimate foreign direct investment survival without accounting for self-selection indicate that greenfield entries are significantly more likely to survive compared to acquisitions. This is consistent with the aforementioned studies of foreign direct investment performance. However, once I account for firm self-selection of entry mode in the estimation, the statistical significance of entry mode choice on survival disappears. I also present evidence that firms that chose to enter by acquisition perform better than if they had entered by new plant and firms that chose to enter by new plant perform better than if they had entered by acquisition. This supports the expectation that performance advantages from entry mode choice are not universal but depend on firm attributes and industry conditions. All told, the empirical findings confirm that incorrect or misleading conclusions might be drawn when strategy performance estimates do not account for the endogeneity of strategy choice. Moreover, the results improve our understanding of how entry mode choice affects foreign direct investment performance.

The next section outlines how firm strategy self-selection affects strategy performance estimates and

presents a method to control for self-selection introduced by Heckman (1979). The following sections describe the data and exhibit results from models that do and do not account for self-selection when assessing strategy performance. The final section concludes.

2. Self-Selection and Strategy Performance

In strategic management research, we often wish to draw conclusions about the superiority of one strategy compared to alternatives so that we can aid managers with their business decisions. A difficulty in making such assessments is that firms purposely choose their strategies based on their capabilities and industry conditions. Because firms self-select the strategies we observe, we are not able to make the comparison of strategy performance in an experimental setting where firms are randomly assigned strategies. Under these conditions, empirical estimates of strategy performance will often be misleading (Masten 1993).

In general, we expect firms to choose strategies that result in the greatest expected return. Therefore, if we observe some firms choosing one strategy and other firms choosing different strategies, it would not appear that one strategy unconditionally leads to superior performance. For example, when assessing the performance effects of corporate diversification, we observe many firms that choose to diversify, while others do not. Therefore, it would appear that some firms believe that diversification is desirable while other firms do not. Likewise, with respect to foreign direct investment, because we observe some entrants choosing acquisitions and other entrants choosing new plants, then, by their actions, firms reveal that acquisitions have expected performance advantages under certain conditions and greenfield investments have expected performance advantages under other conditions.

When firms choose strategies, regressing performance on a strategy choice dummy variable will not accurately capture how strategy choice affects performance unless one of two conditions holds: (i) Firms regularly make errors when choosing strategies such that the process is random or (ii) all factors that influence performance can be identified and incorporated in the empirical model that estimates performance (i.e., there

are no unobservable effects on performance). The following analysis formalizes this argument.¹

Continuing with the example of foreign direct investment entry mode choice, once a firm decides to operate in a foreign country, it must then choose an entry mode.² Firms will choose acquisitions when the expected value of entering by acquisition exceeds the expected value of entering by new plant. I define the variable Acquisition_i^* as the difference in the expected value of entering by acquisition and the expected value of entering by new plant for investment i . This value, and therefore chosen entry mode, is a function of measurable firm attributes and industry conditions that form the vector \mathbf{w}_i (this can include a constant term) and a disturbance term u_i . I cannot observe Acquisition_i^* but I can observe the chosen entry mode ($\text{Acquisition}_i = 1$ if entry is by acquisition, $\text{Acquisition}_i = 0$ if entry is by new plant) and thus infer whether or not Acquisition_i^* is positive or negative. This is the standard formulation of a dichotomous choice model, which can be represented by the following equation:

$$\text{Acquisition}_i^* = \gamma' \mathbf{w}_i + u_i,$$

$$\text{Acquisition}_i = 1 \text{ if } \text{Acquisition}_i^* > 0, \\ 0 \text{ otherwise.} \quad (1)$$

I assume that u_i is normally distributed with zero mean and unit variance; therefore, this is a probit specification. Moreover, u_i will be attributable, in part, to unobservable characteristics that affect entry mode choice. That is, the error term will capture effects that ideally would be contained in \mathbf{w}_i but cannot be identified or measured.

With respect to foreign direct investment entry mode choice, Hennart and Park (1993) argue that firms prefer greenfield entries when they possess strong sources of competitive advantage and acquisitions when they pos-

sess weak sources of competitive advantage. The reason is that firms encounter difficulties when they try to combine their firm-specific competitive advantages with different human capital, operating systems, and assets in the acquired operations. Some sources of competitive advantage can be measured and included in \mathbf{w}_i ; however, many sources of competitive advantage that firms draw upon when undertaking foreign direct investment are intangible in nature (e.g., Caves 1982, Markusen 1995) and thus difficult to measure. These include exceptional management, superior human capital, specialized operating procedures, technological prowess, innovativeness, and marketing skills.

Turning to the estimation of entry mode performance, consider the following specification:

$$P_i = \beta' \mathbf{x}_i + \delta \text{Acquisition}_i + \epsilon_i. \quad (2)$$

P_i is the performance of entry i , \mathbf{x}_i is a vector of explanatory variables that affect performance (this can include variables in \mathbf{w}_i from Equation (1) and an intercept constant), Acquisition_i is the binary variable that indicates whether entry is by acquisition or not, and ϵ_i is an error term that is normally distributed with zero mean and variance σ_ϵ .

The error term in Equation (2), ϵ_i , will be attributable, in part, to unobservable characteristics that influence performance and are not included in \mathbf{x}_i . If unobservable effects captured in ϵ_i are the same as in u_i , then ϵ_i and u_i will be correlated. For example, with respect to foreign direct investment performance, regardless of what entry mode is chosen, one would expect a firm with better managers, greater innovativeness, and superior marketing skills to outperform firms lacking these capabilities. Therefore, ϵ_i and u_i will be correlated unless these factors can be measured and included in \mathbf{x}_i . To facilitate estimation, assume that ϵ_i and u_i are distributed bivariate normal with correlation ρ .³

If a researcher were to estimate Equation (2) without accounting for the self-selection of entry mode choice

¹ The following discussion draws on Greene (1993), Masten (1993), Maddala (1983), and Heckman (1979).

² I take as the starting point that a firm has decided to undertake foreign direct investment and then it chooses an entry mode. For this reason, the arguments and results must be interpreted as conditional on a firm deciding to undertake foreign direct investment. This is the perspective taken by the previously cited studies that examine foreign direct investment entry mode choice and entry mode performance.

³ Unobservable industry characteristics might also affect entry mode choice and performance. However, with respect to entry mode choice, theory does not offer guidance to what these characteristics might be. Nevertheless, the approach described later in this section accounts for unobservable industry characteristics in addition to unobservable firm characteristics, though it cannot distinguish the source of the unobservable effects.

and interpret δ as the performance effect of choosing acquisition strategies on performance (i.e., standard practice in the empirical strategy literature), the results would likely be misleading. The reason is that the estimate of δ will not have desirable statistical properties due to the correlation between u_i and ϵ_i . This can be shown formally by examining the expected value of P_i from Equation (2). Because I only observe the performance of entry modes that firms have chosen and because firms choose their entry mode, the expected value of P_i is *conditional* on the entry mode choice. Therefore, although Equation (2) is estimated for the entire sample, I must assess the estimates' properties for acquisitions and greenfield entries separately. For instance, the expected value of P_i given that entry is by acquisition is:

$$\begin{aligned} E[P_i | \text{Acquisition}_i = 1] \\ &= \beta'x_i + \delta + E[\epsilon_i | \text{Acquisition}_i = 1] \\ &= \beta'x_i + \delta + E[\epsilon_i | u_i > -\gamma'w_i] \\ &= \beta'x_i + \delta + \rho\sigma_\epsilon[\phi(\gamma'w_i)/\Phi(\gamma'w_i)] \end{aligned} \quad (3)$$

where, ϕ and Φ are, respectively, the probability density function and cumulative distribution function of the standard normal distribution.

The last term appears in the equation because of the self-selection process that was previously discussed—unobservable firm capabilities will lead to entry by new plant and superior performance, thus the expected correlation between u_i and ϵ_i . Therefore, the expected value of ϵ_i conditional on entry mode choice is non-zero.⁴ Likewise, the expected value of P_i , given that entry is in the form of a new plant, is:

$$\begin{aligned} E[P_i | \text{Acquisition}_i = 0] \\ &= \beta'x_i + E[\epsilon_i | \text{Acquisition}_i = 0] \\ &= \beta'x_i + E[\epsilon_i | u_i \leq -\gamma'w_i] \\ &= \beta'x_i + \rho\sigma_\epsilon[-\phi(\gamma'w_i)/\{1 - \Phi(\gamma'w_i)\}]. \end{aligned} \quad (4)$$

⁴ The functional form of the last term in Equation (3) is derived from the assumption that ϵ_i and u_i are distributed bivariate normal with correlation ρ . The value of u_i is truncated due to the selection process (i.e., $u_i > -\gamma'w_i$); therefore, the expected value of ϵ_i is derived from the moments of the truncated bivariate normal distribution (a further discussion can be found in Greene 1993, p. 707).

The difference in expected performance between acquisition and new plant is the difference between Equations (3) and (4).

$$\begin{aligned} E[P_i | \text{Acquisition}_i = 1] - E[P_i | \text{Acquisition}_i = 0] \\ = \delta + \rho\sigma_\epsilon[\phi(\gamma'w_i)/\{\Phi(\gamma'w_i)(1 - \Phi(\gamma'w_i))\}]. \end{aligned} \quad (5)$$

Equation (5) represents the estimated value of δ when Equation (2) is estimated without accounting for self-selection of entry mode. It is clear that the estimated value of δ will not reflect the true influence of acquisition entry on performance unless ρ , and thus the last term, equals zero. Because the term in the square brackets and σ_ϵ are positive, the estimate of δ will be biased in the direction of ρ . Furthermore, the standard errors of the estimates will be biased downward, thus increasing the likelihood that coefficient estimates appear significant (Heckman 1979).

In general, when estimating strategy performance, ρ will be zero only if one of two conditions hold. First, firms randomly choose their strategy with respect to any influence on performance that is not included in the set of explanatory variables in the performance equation. Second, I identify and measure all determinants of performance; therefore, ϵ_i will be a random effect and uncorrelated to u_i .

For example, when assessing the effect of entry mode choice on foreign direct investment performance, performance model estimates and conclusions will be valid only if: (i) firms' choice of entry mode is random with respect to any hard-to-measure or unobservable effect that influences performance (e.g., possession of exceptional management, superior human capital, specialized operating procedures, technological prowess, marketing skills, and innovativeness); or (ii) I identify, measure, and include in the performance estimation all determinants of foreign direct investment performance (i.e., any source of firm competitive advantage such as exceptional management, superior human capital, specialized operating procedures, technological prowess, innovativeness, and marketing skills).

If these conditions do not hold, which is the case in many empirical settings, it is possible to estimate the true effect of δ by controlling for the last term in Equations (3) and (4). This is exactly what estimation methods that account for self-selection do. Estimation methods to account

for self-selection are common in econometrics and are discussed at length in several sources (e.g., Heckman 1979, Maddala 1983, Greene 1993). In general, the approach involves the following steps. First, estimate the selection probit model (Equation (1)) to obtain estimates of γ . Using the estimates of γ , it is possible to compute a predicted value for the square-bracketed portion of the last term in Equation (3) if $\text{Acquisition}_i = 1$ or in Equation (4) if $\text{Acquisition}_i = 0$ (call these values λ). Least squares can then be applied to the performance equation to estimate β , δ , and $\beta_\lambda = \rho\sigma_\epsilon$. The resulting error term in this estimation (call it η) has zero mean, but it is not normally distributed and it is heteroskedastic. Therefore, the estimates of β , δ , and β_λ will be consistent but not efficient. The final step in the estimation procedure involves accounting for the heteroskedastic error term and estimating asymptotically efficient standard errors.

Finally, should a researcher wish to examine performance variation within a strategy choice by regressing performance on a set of independent variables, the confounding effect of strategy self-selection is still a concern. For example, consider estimating the following equation for the set of acquisition entries only: $P_i = \beta'x_i + \epsilon_i$. Equation (6) presents the expected value of P_i , given that firms have chosen to enter by acquisition.

$$\begin{aligned} E[P_i | \text{Acquisition}_i = 1] \\ &= \beta'x_i + E[\epsilon_i | \text{Acquisition}_i = 1] \\ &= \beta'x_i + E[\epsilon_i | u_i > -\gamma'w_i] \\ &= \beta'x_i + \rho\sigma_\epsilon[\phi(\gamma'w_i) / \Phi(\gamma'w_i)]. \end{aligned} \quad (6)$$

Once again, the final term in Equations (6) highlights that the estimates will not have desirable statistical properties and conclusions will be misleading unless $\rho = 0$ or the last term in the equation is controlled for in the estimation.

To judge the impact of self-selection on empirical estimates of strategy performance, I empirically examine the influence of entry mode choice on foreign direct investment survival in the following sections.

3. Data

Data Sources

The sample consists of foreign direct investment activities into the United States in 1987. The primary data

source is the Department of Commerce, International Trade Administration publication *Foreign Direct Investment in the United States, 1987 Transactions* (subsequently referred to as the *Transactions List*). This source provides a list of all publicly known instances of foreign direct investment in the United States in 1987 and is compiled from "generally available public sources, transaction participants, and miscellaneous contacts" (U.S. Department of Commerce 1988, p. 1). An advantage of this sample is its comprehensive coverage of foreign direct investment into the United States from all nations. Moreover, restricting the dataset to one year holds constant many factors such as business cycle effects and inflation. Excluding real-estate transactions, the publication identified 1,219 foreign entries by over 800 firms.

The *Transactions List* provides data on several forms of foreign direct investment. I am interested in assessing whether or not acquisition or greenfield entry affects foreign direct investment performance; therefore, I limit the inquiry to these forms of investment. I exclude joint ventures because of the difficulty in comparing performance between this mode and acquisitions or greenfield entries. For example, firms might engage in joint ventures to absorb capabilities from their partners and then purposely dissolve (e.g., Hamel et al. 1989). Under such motivations, common performance measures are not easily comparable between joint ventures and other entry modes. I also exclude plant expansions and equity increases. The former are capacity additions to existing facilities and therefore incremental investments of firms' successful operations at one location. The latter involve foreign investments that have already been made but where the foreign stake has increased. Finally, I omit foreign entries under the "other" classification because these consist of investments under diverse or unknown conditions. I am left with 710 entries by 544 firms.

I further restrict the sample of new plants and acquisitions to include only entries in the manufacturing sector (SIC 2000-3999) because *The 1987 Census of Manufacturers* and *Annual Survey of Manufacturers (ASM)*, two sources of data that I employ, cover only these SICs and because of the desirability for holding constant conditions that can vary across industrial sectors. Additional entries were excluded for reasons that include the inability to independently verify the entry, missing data regarding concentration ratios in the *1987 Census of Manufacturers*,

joint venture entries by two or more foreign firms, entries that were listed twice, and entries where the investment was made for stated investment purposes (i.e., the foreign firm did not seek control). This reduces the sample to 354 entries by 311 firms. Finally, I restrict the sample to firms whose parent revenue data were available because parent firm size has been shown to be an important determinant of entry mode choice. The resulting sample is 213 entries by 177 firms.⁵

Variable Definitions

Entry Mode Model. Acquisition is the dependent variable in the entry mode model. Acquisition takes the value of one when entry is in the form of acquisition and zero when entry is in the form of new plant. The set of independent variables are factors that have been previously shown to affect the decision to enter by acquisition versus new plant. These variables include industry growth prior to entry, number of subsidiaries that the firm controls in the U.S., and whether or not these are in related industries, industry concentration, parent revenues, and parent R&D intensity.

The first independent variable is industry growth prior to entry. Hennart and Park (1993) show that acquisitions are favored in industries that are growing. They argue that acquisitions are desired in such industries because firms can quickly enter growing markets. However, Zejan (1990) shows that industry growth has a negative effect on entry by acquisition. He argues that conditions are more favorable for foreign entrants to add to industry capacity in growing industries because demand growth fosters investment in new capacity. I measure industry growth as the change in industry shipments between 1982 and 1986 divided by the level of industry shipments in 1982.⁶ The data source is the *Annual Survey of Manufacturers (ASM)*.

I also measure the number of subsidiaries that a firm controls in the United States in 1986. This is an indica-

tion of firm size in the United States at the time of entry as well as an indication of firm experience in the United States. Caves and Mehra (1986) find that firms with greater foreign experience are more likely to choose acquisitions. They argue that this result, which was opposite to their expectation, might indicate that firms with greater foreign experience have routinized the process of expanding abroad through acquisition. A parallel argument is that firms with a larger number of subsidiaries in the United States have more experience managing and valuing American operations. As a result, these firms will often capture greater benefits from acquiring operations compared with firms without such a presence. Therefore, I expect firms with greater numbers of subsidiaries to be more likely choose acquisition entries. The source of this variable is *Who Owns Whom*, 1987. These data identify all of a firm's affiliates and are not restricted to manufacturing activities.

Industry concentration has been shown to increase the likelihood of greenfield entry, as shown in the results of Hennart and Park (1993). They argue that foreign entrants can reduce potential competition by acquiring firms in concentrated industries. Therefore, I include the target industry's four firm concentration ratio in the specification. The 1987 *Census of Manufacturers* is the source of the concentration data at the four-digit SIC level.

Hennart and Park (1993) also show that firms making diversifying entries favor acquisitions. I identify a similar effect—whether or not the firm already has operations in a related American industry. Extending Hennart and Park's argument, firms that are entering American industries in which they do not have a presence will be more likely to enter by acquisition because they can benefit from acquiring the experiences of an existing operation. The sources of these data are the 1985 *Directory of Foreign Manufacturers in the United States* and the *Transactions Lists* (1985 and 1986). From here, I identify if a firm had operations in the same two-digit SIC as their 1987 investment. I assign a dummy variable the value of one if a firm has operations in the same American two-digit SIC, and zero otherwise.⁷

⁵ Restricting the analysis to one entry by each firm provides identical, though marginally less significant, coefficient estimates (several subsamples were created where only one entry by a firm with multiple entries was randomly chosen). Most importantly, the estimates of δ react identically in the entire sample and the restricted subsamples once controlling for self-selection of entry mode.

⁶ The industry definition used throughout the paper is four-digit SIC.

⁷ Caves and Mehra (1986) and Zejan (1990) show that diversified entrants favor acquisitions. However, Kogut and Singh (1988) and Hen-

Finally, Kogut and Singh (1988) show that a firm's size outside of the target country increases the likelihood that it enters by new plant. Conversely, Caves and Mehra (1986) find that larger firms are more likely to enter by acquisition. They argue that larger firms have lower financial constraints that allow them to finance foreign acquisitions. Although this firm attribute exhibits contradictory findings in previous research, I include it in the specification. I define this variable as the natural logarithm of the parent firm's 1986 revenues in millions of U.S. dollars.⁸ Finally, Hennart and Park (1993) indicate that research and development intensity increases a firm's likelihood to enter by new plant. Firms with technological capabilities (as proxied by R&D intensity) are better able to exploit these capabilities, which are often firm specific, through greenfield investments. I measure R&D intensity as the proportion of R&D expenditures to parent firm revenue in 1986. I turn to two databases, *Compustat Global Vantage* and *Worldscope*, to gather the revenue and R&D data. The former contains data on over 7,200 firms in 30 countries and the latter provides data on 10,000 firms in 40 countries. R&D expenditures are not available for all parents that disclose revenue data; therefore, specifications that include this variable have a reduced sample size.

Performance Model. The performance measure I employ is survival. This variable takes the value of one if the investment continues to be controlled by the investing firm five years after entry (1992), or zero if the firm does not control the operation five years after entry. The survival measure is consistent with the foreign entry data because it is measured either with respect to the new plant or the acquired operations. The survival data were collected from an extensive archival search that included electronic databases, Dun and Bradstreet's *Dun's Market Identifiers*, *The Directory of Foreign Firms Operating in the United States: 7th edition* (1992), *The Directory of International Affiliates* (Fall 1992), *Who Owns*

Whom (1993), and *The Directory of Foreign Manufacturers in the United States: 5th edition* (1993).

A concern about using survival as a measure of performance is that failure, as measured, might not always indicate poor performance. Firms might develop viable, attractive operations that are bid away by an acquirer. In this situation, firms are compensated for their efforts and the interpretation of failure differs greatly from the situation where a firm is forced to liquidate its assets. To ensure that failure was an indication of poor performance, I checked the conditions of the sale as reported in the business press if a firm exited by divestiture. There were no instances where it was reported that profitable operations were bid away from the existing owner. In fact, in most cases it appeared that the foreign firm's American operation was performing poorly. Therefore, for these foreign entries, the sale of assets is consistent with poor performance.

Turning to the explanatory variables, the variable of most interest for this study is the dummy variable that indicates the chosen entry mode. As defined previously, the acquisition dummy variable takes the value of one if entry is the form of acquisition and zero if entry is in the form of a new plant. Previous studies (Li and Guisinger 1991, Woodcock et al. 1994, Li 1995) find that acquisitions are less likely to survive compared to new plants. These studies argue that acquisitions are more difficult to integrate into the parent firm's organization than new plants. Therefore, acquisitions exhibit poorer performance.

However, if firms are self-selecting to the most favorable entry mode based, in part, on unobservable competitive advantages, then self-selection likely biases these estimates. In fact, I do not expect entry mode choice per se to affect foreign direct investment survival because rational firms will choose acquisitions when they are expected to outperform new plants and new plants when they are expected to outperform acquisitions. Namely, I expect $\delta = 0$.

Moreover, previous findings from studies of entry mode performance are consistent with $\delta = 0$ and the existence of the bias attributable to self-selection described in §2. If unobservable sources of competitive advantage increase the likelihood of greenfield entry and increase performance, then the correlation between the error terms in the choice and performance models will

nart and Park (1993) do not find this effect significant. I find no effect of a variable that identifies whether or not the entry is in the foreign parent's main line of business (two-digit level). This result combined with the indeterminate results from the previous studies lead me to omit the variable from presentation.

⁸ Employing the revenue value instead of its logarithm provides similar results.

be negative. Firms with unobservable capabilities will be less likely to choose acquisitions than predicted by observable characteristics (from Equation (1)); therefore, u_i will tend to be negative for these firms. Similarly, these firms will also tend to have better performance than could be predicted by observed characteristics; therefore, ϵ_i will tend to be positive for these firms. A negative correlation will bias the estimate of δ downward and increase the likelihood of a negative significant estimate. Interestingly, this is the reported effect in the previously cited studies.

I also include the following seven explanatory variables to control for observable factors that might affect foreign direct investment survival. First, I control for industry growth after investment in 1987 by measuring the proportionate change in industry shipments between 1987 and 1991. The source of these data are various years of the *ASM*. Firms that enter industries with large realized growth might have survival advantages because, in growing industries, increasing or maintaining sales does not have to be at the expense of incumbent firms that might retaliate (Wagner 1994). However, empirical findings tend to show that industry growth after entry tends not to affect survival (Audretsch 1991, Wagner 1994). Second, Wagner (1994) argues that in concentrated industries, incumbent firms are more likely to retaliate against new entrants. Retaliation by incumbent firms would result in decreased profitability and lower the likelihood of survival. For this reason, I include the four-firm concentration ratio as an explanatory variable.

Third, I include the proportion of American firms in each industry with international operations in the performance equation. Industries in which many U.S. firms have international presence might indicate that the industry structure is conducive for firms to control international operations. Foreign firms that expand into the United States under such industry conditions will likely have survival advantages, although underlying difficulties of entering the U.S. will still exist. A complementary interpretation is that industries in which many American firms have international operations might be industries where foreign firms believe that long-term competitiveness hinges upon operating in the United States. Under this scenario, foreign firms might be more willing to maintain

their American operations even if they are not immediately profitable. For each American firm in the *Compustat PCplus* database, I identified all four-digit manufacturing SICs in which the firm operates. I classified the firms as having international operations if they reported foreign income or foreign taxes in 1987. If a firm had foreign operations, I coded all of the company's four-digit operations as international. I then calculated the proportion of firms with international operations within each four-digit SIC.

I include the previous described measures of parent firm revenues and R&D intensity in the performance model. Firms with greater size and intangible assets likely have performance advantages. Firms with greater size might be better able to finance entry into a foreign market. Moreover, larger firms might have the ability to weather a period of unprofitability that can occur after a direct investment is made. Firms with larger levels of intangible assets (as proxied by R&D intensity) are expected to have performance advantages because they bring with them appropriable knowledge and skills that can be applied in the foreign market (e.g., Morck and Yeung 1992).

Foreign entrants might also be more likely to survive when they have previous operations in the United States. By drawing on their experiences, these firms can often mitigate many of the difficulties that their investment faces and increase the investment's chances of survival (Li 1995, Shaver et al. 1997). I employ the previously described count of U.S. subsidiaries to assess the extent of a firm's previous presence in the United States. Finally, I also expect firms to have survival advantages if they already control operations in related American industries because, by drawing on industry-specific experiences in the United States, I expect these firms to face lower costs of initiating operations. For this reason, firms making investments in related industries are expected to be more likely to survive. I employ the previously defined dummy variable that identifies whether or not foreign firms have related operations in the United States. Whether or not a firm makes a related entry is, like entry mode, a firm choice. Therefore, I cannot interpret the coefficient estimate of this variable as the performance benefit of a strategy choice. This estimate will include both the strategy effect and the se-

Table 1 Descriptive Statistics

Variable	Description	Mean	Standard Deviation	Minimum	Maximum
SURVIVAL	Whether or not the investment was still controlled in 1992	0.821	0.383	0	1
Acquisition entry	=1 if entry by acquisition, =0 if entry by new plant	0.723	0.448	0	1
Preentry industry growth	Proportionate change in industry shipments 1982–1986	0.281	0.254	–0.408	1.211
Number of U.S. subsidiaries	Number of subsidiaries controlled by the foreign parent in the U.S. in 1986.	8.619	12.266	0	68
Four-firm concentration ratio	Four-firm concentration ratio, 1987.	38.577	19.304	2	90
Related entry	Whether or not the foreign parent controls operations in a similar two-digit SIC and U.S., 1986	0.436	0.497	0	1
ln (parent revenues)	Natural log of parent firm revenues in U.S. dollars (millions), 1986	7.511	1.635	3.086	11.735
Postentry industry growth	Proportionate change in industry shipments 1987–1991	0.143	0.178	–0.325	1.029
Extent of int'l activities by U.S. firms	Proportion of American firms in the industry with international operations, 1987	0.464	0.169	0	0.833
R&D intensity	Proportion of parent revenues spent on R&D, 1986	0.037	0.030	0	0.119

Note. $n = 213$, except for RD, where $n = 87$.

lection effect previously shown in Equation (5). Therefore, this variable serves only as a control.⁹

Table 1 presents summary statistics for these variables. Approximately 82 percent of the foreign entries survived until 1992. Consistent with previous research, the survival rate of greenfield entries exceeds that of acquisitions (88 versus 80 percent).

4. Method and Results

To estimate the effects of entry mode on survival I employ Heckman's (1979) method as previously described. However, a complication arises because the dependent variable in the performance model is binary. There exist two ways to address this issue.

The first is to estimate the performance model as a linear probability model. The disadvantage with the linear probability specification is that the predicted values can lie outside the range of zero to one and the distur-

bance term is heteroskedastic. However, it is possible to correct for the heteroskedastic error term in the linear probability model by using weighted least squares (McGillivray 1970, Maddala 1983).

The second possibility is to estimate the performance equation using a probit specification with self-selection following the approach of Van De Ven and Van Praag (1981). This approach produces approximations of the probit estimates because, as mentioned in the second section, the resulting error term in the performance model after controlling for self-selection is not normally distributed.

Both approaches produce similar results. Because I utilize the predicted values of SURVIVAL when interpreting the results, I present estimates from the probit approximations.

Entry Mode Model Estimates

Table 2 presents the results of the entry mode choice model. The specification of the probit model is:

$$\text{Acquisition}^* = \gamma' \mathbf{w} + u$$

$$\text{Acquisition} = 1 \text{ if } \text{Acquisition}^* > 0, \quad 0 \text{ otherwise.}$$

⁹ Estimates in specifications that do not include the variable that identifies related entries exhibit similar results.

Table 2 Probit Estimates of the Entry Mode Choice Model

	1	2
INTERCEPT	3.6483*** (5.940)	4.1674*** (3.318)
Preentry industry growth	-1.1390*** (2.641)	-0.1631 (0.208)
Number of U.S. subsidiaries	0.0610*** (3.630)	0.0801*** (2.351)
Four-firm concentration ratio	-0.0212*** (3.910)	-0.0345*** (3.870)
Related entry	0.0035 (0.016)	0.1376 (0.382)
ln (parent revenues)	-0.2971*** (3.922)	-0.3549** (2.177)
R&D intensity		2.0826 (0.347)
<i>n</i>	213	87
χ^2 (df)	59.40 (5)***	33.10 (6)***

Note. Positive values indicate greater probability of entry by acquisition (*t* statistics in parentheses).

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$: one-tailed tests.

The vector \mathbf{w} includes an intercept constant and the following variables: preentry industry growth, number of U.S. subsidiaries, four-firm concentration ratio, related entry dummy, and log of parent revenues. The second column includes R&D intensity in \mathbf{w} and thus suffers a reduction in sample size. Consistent with Zejan's (1990) finding, greater industry growth decreases the probability of acquisition entry as evidenced by the negative and significant coefficient estimate in column 1. Although the coefficient estimate of preentry industry growth is negative in column 2, it is not significant. Firms with numerous operations in the United States prefer subsequent entry in the form of acquisition as indicated by the positive and significant effect of this variable in both columns. Consistent with previous findings, firms favor new plants in highly concentrated industries. In both columns, the coefficient estimate of parent revenues is negative and significant, indicating that larger firms have a tendency to enter by new plants compared to acquisitions. This is consistent with Kogut and Singh's (1988) finding. Whether a firm enters an American industry in which it has related operations does not significantly affect entry mode choice. Finally,

the effect of R&D intensity on entry mode choice is not significant.

The results from the choice model are largely consistent with previous studies that have examined foreign direct investment entry mode choice. They indicate that firms systematically choose their entry mode based on their attributes and industry conditions. Firms favor acquisitions over new plants when they have a larger number of American subsidiaries, smaller world-wide sales, and when they compete in slow growing, less concentrated industries. The following section uses these estimates to assess if the previously described self-selection process affects the performance equation estimates.

Performance Model Estimates

Table 3 provides results from the performance model and presents three sets of regression results. Columns 1 and 2 present estimates of specifications that *do not* control for self-selection. Column 2 differs from column 1 in that it includes R&D intensity as an explanatory variable. According to my arguments, these models are misspecified because they do not account for self-selection of entry mode choice. However, I present their results for two reasons. First, by presenting the results from the misspecified model it is possible to highlight how the estimate of δ changes between specifications that do and do not account for self-selection of entry mode choice. Second, presenting these results facilitates comparability to previous studies that have examined the relationship between foreign direct investment entry mode and performance.¹⁰ The specification of the performance model without accounting for self-selection is:

$$\text{SURVIVAL} = \beta' \mathbf{x} + \delta \text{Acquisition} + \epsilon.$$

The vector \mathbf{x} includes an intercept constant and the pre-

¹⁰ With respect to comparability to previous studies: Li and Guisinger (1991) did not control for other effects when assessing the survival differences among entry modes; Woodcock et al. (1994) controlled for investment age before making the comparisons; Li (1995) controlled for several firm and industry effects that largely overlap the independent variables that I include. Moreover, Li and Guisinger (1991) based their sample on the list of companies that filed Chapter 7 or Chapter 11 bankruptcy protection between 1978 and 1988. Woodcock et al. (1994) sampled Japanese manufacturers operating in North America in 1991. Li (1995) examined foreign entrants in U.S. computer and pharmaceutical industries between 1974 and 1988.

Table 3 Probit Estimates of the Performance Model

	1	2	3	4	5 Acquisitions	6 New Plants
INTERCEPT	0.5425 (0.798)	1.0204 (0.680)	-0.2774 (0.156)	-4.7875 (0.802)	-0.9961 (0.985)	-1.2362 (0.268)
Postentry industry growth	-0.5698 (0.959)	-0.9041 (0.966)	-0.5926 (0.982)	-0.9337 (0.796)	-0.1820 (0.250)	-2.0424* (1.361)
Four-firm concentration ratio	-0.0056 (0.935)	-0.0150 (1.264)	-0.0017 (0.172)	0.0184 (0.488)	0.0083 (0.673)	0.0011 (0.045)
Extent of int'l activities by U.S. firms	2.2207*** (3.251)	3.2084** (2.185)	2.2092*** (3.210)	3.8991** (2.253)	2.1865** (2.571)	2.6005** (1.688)
Number of U.S. subsidiaries	0.0274** (1.922)	0.0762** (1.675)	0.0207 (1.079)	0.0128 (0.166)	0.0050 (0.226)	0.0210 (0.225)
Related entry	0.7441*** (2.874)ep	1.2986*** (2.665)	0.7339*** (2.788)	1.4062*** (2.447)	0.5136** (1.680)	1.5312** (1.923)
ln (parent revenues)	-0.0537 (0.716)	-0.1887 (1.142)	-0.0068 (0.057)	0.1309 (0.357)	0.1400 (0.884)	0.1303 (0.337)
R&D intensity		7.8536 (1.084)		5.7773 (0.649)		
Acquisition entry	-0.4612* (1.642)	-0.6660* (1.381)	0.0867 (0.076)	2.5979 (0.771)		
Correction for self-selection (λ)			-0.3380 (0.487)	-1.9883 (0.961)	-1.5093* (1.496)	-0.0685 (0.051)
<i>n</i>	213	87	213	87	154	59
χ^2 (df)	29.16 (7)	24.47 (8)	29.47 (8)	25.10 (9)	23.73 (7)	8.93 (7)

Note. Positive coefficients indicate greater probability of survival (*t* statistics in parentheses).

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$, one-tailed tests.

viously described effects that were argued to affect foreign direct investment survival.

Columns 3 and 4 present estimates for specifications that mirror columns 1 and 2 with the exception that they control for self-selection. The specifications in these columns are often referred to as treatment models (Greene 1993). I present the treatment model specification because it is most similar to the specification that strategy researchers employ to estimate performance. That is, a dummy variable identifies the strategy choice and its coefficient estimate leads to the interpretation of whether or not a strategy exhibits superior performance. The treatment model specification is:

$$\text{SURVIVAL} = \beta'x + \delta\text{Acquisition} + \beta_{\lambda}\lambda + \eta$$

$$\text{where } \lambda = \phi(\gamma'w) / \Phi(\gamma'w) \quad \text{if Acquisition} = 1,$$

$$\lambda = -\phi(\gamma'w) / \{1 - \Phi(\gamma'w)\} \quad \text{if Acquisition} = 0.$$

There are, however, two disadvantages with the treatment model specification. First, it restricts the estimates of β to be the same for both entry modes. Although I do not have any reason to believe that the independent variables will have different effects for greenfield and acquisition entries, there is no reason to assume they will be the same. Second, and related to the first point, it is difficult to interpret the effect of self-selection (β_{λ}) in these models because its estimate is restricted to be the same for both entry modes.

Columns 5 and 6 separately estimate the performance model for acquisitions (column 5) and new plants (column 6) while accounting for self-selection. This is accomplished by restricting the sample to entry by one mode or the other, adding the correction for self-selection (λ), and removing the dummy variable that identifies the chosen entry mode. To make the

interpretation of λ comparable across these two subsamples, the choice model for column 5 is estimated to predict the probability of entry by acquisition and the choice model for column 6 is estimated to predict the probability of entry by new plant. An advantage of these specifications is that they do not restrict the independent variable coefficient estimates to be the same for both entry modes. For this reason, β_λ is more easily interpretable than in the treatment model. The performance models in columns 5 and 6 take the following specifications:

$$\text{SURVIVAL}_{\text{Acquisition}} = \beta'x + \beta_\lambda\lambda + \eta,$$

$$\text{where } \lambda = \phi(\gamma'w) / \Phi(\gamma'w)$$

$$\text{SURVIVAL}_{\text{New Plant}} = \beta'x + \beta_\lambda\lambda + \eta$$

$$\text{where } \lambda = \phi(\gamma'w) / \Phi(\gamma'w), \text{ from the probit estimate of whether or not entry is by new plant.}$$

Turning to the results, the effect of acquisition entry on survival is negative and significant in the specifications that do not control for self-selection. This is consistent with previous research (Li and Guisinger 1991, Woodcock et al. 1994, Li 1995).¹¹ Once again, I expect that this model is misspecified and I present these estimates to contrast the results in specifications that control for self-selection.

In contrast, the treatment model estimates (columns 3 and 4) provide no evidence that entry mode affects foreign direct investment survival because the coefficient estimates of δ do not show statistical significance. Moreover, the estimates of δ become positive (i.e., they are less negative). This is consistent with the expectation that the error terms in the choice and performance models are negatively correlated and that unobservable firm capabilities affect entry mode choice and foreign direct investment performance.

The estimates of β_λ in columns 3 and 4 are negative as expected but are not significant. A potential interpretation of β_λ 's lack of statistical significance is that self-selection is not prevalent. However, if entry mode had

an effect on foreign direct investment performance independent of the previously described self-selection process (e.g., new plants always convey performance advantages), then this effect should persist once λ is added to the model specification. I do not observe this.¹²

The results in columns 5 and 6 aid in interpreting whether self-selection drives the change in the estimated values and significance of δ in columns 3 and 4 or whether entry by new plant universally conveys performance advantages. Column 5 presents the performance model results for firms that choose to enter by acquisition. The negative and marginally significant coefficient estimate of λ indicates that the probability of survival for firms that choose to enter by acquisition is greater than the probability of survival for all firms with equivalent observable characteristics, (i.e., same vector w) had they chosen to enter by acquisition. In other words, unobservable characteristics that affect entry mode choice also affect performance.

Column 6 presents similar estimates when the sample is restricted to firms that chose greenfield entries. Once again, the estimate of β_λ is negative, as would be expected if firms are self-selecting to the most favorable entry mode based on their unobservable characteristics. However, β_λ is not significant.

The model estimates in columns 5 and 6 of Table 3 can be used to assess the superiority of one entry mode versus another. Multiplying the coefficient estimates in column 5 by the vector of firm attributes for the subsample of acquisitions (the value of λ is calculated for each observation from the choice model) allows me to calculate whether or not an entry is predicted to survive. The proportion of predicted survival for acquisition entries is .96 (i.e., average predicted value of SURVIVAL) and is reported on the top left cell of Table 4. It is also possible to assess the predicted survival of foreign entries by new plant *had they entered by acquisition*. This is done by multiplying the coefficient estimates in column 5 by the vector of firm attributes for the subsample of new plant entries. I find that the proportion of predicted survival is .81 (top right cell of Table 4).

¹¹ Because the arguments and results from previous studies of entry mode performance conclude that new plants outperform acquisitions, I employ one-tailed tests (the p value of δ in column 1 is 0.0503).

¹² To control for firm nationality differences, I perform the same analysis on the set of Japanese entrants ($n = 72$) and on the set of non-Japanese entrants. The results from these analyses are consistent with those from the entire sample and are available from the author.

Table 4 Predicted Values from Probit Models of Acquisition Performance and New Plant Performance

	Firms That Chose to Enter by Acquisition (<i>n</i> = 154)	Firms That Chose to Enter by New Plant (<i>n</i> = 59)
Proportion of predicted survivors. ^a		
Estimates from the performance model of acquisition entries (Table 3, Column 5)	0.96	0.81
Proportion of predicted survivors. ^a		
Estimates from the performance model of new plant entries (Table 3, Column 6)	0.88	0.98

^a This is the average predicted value of SURVIVAL.

I employ the estimates of new plant performance (column 6 of Table 3) in the same manner to assess the predicted survival of greenfield entries and the predicted survival of acquisition entries *had they entered by new plant*. Multiplying the estimates of new plant survival by the vector of firm attributes for greenfield entries reveals a predicted survival proportion of .98 (bottom right cell of Table 4). The proportion of predicted survival of acquisition entries *had they entered by new plant* is 0.88 (bottom left cell of Table 4).

These estimates allow the comparison of the predicted survival between acquisition entries and acquisition entries had they entered by new plant. The left column of Table 4 indicates that entries by acquisition are significantly more likely to survive than if they *had chosen to enter by new plant* (96 percent predicted survival versus 88 percent, $p = 0.01^{13}$). The difference in the predicted survival is due to differences in the estimates of how observable and unobservable characteristics affect survival (i.e., β) for acquisitions (column 5 of Table 3) and new plants (column 6 of Table 3). The interpretation is that foreign investments that chose to

enter by acquisition perform better than if they had chosen to enter by new plant. Similarly, the right-hand column of the table indicates that the firms that entered by new plant are significantly more likely to survive than if they *had entered by acquisition* (98 percent predicted survival versus 81 percent, $p = 0.004$).

Table 4 presents evidence that firms enter by acquisition when this mode is more likely to be successful and enter by new plant when this mode is more likely to be successful. This does not support the results from the misspecified models (columns 1 and 2 of Table 3) that greenfield entries unconditionally lead to performance advantages. If the conclusion from the misspecified models were correct, then the predicted survival of entry by new plant would be greater than the predicted survival of entry by acquisition for all firms. That is, the predicted survival of the bottom cells in Table 4 would be greater than the corresponding top cells. However, Table 4 supports the interpretation of the treatment model that entry mode *per se* does not affect foreign direct investment survival (δ in the treatment model does not significantly differ from zero). This is because greenfield entries are advantageous in certain circumstances and acquisition entries are advantageous in others.

Turning to the control variable estimates in Table 3, only two variables exhibit consistent significant effects. First, the extent of international activities by U.S. has a positive effect on survival as expected. Foreign firms are more likely to survive in industries where their American counterparts have a larger international presence. Second, firms that already have American operations in related industries appear to have survival advantages. Interestingly, the coefficient estimates of the number of U.S. subsidiaries lose significance in the specifications that control for self-selection. This indicates that the number of U.S. subsidiaries does not directly affect survival. Rather, the affects on survival are through the choice of entry mode.

5. Conclusion

In this paper, I show that estimates of strategy performance from empirical models that do not account for self-selection might be misleading because firms choose their strategies. In particular, I demonstrate that the

¹³ Because the predicted values of SURVIVAL are either 1s or 0s, it is possible to test the hypothesis that the proportions come from the same underlying distribution. I use Fisher's exact test on a 2×2 contingency table where cells are counts, the rows identify the predicted values of SURVIVAL (0 or 1), and the columns identify whether the coefficient estimates are from the acquisition performance model or from the new plant performance model.

interpretation of how entry mode choice affects foreign direct investment survival changes once accounting for strategy self-selection. This suggests that strategy choices that appear to significantly affect performance in many empirical studies might not truly reflect strategy performance differences—especially when hard-to-measure or unobservable firm characteristics affect both strategy choice and performance.

Many recent theoretical views in strategic management have introduced concepts like intangible assets, firm capabilities, or sustainable competitive advantages to describe strategy choices and performance outcomes. Because these are concepts that are difficult to observe and empirically measure, the results and methodology employed in this paper can be used as a guide for empirical strategy research. Furthermore, an advantage of this technique is that it integrates research that examines strategy choice and strategy performance.

The paper's results also add to our understanding of how entry mode affects foreign direct investment performance. They indicate that entry mode choice affects survival but that the effect is not universal. Depending on firm attributes and industry conditions, new plants have performance advantages over acquisitions, yet given different firm attributes and industry conditions, acquisitions have performance advantages over new plants. In addition, the results are consistent with the notion that firms with stronger sources of competitive advantage prefer new plants versus acquisitions.

It is important to make two concluding points. First, the arguments and estimates in this paper suggest that, overall, firms systematically make strategic choices based on the expected performance of their choices. It is possible, and in fact one would expect, that some firms make mistakes in their selection of strategies. Therefore, there is value in highlighting what conditions lead to strategy choice and how this relates to performance.

Second, to the extent that mistakes are common, the factors that make one strategy more attractive than another are not well understood by decision makers, or all determinants of performance can be identified and measured, self-selection will not affect the estimates of strategy performance. Therefore, not all conclusions that have been reached in the strategic management field

will necessarily change. Nevertheless, incorporating this methodology and re-examining many of the conclusions that have been drawn in the empirical strategy literature will likely provide fruitful grounds for research and important insights to guide managerial action.¹⁴

¹⁴ Conversations with Scott Masten and Rick Flyer have been instrumental in motivating and shaping this paper. I also appreciate helpful comments from Ya-Ru Chen, Wilbur Chung, Kiyohiko Ito, Andrew King, Will Mitchell, Tom Pugel, Bernard Yeung, seminar participants at NYU, the anonymous referees, and the editor, Rebecca Henderson. The data in this paper draw on my dissertation, which was supported by the Social Sciences and Humanities Research Council of Canada.

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