Plant Scale in Entry Decisions: A Comparison of Start-ups and Established Firm Entrants

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This paper examines the competitive advantage enjoyed by established firms over start-up firms in their choice of plant scale when entering industries. We hypothesize that established firms will enter at smaller scale because they have the opportunity to substitute other resources and advantages for the cost disadvantages that result from small scale. We find that established firms enter with lower scale plants which suggests that they have access to resources that allow them to be competitive at lower scales. Copyright © 1999 John Wiley & Sons, Ltd.

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INTRODUCTION

The entry of firms into industries plays a seminal role in research in economics and business strategy. In the simplest neoclassical model of entry, the potential for economic profits in an industry attracts entry by firms, and 'new' entry into the industry continues until the potential for economic profits is driven to the competitive level. It is precisely because entry has the effect of lowering profits that the concept of 'barriers to entry' occupies an exalted (or nefarious!) position among the 'structural' explanations that are advanced to explain sustained profitability differences across industries.

It was this reasoning that led Bain (1956) to focus on the conditions of entry in industries. His detailed and extensive research into a whole range of industries identified the conditions which made entry easy or difficult. Bain's research focused on the advantages that incumbent firms had over start-up firms desiring to enter an industry.

Bain's analysis did not differentiate between entry by 'new' entrants (start-up firms) and entry by 'established' firms (firms already participating in other industries). While the many barriers identified by Bain were likely to impede new firms, did they, or could they, have the same effect on established firms? Hines (1957) provided a detailed exposition on the issue of whether the conditions of entry facing established firms were substantially different from those facing start-ups. Hines argued that while conditions of entry in some industries may impede the entry by new firms, established firms did not face the same impediments. Gorecki (1975) presented empirical evidence that barriers to entry were less severe for established firms than for brand new enterprises. Yip (1982) also showed how the conditions of entry into an industry were firm specific, and depended on whether the firm was already established or not.

The asymmetry between established firms and start-up firms may lead to different strategic entry choices. Established firms often have access to substantial resources which are unavailable to

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start-ups. These resources include brand-name capital, access to capital and other assets. Montgomery and Hariharan (1991) presents evidence that established firms do not expand randomly into different industries but choose to enter industries in which they are able to use resources that they have in-house. Lemelin (1982), Stewart *et al.* (1984) and MacDonald (1984) also demonstrate a pattern of 'diversification' across industries that appears to be driven by similarity of industry characteristics (such as R&D intensity and advertising intensity). Similarly, Brush (1996) shows that entry by established firms through acquisition increased opportunities for resource sharing and that resource sharing in established firms improved post-acquisition performance. Using cross-sectional comparisons across industries, Gorecki (1975) shows that while conventional barriers to entry has no effect on the net rate of entry of diversifying enterprises, the rate of net entry of new firms is sensitive to all barriers to entry. This strongly suggests a competitive advantage for established firm entrants relative to new firm entrants.

A recent survey of empirical studies of entry and exit indicates that there is limited empirical research that examines the competitive advantages of established firms over start-ups (Siegfried and Evans, 1994).[1] Although Montgomery and Hariharan (1991) examines the patterns by which established firms diversify into other industries, it does not explore how established firms differ from start-ups in characteristics of their entry decisions.

We expect that the choices made by established firms are different from those made by start-ups. For example, in developing a theory of the growth of the firm, Penrose (1959) focuses not only on the external inducements to growth but also on the internal inducements to growth, particularly the fixed factors that are freed up as a firm learns to operate more efficiently. Chandler (1962) also shows how the growth of firms in the chemical industry, such as Dupont and Monsanto, was based on the particular skills and competences they had developed. If the nature of these skills and competences drive expansion of established firms into industries in which these resources are particularly useful (Teece, 1980; Montgomery and Hariharan, 1991), then we should expect that the possession of these resources would confer some advantages to established firms over start-up firms. These resource

differences should be reflected in different entry decision choices made by the two types of firms, such as scale of entry, entry strategies and so on.

This study examines differences between the entry strategies of start-up firms and established firms on a single but significant characteristic: the scale of entry. The scale at which a firm enters an industry is an important one in two respects. It represents the first major commitment made by the firm to be a part of an industry and is usually the minimum level of commitment necessary for entry. Scale of entry generally has an important bearing on the cost and, hence, the competitive position of the firm, especially in industries characterized by scale economies and significant price competition.

THEORETICAL PERSPECTIVES

In the simplest model of entry, the choice of the scale of entry is 'technologically' determined. The technologically determined scale of entry for *all* firms entering an industry is the Minimum Efficient Scale (MES), a concept based on the shape of the cost curve. MES is the minimum scale at which a plant achieves a competitive cost position. When all firms are price takers selling a homogeneous or undifferentiated product, firms would not survive if they entered at any scale lower than the MES. When products are differentiated, firms may have more flexibility in pricing. Differentiation may allow firms to enter niches of the market and at volumes that are below MES if the prices charged in that market segment can support a higher cost position.

A second perspective comes from the field of business strategy. In this view, firms are assumed to possess distinct and unique bundles of assets or resources and this stock of 'resources' drives a firm's competitive advantage and its pattern of growth. In this view, a firm's stock of resources is an important determinant of its strategic choices. The resources within the firm influences which new businesses to enter, the mode of entry, and the scale of entry because each of these is closely linked to the firm's competitive advantage, both in its existing business and in the businesses it seeks to enter.

If the idiosyncratic resource bundles of firms play a significant role, then the scale of entry might be different for firms with different bundles

of resources. It is apparent that the 'asset bundles or resources' possessed by established firms are substantially different from those possessed by start-up firms. By definition, start-ups have to acquire most of their resources in the 'market' (except maybe, for the entrepreneur's human capital). Resources that are developed within established firms, and are interconnected with other assets within those firms, are not generally available separately in the market and start-up firms have limited access, or higher cost access, to them (Teece, 1980; Dierickx and Cool, 1989).

CHOOSING THE SCALE OF ENTRY

Companies generally attempt to balance two considerations to cope with the risk associated with entry into a new market. On the one hand, they need to enter at scales that will ensure competitive parity with industry incumbents. On the other hand entrants will also attempt to enter at the lowest scale possible to minimize their investment and commitment.

Due to the availability of a wide range of resources within the established firm, the trade-off it faces differs from the one faced by new entrants. As Penrose (1959) points out, one of the primary inducements for the growth of a firm is its ability to use in new markets the 'excess capacity' in 'fixed' factors that are generated over time as the firm grows and learns to be more efficient. Entry into new markets by established firms is a result of their desire to cope with short-run disequilibria in the use of input factors (Rubin, 1973). With no resources from existing business, new entrants have to enter at or close to MES in order to remain competitive. Established firms, on the other hand, may attain competitiveness at lower scales by using 'factors' that they have available. The cost minimizing scale of a diversifying firm may depend on average variable cost rather than average total cost, since the opportunity cost of fixed inputs of a diversifying firm may be low (i.e. they may have excess capacity). In other words, the average variable cost curve hits its minimum at a lower output per time period than does the average total cost curve. If established firms that are diversifying into other industries use excess capacity of fixed assets to do so, their fixed costs are largely irrelevant and the average variable cost curve rather than the average total cost curve governs cost minimization.

There are two major reasons why the resource bundles of established firms may allow them to enter a market at lower scale:

(a) Leveraging know-how across markets: Established firms often have better know-how than start-ups regarding the technologies and other activities used in the industry being entered. This know-how can often be transferred from one product market to another (Prahalad and Hamel, 1990). By definition, start-ups lack these opportunities. This advantage in leveraging know-how may allow the established firm to achieve a competitive cost position at a lower scale relative to start-ups.
(b) Shared activities: Shared activities may lower costs of established firms providing them with a competitive cost position even at scales lower than MES. Economies of scope in activities such as advertising and R&D when coupled with market failure (Teece, 1980; Montgomery and Hariharan, 1991) may drive the diversifying expansion of established firms.

Established firms and start-ups also cope differently with the uncertainty associated with entry into a new market. The first plant often represents only the initial commitment in a sequence of investments in an industry. If the returns from the first investment (i.e. the plant) indicate optimism, the entrant may expand its presence in the industry with subsequent investments. The differences in their response to uncertainty may be best understood from an options perspective (Wernerfelt and Karnani, 1987). The first investment by both established firms and start-ups may be characterized as 'buying' a call option to expand in an industry which is exercised subsequently by expansion of plants and output depending on the success of the first commitment (Bowman and Hurry, 1993).

Conventional wisdom generally holds that start-ups should enter small since they are often presumed to be resource constrained. The recommendation that start-ups 'enter small' is made in comparison to incumbents. We, however, are comparing scale of entry employed by start-ups relative to the diversifying entry of established firms. Our argument above only suggests that established firms might be expected to enter with smaller scale plants than start-ups. Biggadike

(1979) reports that established firms tend to diversify by entering at small scales; however, there was no attempt to compare the scales of entry of diversifying entrants relative to start-ups. Our arguments above provide a rationale for the low scale of entry for established firms reported by Biggadike (1979).

THE MODEL

Our model explains scale of entry as a function of firm characteristics of the parents of entrants and of industry characteristics of the target industry. Let $S(F, I)$ be the scale of entry of firm F, or the size of an entrant relative to the size of minimum efficient scale plants in industry I:

$$S(F, I) = F(X(F), Y(I)), \qquad (1)$$

where $X(F)$ is a vector of characteristics of firm F and $Y(I)$ is a vector of characteristics of industry I. We first examine whether there is any significant difference in the scale of entry used by established firms relative to start-ups. We also examine the effect of diversification profiles and resource bundles of established firms on the scale of entry. We also include the characteristics of the entered industry as control variables in each of our models.

In the following sections, we describe the variables used in the study, the data sources, and the estimation of the models in the study.

VARIABLES

The Dependent Variable

SCALE The dependent variable is scale of entry relative to industry MES. Scale of entry is measured as the sales of the entry plant divided by the level of minimum efficient scale for the industry. Our measure of MES for the industry is the average plant size of the plants corresponding to the 40–60% of sales when plants are rank ordered by sales in the Census of Manufacturers. Many previous studies have reasoned that a measure of the average size of larger plants would be correlated with MES. Weiss (1963) picked the plant size accounting for the 50th percentile, Comanor and Wilson (1967) chose the average size of the largest plants corresponding to 50% of output.

SCALE = plant sales/industry MES.

Firm Specific Independent Variables

D This dummy variable is equal to 0 for new entrants and 1 for diversified entrants. This allows us to test for differences in scale of entry for diversified firms. We expect D to be negative. When the model includes a number of variables to account for specific parent firm characteristics, this variable captures the overall effect of all characteristics not explicitly enumerated by the other variables in the model.

$D*$DIVS This variable is a measure of firm diversity relative to the entry's target industry. It is measured using the concentric diversification index as suggested by Caves *et al.* (1980). The value of DIVS is a sales weighted average of pair-wise relationships between each business in the parent and the target industry. The pair-wise relationship takes on the value zero if the pair are in the same four-digit standard industrial classification (SIC), 1 if in the same three-digit SIC, 2 if in the same two-digit SIC, 3 if in the same one-digit SIC, and 4 if they don't share the same first digit. A low value of DIVS means the parent firm is very close in SIC distance to the target industry and is more likely to find resources that can be shared between the firm and the entry. The low value of DIVS also indicates that the established firm could substitute its resources to enter at a lower scale without sacrificing its competitive position. We expect the availability of resources within established firms would allow them to enter smaller which leads us to expect a positive coefficient for $D*$DIVS for diversified entrants (since a large $D*$DIVS implies fewer or less applicable resources).

$D*$PARADV The opportunity for the parent to share advertising resources with the entry depends on the advertising intensity of the parent and the proximity of the firm to the entrant industry. The presence of applicable advertising skills in the parent, and the potential transfer of brand equity into contiguous industries, provides established firms the opportunity to enter at a smaller scale to reduce risk. We expect a negative coefficient on $D*$PARADV indicating that firms use parent advertising resources to allow smaller scale entry.

Where ADV is the advertising/sales ratio for the parent firm and 1/DIVS is high when the

entrant is close in SIC distance to the target, PARADV is defined as the following for diversified entrants:

PARADV = ADV/DIVS.

When PARADV is high it represents a high level of advertising resources that are available in the businesses of the firm that are close in SIC distance to the industry that is being entered.

D∗PARRND   The opportunity for the parent to share R&D resources with the entrant depends on the R&D intensity of the parent and the proximity of the firm to the entrant industry. Like PARRADV, the presence of applicable R&D skills in the parent, and the potential transfer of these skills into contiguous industries, could allow firms the opportunity to enter at smaller scale to reduce risk. We expect a negative coefficient on D∗PARRND as an indication that firms choose to use parent R&D resources to enter at smaller scale.

Where RND is the R&D/sales ratio for the parent firm and 1/DIVS is high when the entrant is close in SIC distance to the target, PARRND is defined as the following for diversified entrants:

PARRND = RND/DIVS.

The logic for the definition of PARRND is similar to that for PARADV.

Industry Specific Independent Variables

SCALR   The scale of entry should be critically sensitive to the shape of the target industry's cost curve. Where plants come in below MES, the penalty they suffer depends on the productivity of low scale plants relative to MES scale plants, or the degree of industry scale advantages. Caves *et al.* (1975) expressed this through a cost disadvantage ratio which was the average productivity of the plants in the top 50% of sales in the industry divided by the productivity of the plants in the bottom 50% of sales in the industry. We define a similar ratio which is the average productivity of MES plants corresponding to sales of 40–60% of industry sales (PROD4060) divided by the average productivity of plants corresponding to sales of 20–40% of industry sales (PROD2040). Productivity is defined as value added/payroll expense. We expect that where SCALR is high, entrants will have a strong incentive to enter at or above MES, i.e. a positive coefficient for SCALR:

SCALR = PROD4060/PROD2040.

This measure of SCALR has the advantage of being a simple to calculate partial factor productivity measure. A problem with this measure is that if the capital/labor ratio rises with scale, then value added/payroll can rise, even though total factor productivity does not rise. Thus, this measure of the advantage of scale may overestimate scale advantages. The result is that the estimated coefficient could be less significant than would be the case if a total factor productivity measure were used.[2]

INDGROW   Industry growth has two effects on the choice of entry scale. On the one hand, industry growth makes entry easier because entrants can gain market share without taking sales away from incumbents. Industry growth can therefore make low scale entry easier. On the other hand, industry growth allows entrants to build larger scale plants with the knowledge that the excess capacity of these plants will be filled more quickly (Manne, 1961). We attempt to isolate the second effect by including a variable to capture situations where industry growth is rapid and where capital intensity is high (using the variable IPPE∗INDGROW discussed below). Thus, excluding the second effect in industries with rapid growth and high capital intensity, we expect INDGROW to be negative because it reflects primarily the first effect. INDGROW is the industry sales for each industry in 1982 (INDSAL82) divided by industry sales in 1977 (INDSAL77). Industry sales are from the 1977 and 1982 Census of Manufacturers.

INDGROW = INDSAL82/INDSAL77.

IPPE∗INDGROW   Scale of entry should be especially sensitive to industry growth in industries where capital intensity is high. As Manne (1961) suggested, firms will be more willing to enter at large scale with capital intensive plants if they believe that the underutilized capacity will be shortlived—as it would be in a rapidly growing industry. Among industries with rapid sales growth, we therefore expect larger scale entry in industries where capital intensity is high—where IPPE∗INDGROW is high. IPPE is measured as the aggregate total property plant and equipment/sales, (PPE/SALES) for four-digit SIC industries from the COMPUSTAT II database. We expect IPPE∗INDRGOW to have a positive coefficient.

IPPE∗INDGROW = IPPE∗INDGROW.

IADV   Industry advertising intensity is used to identify industries in which differentiation strategies are more likely to characterize competition. It is expected that scale of entry is less likely to be important for survival in these industries. IADV is the COMPUSTAT II industrial aggregate advertising/sales ratio (AD/SALES). We expect IADV to have a negative coefficient.

IADV = AD/SALES.

IRND   Industry R&D intensity is used to identify industries in which technological intensity allows firms to pursue differentiation strategies based on technology in which performance may not be closely related to scale of entry. It is expected that scale of entry is less likely to be important for survival in these industries. IRND is the COMPUSTAT II industrial aggregate R&D/sales ratio (R&D/SALES). We expect a negative coefficient on IRND.

IRND = R&D/SALES.

ESTIMATED MODEL

We estimate four models. The first model is used to test the hypothesis that established firms enter at scales lower than start-ups. The second model tests the effects of diversification profile of the established firm on the chosen scale of entry. The third model examines the effect of specific resource bundles on the chosen scale of entry when the diversification profile of the established firm is included. Finally, we estimate a full model with both diversification profile and specific resource bundles. In all models we include several variables for industry characteristics.The full model for diversified entrants is the following:

$$SCALE = \beta_1 + \beta_2 D + \beta_3 D*DIVS$$
$$+ \beta_4 D*PARADV + \beta_5 D*PARRND$$
$$+ \beta_6 SCALR + \beta_7 IADV + \beta_8 IRND$$
$$+ \beta_9 INDGROW$$
$$+ \beta_{10} IPPE*INDGROW + \varepsilon. \qquad (2)$$

The scale of entry for new company entrants is estimated from Equation (2) above, where $D = 0$. For new company entrants the model is effectively the following:

$$SCALE = \beta_1 + \beta_6 SCALR + \beta_7 IADV + \beta_8 IRND$$
$$+ \beta_9 INDGROW$$
$$+ \beta_{10} IPPE*INDGROW + \varepsilon. \qquad (3)$$

We estimate several variations of the full model (2) above. The first model (column a in Table 2) focuses on the differences in the scales chosen by established firms and start-ups but controls for the industry differences that are the primary effects in (3) above. The full model is shown in column d in Table 2. We also estimate some intermediate models (column b and c in Table 2). The results, shown in Table 2, are discussed in the 'Empirical Results' section.

DATA AND PROCEDURES

The research uses the TRINET Inc. Large Establishment Database to derive sales for entering plants. Entry is determined by comparing ownership and plant data between 1980 and 1982. The size of the entering plant is calculated by examining the sales of these plants in 1984. This prevents the possibility that a plant which has entered but is not yet producing at full capacity would appear to be a smaller scale entry. The TRINET tapes used for the identification of these entry events are the 1981, 1983, and 1985 TRINET tapes which correspond to 1980, 1982 and 1984, respectively.

The Census of Manufacturers for 1982 (U.S. Department of Commerce and Bureau of Census, 1982) is used to determine minimum efficient scale in each manufacturing industry. Table 2, 'Industry Statistics by Employment Size of Establishment: 1982', allows us to rank order plants from smallest to largest size categories. We identify as average plant size of the plants which collectively produce the first 20% of industry sales. We also calculate this for plants that correspond to each successive 20% of sales. The Census of Manufacturers for 1977 is also used to calculate industry sales growth between 1977 and 1982.

For parent firm expense data, we use the 1981 COMPUSTAT II Database. We retrieve accounting data on R&D expense and advertising expense from this source. For some industry data which are not available from the Census of Manufacturers, we use the COMPUSTAT industry aggregates. The data for advertising/sales and

R&D/sales are not widely available in the 1981 industry data. Therefore we calculate these ratios from the 1985 COMPUSTAT industry aggregates and assume that these ratios, as indicators of the relative expense intensity of different industries, are stable between 1981 and 1985.

Data from these sources are merged together by four-digit SIC. There are seven industries for which there is TRINET Data but there is no corresponding Census of Manufacturers Data. The TRINET entries that correspond to these industries are dropped from the study. The resulting 17 700 plants are either entry or firm expansion events between 1980 and 1982. These 17 700 plants are classified as acquisition entries ($A = 3653$, average scale 0.9100), diversification entries ($D = 2568$, average scale 0.5882), firm expansions ($E = 6348$, average scale 0.7179), spinoff entries ($S = 258$, average scale 0.7488), and new company entries ($N = 4873$, average scale 0.8265). The total mean scale was 0.7691.

The D types have parents in the TRINET Database in 1981 and we attempted to link these cases to the COMPUSTAT II Database from 1981. Many parents were not publicly held or were not traceable to firms in the COMPUSTAT II Database and were dropped for the subsequent regression analysis. Since we lose so many observations moving from the original data to the data that can be linked to COMPUSTAT, we are concerned that the inferences from the linked data may not represent the original data. In other words, the COMPUSTAT publicly traded firms may be systematically larger than the non-publicly traded firms that are missed. We test for differences in the scale variable for these two samples. The original 2568 were dropped to 2454 observations that had non-zero values for scale. These remaining observations are divided into 1385 dropped observations and the 1069 observations that were successfully linked to COMPUSTAT (other observations from this group were subsequently dropped due to missing data for certain variables). The test of the difference in scale for these samples shows that the dropped observations were actually somewhat larger, with a mean value of 0.618 versus 0.612 for the retained observations. No differences were found between these samples when tests were run using t-tests, REGWQ grouping test, or Tukey's studentized range test.

There is no need to link data to their parents for new entrants so no observations were dropped for this reason among the new entrants (N types), however, 469 out 4873 were dropped due to zero or missing values for scale of entry.

Due to the need to link to COMPUSTAT for established firms there is an asymmetry in the censoring of established firm entrants relative to new entrants. To address this problem we used the re-weight option in SAS to weight the new entrant observations in the regression. The importance of the new entrant observations was given a weight such that they would be in the same proportion to the established firm entrants as they were in the original sample in which established firms were 2568/7441 or 34.5% of the total. In the regression sample there are 196 diversification entries (D) or established entrants (average scale 0.517) and 4404 new entrants (average scale 0.868). Thus, we solve for x in the following equation, where x is the desired number of new entrants: $196/x = 0.345$, or $x = 568$. Since we actually have 4404 new entrants, we give each a weight of 0.129 such that their effective number in the regression sample is 568.

The COMPUSTAT industry aggregate file aggregates data across some four-digit industries which are reported separately by the Census and TRINET. In this case the same COMPUSTAT industry data was matched to multiple SICs in the Census and TRINET databases. For cases in which this aggregation was not clear or there was no COMPUSTAT industry data available at the four-digit level, we exploited the hierarchical logic of the SIC classification system and assigned three-digit, or in some cases two-digit, industry data.

In some cases (103 out of 4600) the entry scale was so large (greater than five times our estimate of MES) that we decided to drop these observations from the sample. These cases probably reflect the heterogeneity of the technologies used within the industry, or that the four-digit industry classification is too broad to be accurately represented by a common cost function.

EMPIRICAL RESULTS

The descriptive statistics for SCALE shown in Table 1 provide evidence that for the original sample, the mean relative scale of entry chosen by

established firms diversifying into other industries is smaller than the mean relative scale of entry chosen by start-up firms.[3] While the 4873 start-up plants came in at a mean plant scale that was 0.83 times the MES of the industry, the scale chosen for the 2568 new plants set up by established firms diversifying into other industries was only 0.59 times the MES for the industry.[4]

The first model is presented in column a of Table 2. We interpret the significant intercept term to indicate that start-ups enter at scales relatively close to MES (the estimate is 0.96) after controlling for industry effects. When we examine the coefficient of D, we note that it is significant (at the 5% level) and is -0.12, i.e. established firms enter about 12% smaller than new company entrants. The established firm dummy reduces scale by 12% when no other firm level effect is included.

The industry level variables indicate that the relative scale of entry is, in general, lower when (a) industry advertising intensity is higher and (b) industry R&D intensity is higher, and (c) industry growth is higher. All of the above effects have the expected sign and are significant at the 5% or 1% level.

We explore other ways of representing the effect of the established firm by adding a variable representing firm diversification ($D*\text{DIVS}$) to the model (column b). While the coefficient on D is still significant it is lower than in column a, (-5% instead of -12%). Some of the difference is picked up by the diversification variable (-2%) but this effect is not significant. In column b, the effect of this addition decomposes the 12% effect of D in column a, into two smaller parts, -5% for D and -2% for $D*\text{DIVS}$, in column b. The absence of significance could also be in part due

to the correlation of these variables since both include D. A negative coefficient on $D*\text{DIVS}$ means that the more distant the established firm is from the target industry the smaller the entrant scale.

In column c we drop the diversification variable ($D*\text{DIVS}$) and add direct measures of resource sharing in the firm instead. Here we find the effect of D is larger—it moves up to -17%, but the presence of parent company advertising intensity and R&D intensity is positive at 3% and 4%, respectively, though only the latter effect is significant. Added together they bring the total corporate effect in column c, back to roughly equal the effect of D in column a. By discussing the incremental development of models with different specification of firm specific variables we show that the established firm effect is robust under many different specifications. It should be noted that the signs on PARRND and PARADV are opposite in sign to our expectation that these resources would allow lower entry scale. Of the two, only PARRND is significant. Next we proceed to investigate these effects in a full model with all variables included.

The estimation of the full (or expanded) model is presented in column d of Table 2. When all firm variables are added to capture different resource bundles, the established firm dummy variable D stays statistically significant and increases to -26%, or a 26% smaller entry scale for established firms. The positive (though insignificant) coefficient on $D*\text{DIVS}$ indicates that scale of entry is higher for firms whose diversification profile is distant from the target industry as expected. Contrary to our expectation, the other firm variables ($D*\text{PARADV}$, $D*\text{PARRND}$) raise the estimated scale of entry for diversifying entrants. Once again, only $D*\text{PARRND}$ is statistically significant.

It appears that firms that have generalized resources or knowledge accumulated in other industries can choose to enter smaller than start-ups and avoid the risks associated with large scale entry. For them the entry experience can be viewed more like an option to see if their generalized knowledge or resources are applicable. Only through the entry experience can they determine if they can survive based on their established firm resources. The new firm entrants may not be able to survive at less than full scale entry, nor would their survival necessarily provide additional

Table 1. Comparing Relative Scales of Entry Regression Comparing Established To Start-Ups (Dummy Variable for Established)

	Scale (coefficient)	t-statistic
Intercept	0.8480***	40.046
Established firm dummy ($N = 7204$)[a]	-0.2324***	-6.517
R^2	0.0059	
R^2-adjusted	0.0057	

[a] 2454 established entrants and 4750 new firm entrants.
*** Statistically significant at 1% level.

Table 2. Results of Regression Model for Sample with Firm Level Data (*t*-Statistic in Parentheses)

Variable	Firm dummy variable only (Column a)	Firm dummy variable and diversification (Column b)	Firm variables without diversification (Column c)	Full model (Column d)
(1) Intercept	0.959*** (8.957)	0.958*** (8.943)	0.954*** (8.916)	0.955*** (8.926)
(2) Established firm dummy variable (D)	−0.121*** (−4.286)	−0.046** (−2.717)	−0.167*** (−5.206)	−0.262* (−2.039)
(3) D*diversification (D*DIVS)		−0.024 (−0.710)		0.028 (0.766)
(4) D*parent advertising (D*PARADV)			0.030 (1.152)	0.035 (1.283)
(5) D*parent R&D (D*PARRND)			0.036** (2.975)	0.040** (3.045)
(6) Industry scale advantages (SCALR)	−0.106 (−1.019)	−0.105 (−1.006)	−0.100 (−0.959)	−0.101 (−0.969)
(7) Industry advertising intensity (IADV)	−0.024*** (−4.169)	−0.024*** (−4.416)	−0.024*** (−4.161)	−0.024*** (−4.168)
(8) Industry R&D intensity (IRND)	−0.063*** (−10.759)	−0.063*** (−10.767)	−0.064*** (−10.940)	−0.064*** (−10.947)
(9) Industry growth rate (INDGROW)	−0.218* (−1.971)	−0.222* (−2.003)	−0.253* (−2.275)	−0.252* (−2.267)
(10) Capital intensity*industry growth (IPPE*INDGROW)	0.005 (1.527)	0.005 (1.538)	0.005 (1.607)	0.005 (1.603)
R^2	0.060	0.0602	0.0625	0.0627
R^2-adjusted	0.058	0.0586	0.0607	0.0607
F-value	44.520***	38.228***	34.817***	31.010***
N	4184	4184	4184	4184
Df	4177	4176	4175	4174

Test of whether variables (3)–(5) are equal to zero: rejected *F*-value 3.1189, $p > F$ 0.0142, df numerator 4, df denominator, 4174.
Test of whether variables (2)–(5) are equal to zero: rejected *F*-value 6.1869, $p > F$ 0.0001, df numerator 5, df denominator, 4174.
[a] Statistically Significant at 10% level.
* Statistically Significant at 5% level.
** Statistically Significant at 1% level.
*** Statistically Significant at.1% level.

insights into the applicability of generalized firm resources. New firm entrants only have the resources that they buy in the market place for entry, and the value of these resources is known to be equal to their market factor prices (Peteraf, 1993).

Advertising and R&D skills in a parent which are closely related in SIC distance, to the industry entered, are positively related to entry scale, but only parent RND is significant. This is contrary to our expectations. The availability of these resources suggests that diversifying entrants enter with greater commitment and scale when the level and applicability of advertising and R&D skills in the parent are greater. One could interpret this

finding in the following way. If uncertainty regarding marketing or R&D for the entry is reduced by the presence of these capabilities in the parent, the parent may not need to reduce risk by entering at a small scale.

Industry Specific Variables

We find no significant association between productivity disadvantages of small scale entry and entry above the MES scale. The failure to find a positive coefficient here could be because our measure only captures labor productivity disadvantages of small scale entry rather than total factor productivity disadvantages.

In the expanded model, as before, we expect scale to be of less importance in industries where differentiation strategies are likely to be viable. We therefore expected negative coefficients for IADV and IRND. These expectations are borne out by the results. Both coefficients are significant at the 1% level.

Entry into industries with rapid industry growth occurs at smaller scale which suggests that the reduced rivalry in such industries creates an opportunity for small scale entry by new companies. The reduced rivalry due to industry growth allows firms to enter at less than MES and still survive (Porter, 1980). As expected, the coefficient for INDGROW is negative and statistically significant at the 5% level. The effect of industry growth on scale of entry also depends on the capital intensity. When capital intensity is high, scale of entry is expected to be high. This is shown by a positive coefficient for IPPE*INDGROW, though this coefficient is not significant even at the 10% level.

In comparing the results of the models, the industry effects on choice of scale of entry remain consistent across models a–d in Table 2. When a single dummy variable is used to capture all of the differences between established firms and start-ups, the result is very clear: established firms enter with plants at lower scales than start-ups. And the result is statistically significant.

When we attempt to account for generalized resources of established firms through the construction of the variable $D*\text{DIVS}$, a measure of how close the target industry is to the industries in which the parent firm is active, we don't find $D*\text{DIVS}$ to be significant. Finally, when we identify the effects of specific resource bundles, the results are clear: with the addition of particular firm level variables, the established firm dummy variable gets even more negative, and parents with similar advertising and R&D resources as those required in the target industry increase entry scale. However, only parent R&D is statistically significant in the expanded model. These results suggest that the ways in which researchers have measured particular resource bundles need closer examination. The entry scale clearly differs between established firms with generalized resources and those with particular resource bundles such as parent R&D and advertising. The effects of particular resource bundles on the scale of entry choice may be more complex than we have formu-lated. Our conjecture is that the option value of entry for established firms is greater for those with generalized resources and these firms therefore enter at a lower scale to minimize the commitment associated with the option.

In summary, while our results show a statistically significant difference between established firms and start-ups in their choice of scale of entry, our expanded model shows the difficulty of identifying, measuring, and estimating their effects of particular resources on the scale of entry. On the other hand, the industry effects we hypothesized were generally supported. Our results suggest a more complex interaction between scale choice and established firm variables than we originally conceptualized. In the following section, we use the implications of our results to develop some theoretical propositions on the nature of the advantage enjoyed by established firms over start-ups.

THE ADVANTAGE OF ESTABLISHED FIRMS: FOUR HYPOTHESES

Our results suggest detailed additional propositions on how established firms and start-ups may differ in their choice of scale of entry. We expect that the differences in the scale of entry choices made by established and new entrants are related to the uncertainty facing all entrants and the ease with which resources can be transferred from one business to another.

The major difference between the established firm and the new entrant is in the variety and amount of resources available to the established firm. Access to these resources is what allows the established firm to reduce its commitment to larger plant size by 'substituting' for scale other fixed factors that are available to it. This 'substitution' hypothesis is given as:

Hypothesis 1: *Ceteris paribus*, the greater the variety and amount of resources available to an established firm, the lower the scale it will choose to enter relative to a new entrant.

In the absence of uncertainty, all entrants would know precisely what share of the market they could obtain. The greater the uncertainty, the higher the value to the established firm of 'keeping its options open' by reducing the level of its

commitment (Wernerfelt and Karnani, 1987; Bowman and Hurry, 1993). While the incentive to reduce the scale of entry also applies to the new entrant, it is unable to capitalize on the option to the same extent as the established firm since it doesn't have other factors to offset its loss of competitiveness at a lower scale. At low levels of uncertainty, the value of this option is less for both established firms and new entrants. This 'option' hypothesis is stated as:

Hypothesis 2: *Ceteris paribus*, the higher the uncertainty facing all entrants, established firms will choose to enter at lower scales than new entrants.

While the availability of resources within the established firm provides it with a potential advantage, the advantages are realized only when these resources are actually transferred and brought to bear in the new business. The more easily these resources are transferred, either because of (a) the nature of these resources, or (b) the effectiveness of organizational mechanisms used by the established firm to effect this transfer, the lower the scale at which the established firm can enter while retaining its competitiveness. This 'transferability' hypothesis is stated as:

Hypothesis 3: *Ceteris paribus*, the easier it is for the established firm to transfer resources from one business to another, the lower the scale (relative to new entrants) at which it will enter.

The above conditions all increase the firm's desire to use its resources to reduce risk and uncertainty. However, if an important source of uncertainty in the industry can be addressed by the entrant with the resource or shared activity from its parent, the outcome may be different. The presence of this resource and activity sharing may work to *reduce* the risk of entry, and *increase* the scale of entry, for this firm relative to other firms. This 'paternity' hypothesis is stated as:

Hypothesis 4: *Ceteris paribus*, the greater the presence of shared activities which allow the entrant to reduce an important source of risk faced by all entrants in the industry, the more likely that the entrant will use these resources to increase the scale (relative to new entrants) at which it will choose to enter.

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NOTES

1. Evans and Siegfried (1992) examine the factors affecting entry and exit rates across different types of manufacturing firms. Entry is classified as one of three types: Type 1: new firms with new plants; Type 2: diversifying firms with new plans; or Type 3: diversifying firms producing in an existing plant. They hypothesize and find systematic differences in the entry and exit behavior of the different types of entrants.
2. We would like to thank an anonymous reviewer for pointing out this limitation to our partial factor productivity measure of scale advantage.
3. This comparison is for the original sample prior to any adjustments needed to estimate the regression model.
4. Dunne *et al.* (1988) find that new entrant firms entering with new plants enter at 35% of the size of established firms that entered with new plants. We find that the size of the plants of established entrants are 71% of the size of new firm entrant plants. The difference is that Dunne *et al.* (1988) are summing the plant sizes for multiple plant entries. Both findings would be consistent if established firm entrants tend to enter with more plants than new firm entrants. In their sample which is based on the census for 1977 and 1982 there are 265 000 firms. According to Dunne *et al.* (1988), 'single plant firms account for 93.4% of the total number of firms but only 17.1% of the value of production. Multiplant firms, on average, own 3.59 plants and produce in 2.64 different four-digit industries, while single plant firms produce in 1.14 industries'. Thus, multiplant firms tend to have a larger percentage of output and a multi-plant entry might tend to raise the average entry scale of established firm entry relative to new entrant firms. Another difference in the sample is that an acquisition of an existing plant from a selling firm that stays in the industry constitutes entry while in our sample we only look at new plants in the industry. One last difference in the underlying samples is that the Large Establishment Database of TRINET Inc. includes all plants with more than 20 employees. The Dunne *et al.* (1988) sample deletes the smallest firms in each industry that together produce 1% of the industry's output.

REFERENCES

Bain JS. 1956. *Barriers to New Competition*. Harvard University Press: Cambridge, MA.

Biggadike R. 1979. The risky business of diversification. *Harvard Business Review* **May–June**: 103–111.

Bowman E, Hurry D. 1993. Strategy through the option lens: an integrated view of resource investments and the incremental-choice process. *The Academy of Management Review* **18**(4): 760–781.

Brush TH. 1996. Predicted change in operational synergy and post-acquisition performance of acquired businesses. *Strategic Management Journal* **17**: 1–24.

Caves RE, Khalilzadeh-Shirazi J, Porter ME. 1975. Scale economies in statistical analyses of market power. *Review of Economics and Statistics* **57**: 133–140.

Caves RE, Porter ME, Spence AM. 1980. *Competition in the Open Economy*. Harvard University Press: Cambridge, MA.

Chandler AD Jr. 1962. *Strategy and Structure: Chapters in the History of the American Industrial Enterprise*. The M.I.T. Press: Cambridge, MA.

Comanor WS, Wilson TA. 1967. Advertising, market structure and performance. *The Review of Economics and Statistics* **49**: 423–440.

Dierickx I, Cool K. 1989. Asset stock accumulation and sustainability of competitive advantage. *Management Science* **35**: 1504–1511.

Dunne T, Roberts M, Samuelson L. 1988. Patterns of firm entry and exit in U.S. manufacturing industries. *The Rand Journal of Economics* **19**(4): 495–515.

Evans LB, Siegfried JJ. 1992. Entry and exit in U.S. manufacturing industries from 1977 to 1982. In *Empirical Studies in Industrial Organization*, Audretsch DB, Siegfried JJ (eds). Kluwer Academic Publishers: Boston, MA.

Gorecki PK. 1975. The determinants of entry by new and diversifying enterprises in the UK manufacturing sector 1958–1963: some tentative results. *Applied Economics* **7**: 139–147.

Hines HH. 1957. Effectiveness of 'entry' by already established firms. *Quarterly Journal of Economics* **72**: 139–147.

Lemelin A. 1982. Relatedness in the patterns of interindustry diversification. *Review of Economics and Statistics* **64**: 646–657.

MacDonald JM. 1984. R&D and the directions of diversification. *Review of Economics and Statistics* **67**: 583–590.

Manne AS. 1961. Capacity expansion and probabilistic growth. *Econometrica* **29**: 632–649.

Montgomery CA, Hariharan S. 1991. Diversifying entry by established firms. *Journal of Economic Behavior and Organization* **15**(1): 71–89.

Penrose ET. 1959. *The Theory of the Growth of the Firm*. Basil Blackwell: London.

Peteraf MA. 1993. The cornerstones of competitive advantage: a resource based view. *Strategic Management Journal* **14**(3): 179–191.

Porter ME. 1980. *Competitive Strategy*. The Free Press: New York, NY.

Prahalad CK, Hamel G. 1990. The core competence of the corporation. *Harvard Business Review* **May–June**: 79–91.

Rubin PH. 1973. The expansion of firms. *Journal of Political Economy* **8**(4): 936–949.

Siegfried JJ, Evans LB. 1994. Empirical studies of entry and exit: a survey of the evidence. *Review of Industrial Organization* **9**: 121–155.

Stewart JF, Harris RS, Carleton WT. 1984. The role of market structure in merger behavior. *Journal of Industrial Economics* **32**: 293–312.

Teece D. 1980. Economics of scope and the scope of the enterprise. *Journal of Economic Behavior and Organization* **1**: 223–247.

U.S. Department of Commerce, Bureau of Census. 1982. *Census of Manufacturers*, *Subject Series*, *Concentration Ratios in Manufacturing*. U.S. Department of Commerce.

Weiss LW. 1963. Factors in changing concentration. *The Review of Economics and Statistics* **45**: 70–77.

Wernerfelt B, Karnani A. 1987. Competitive strategy under uncertainty. *Strategic Management Journal* **8**: 187–194.

Yip GS. 1982. *Barriers to Entry: A Corporate Strategy Perspective*. Lexington Books: Lexington, MA.