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Working Paper

Why There? Decomposing the Choice of Target Industry

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WHY THERE? DECOMPOSING THE CHOICE OF TARGET INDUSTRY

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WHY THERE? DECOMPOSING THE CHOICE OF TARGET INDUSTRY

Abstract

How do diversifying firms choose their target industries? We explore target-industry choice empirically by focusing on the relative importance of target-market characteristics and the focal firm's resources and capabilities. We avoid some key restrictions in earlier work by using a measure of relatedness that is highly general and flexible, using population-level data, and including measures of resource strength in addition to resource relevance. We find that the match between the acquiring and target firm's resources and capabilities is a much stronger predictor of diversifying entry than the attractiveness of the target market per se.

Key words

Diversification, entry, resource-based view, firm capabilities, industry attractiveness

INTRODUCTION

The existence of a diversification discount, and its nature and causes, has been a main focus of the on corporate diversification literature during the last several years. Early studies found that diversified firms traded at a discount relative to more specialized firms, or portfolios of specialized firms chosen to match the diversified firm's industries (Lang and Stulz, 1994; Berger and Ofek, 1995; Servaes, 1996), but later studies suggested that the reported discount was due to selection, not treatment (Campa and Keida, 2002; Maksimovic and Phillips, 2002; Graham, Lemmon, and Wolf, 2002; Chevalier, 2004; Villalonga, 2004a, 2004b; Santalo and Becerra, 2008). The newer papers have revived interest in the endogeneity of the diversification decision. Still, they look mainly at the decision to diversify itself, but not the diversifying firm's choice of industry. What industries do diversifying firms target, and why? This question was central to the strategy literature on diversification in the 1980s and 1990s (Lemelin, 1982; Chatterjee and Wernerfelt, 1991; Montgomery and Hariharan, 1991; Farjoun, 1994; Silverman 1999), but has received little attention in the last decade.

This paper focuses on the target-industry choices of diversifying firms, but with a twist. Our analysis is similar in spirit to the variance-decomposition literature in corporate performance (Rumelt, 1991; McGahan and Porter, 1997; Short, Ketchen, Palmer, and Hult, 2007). We examine broad patterns in large samples with highly general and flexible measures of relatedness and resources. With this approach we can identify the relative importance and tradeoffs among the variables that existing literature identifies as drivers of diversifying entry. Specifically, strategy researchers suggests that industry attractiveness (Porter, 1980, 1985, 1987) and the relevance and strength of a firms preexisting resources and capabilities (Chatterjee and Wernerfelt, 1991; Montgomery and Wernerfelt, 1988; Penrose, 1959; Rumelt, 1974) are the most important factors in the choice of target industry. But we do not know any population-level studies that quantify the marginal effects of different aspects of industry attractiveness and firm resources on the probability of entry—in other words, how managers weigh the trade-offs among these variables—and how much each variable contributes to explaining observed diversification decisions. Existing studies are limited either by sampling from a particular sector such as manufacturing or by including only publicly listed firms (Chatterjee and Wernerfelt, 1991; Silverman, 1999); by looking only at particular types of relatedness (for example, technological resources, human resource profiles, or input ratios) (Lemelin, 1982; Montgomery and Hariharan, 1992; Farjoun, 1994; Silver-

man, 1999); or by using noisy measures of relatedness based on distances between SIC codes (Chatterjee and Wenererfelt, 1991). We use large, multi-industry samples and a very general measure that captures all kinds of relatedness. Our approach also allows a robust examination of the potential interactions between firm and industry effects, an important recent theme in the empirical literature on profitability (Claver, Molina, and Tarí, 2002; Eriksen and Knudsen, 2003; Arend, 2009).

As noted above, this exercise is similar in spirit to the variance-decomposition literature on firm performance. As in that literature, we identify broad patterns in a large sample of firms and ask how much “variance” in the outcome—in this case, the choice of target industry—is explained by firm and industry effects. Of course, because our dependent variable, entry, is dichotomous, our statistical methods are different from those used in the variance-decomposition literature, rendering the analogy less than perfect. However, like that literature, our exercise can be interpreted as a horserace between industry-positioning theories, inspired by industrial organization economics, and the resource-based and capabilities views based on Penrosian growth theory and strategic factor-market theory.

To characterize target industries, and the variables explaining the choice between them, we rely on an unusually detailed population-level dataset from the first half of the 1980s, the AGSM Trinet database. Despite its age, this sample is much richer, more detailed, and more expansive than other large-sample databases such as Compustat. Unlike Compustat, Trinet includes private as well as public firms (Voigt, 1993). Compustat’s business-segment information is drawn from SEC filings, which require separate information for all segments constituting 10% or more of turnover. Trinet is a bottom-up dataset, built from establishment-level data, meaning that Trinet provides a much more detailed breakdown of corporate portfolios than what Compustat provides.

We also use a continuous, robust, survivor-based measure of inter-industry relatedness. Relatedness, a critical variable in studies of diversifying entry, is usually measured using distances in the SIC/NAICS or NACE systems. The resulting discrete measures are cruder than the survivor-based approach we employ here. Our procedure is flexible in the sense that it does not single out any particular source of relatedness to the exclusion of others. We capture relatedness by measuring how often different industries are performed together in the same firm, which means that we let local decision makers be the judge of what constitutes the relevant source of relatedness (Tece, Rumelt, Dosi, and Winter, 1994; Lien and Klein, 2009).

Our key finding is that relatedness is by far the most important variable in explaining where firms diversify. In our sample, a one-standard-deviation increase in relatedness increases the probability of entry between 25 and 29%. The next-most-important factor is entry barriers (measured as industry concentration); a one-standard-deviation increase decreases the probability of entry by 5-6%. Other measures of target-industry characteristics and firm resources and capabilities are statistically significant, but not economically significant. Overall, relatedness has by far the largest impact, accounting for about 85% of the explanatory power of our full model.

THEORY

Industrial organization economics

That profitability varies systematically by industry is one of the key empirical findings of the industrial organization literature (Bain, 1956; McGahan and Porter, 1997; Schmalensee, 1989). Incumbency is thus more valuable in some industries than others. This does not mean, however, that firms should rush blindly to enter the industries with the highest growth rates or profitability levels. Industries with higher-than-average returns are likely to have higher-than-average entry costs; in long-run equilibrium we would expect differences in returns to reflect fully the differences in entry costs, so that the expected returns from entering high-return industries should tend to equal the expected returns from entering low-return industries. Similarly, while high growth rates are good for incumbents—if entry barriers are high—high entry barriers make it difficult for entrants to capture the benefits of high growth. If entry barriers are low, high growth rates suggest numerous entry attempts, reducing the survival chances of each entrant and possibly the average return to incumbents. General heuristics such as “enter high-growth or high-return industries” aren’t quite right, because such “rules for riches” cannot exist in equilibrium.

Nevertheless, empirical evidence strongly suggests that industries are generally not in this kind of entry equilibrium, and if they are, they are not likely to remain so for long (Geroski, 1995; Baldwin, 1995). Outside equilibrium, it is precisely the tendency of firms to prefer entering high-growth, high-profitability industries that creates a force tending towards equilibrium. Assuming most industries are in disequilibrium, in this sense, variations in industry profitability and growth should significantly affect entry behavior. Entry results, of course, both from start ups, and from diversification by existing firms. Our focus here is on diversification. Firms making diversification decisions have a choice of target industries. The industrial-organization literature

suggests that firms will tend to target opportunities in attractive target markets. In his classic book *Competitive Strategy* (1980), Michael Porter explicitly argued that firms should screen potential target markets for the strength of competitive forces, and make this a key factor in entry decisions (Porter, 1980).¹

There is considerable empirical support for the strong role of target-market characteristics in entry decisions. Entry is positively associated with industry growth and negatively influenced by various types of entry barriers (Baldwin and Gorecki, 1987; Dunne and Roberts, 1991; Geroski, 1991; Kessides, 1990; Khemani and Shapiro, 1986, 1988; Mata, 1991, 1993; Salinger, 1984).² The relationship between (historical) profit rates and entry is less clear, however (Siegfried and Evans, 1994; Geroski, 1995). The ambiguous findings on this variable are not entirely surprising given that high profit levels may signal high entry costs as much as it signals high expected profits.

In our analysis we use industry growth, concentration, and profitability to characterize target-market attractiveness. Industry growth should increase the probability that a diversifying firm selects a given industry. Industry concentration, a proxy for entry barriers, should be negatively related to the probability that a given industry is targeted.³ Industry profitability, while obviously related to growth and concentration, is not fully explained by them, so we include it partly to control for other mechanisms that influence profitability (e.g. substitutes, vertical bargaining power, etc.), and partly because decision makers may use it as an important statistic in its own right. When we include industry profitability in regressions along with industry concentration, we expect it to be positively associated with the likelihood of entry.

The resource-based view

The resource-based view (henceforth: RBV) takes a different starting point. With Edith Penrose's landmark work on firm growth as the point of departure, the RBV traces entry by diversified firms to excess capacity in existing resources and capabilities (Penrose, 1959). The choice of tar-

¹ An additional argument may be that firms will systematically attempt to develop capabilities that will allow them to enter more attractive markets. Thus target market attractiveness will steer capability development. Conversely, under the RBV, capability development drives the choice of markets.

² Note that this literature as a rule does not distinguish between de novo entry and entry via diversification.

³ Santaló and Becerra (2006) find that highly concentrated industries tend to have a greater ratio of diversified to specialized firms. They suggest that this reflects situations in which the joint conditions of transaction costs (small numbers bargaining) and substantial economies of scope make diversified firms relatively more efficient than specialists.

get markets is driven primarily by considerations about the relevance and strength of this excess capacity in various applications, with the attractiveness of the target market playing a secondary role. Resource relevance is usually measured by the relatedness between the target industry and one (or more) of the diversifying firm's existing industries. A substantial literature confirms that some industries are more closely related than others, and that firms display a strong preference for diversifying into closely related industries (e.g. Lemelin, 1982; Chatterjee and Wernerfelt, 1991; Montgomery and Hariharan, 1991; Farjoun, 1994; Silverman 1999).⁴

The RBV suggests that diversifying firms should not only prefer target industries in which their resources and capabilities are relevant, but also seek ways to leverage their strongest resources as a basis for diversification. Oddly, the diversification literature pays relatively little attention to resource strength. This is particularly odd because the other main emphasis of the RBV, competitive advantage, is about resource heterogeneity (Barney, 1986, 1991; Dierickx and Cool, 1989; Peteraf, 1993). But a clear implication of the RBV is that firms are more likely to target related industries, and more likely to target industries into which they can diversify on the basis of their strongest resources. By "strong" we mean both strength relative to the other resources in the diversifying firm's portfolio, and strength relative to the resources of competitors. Both types of strength should increase the probability of entry, along with relatedness.

DATA AND METHODS

Sample

The ideal sample for this work would be a population-level sample of all diversification decisions made over some period of time. As mentioned above, the AGSM Trinet database is very close to such a sample. Trinet contains biannual records of all U.S. establishments with more than 20 employees, including variables such as 4-digit SIC code, corporate ownership, and sales. It includes 95% of all such establishments and, unlike Compustat, includes both listed and unlisted firms (Voigt, 1993).

⁴ Note that while there is disagreement as to whether related diversifiers outperforms unrelated there is little doubt over the tendency of firms to prefer related diversification.

We use the 1981, 1983, and 1985 Trinet files in our analysis.⁵ We start by comparing the 1981 and 1983 files, recording all cases in which a firm was in an industry in 1983 but not in 1981, giving us a de facto population-level record of diversification moves during that period. Note also that we *only* include firms actually making diversification moves, as our analysis focuses not on which firms choose to diversify, but what industries are targeted by diversifying firms. Next we repeat the procedure with the 1983 and 1985 files, giving us a second sample of all diversification moves between 1983 and 1985. For both samples, and for each diversification move by each firm, we construct a control group of four randomly selected possible target industries that were not chosen by that firm (and were not already present in the firm's portfolio).⁶

The resulting 1981–83 sample contains 2,592 firms that entered 6,377 new industries, along with 25,508 randomly chosen non entries (4 for each actual entry). Missing data reduces this number to 24,980, for a final sample of 31,357 cases. The 1983–85 sample contains 2,440 firms that entered 5,849 industries, plus 23,396 randomly chosen non entries, resulting in a final sample (with a few cases lost to missing data) of 29,037 cases. These are substantially larger samples than those used in prior work on entry choice.

Trinet, unfortunately, does not provide firm- or segment-level financial information (other than parent-firm sales), so we use Compustat to calculate industry profitability, as well as industry growth for 1980–81, the period before our Trinet sample begins (we use Trinet to calculate 1982–83 industry growth). Compustat, of course, includes publicly listed firms only; to see if the use of Compustat for some industry-level variables causes bias, we checked the correlation between parent sales figures for Trinet and Compustat for the period 1981 to 1985 and found a correlation of 0.893, indicating that this not a major problem. (Also, as seen below, the coefficients on industry growth is very similar across the two periods.)

⁵ Trinet also includes data from 1979, 1987, and 1989. The 1979 and 1989 files are coded differently from the other years, making it difficult to identify diversification moves. We also dropped the 1987 data because the SIC classification system was changed this year, making it difficult to determine whether a change in segment activity between 1985 and 1987 is a change in diversification or a segment reclassification.

⁶ We thus use state-based sampling, rather than including the universe of potentially enterable industries, to avoid having a sample dominated by nonentries. McFadden and Manski (1981) suggest using state-based sampling in situations when a sample is overwhelmingly characterized by one state, and demonstrate that this provides unbiased and consistent coefficients for all variables except the constant term.

Variables

Our dependent variable for each sample is dichotomous, simply the presence (entry = 1) or absence (entry = 0) of diversifying entry between the starting and ending year of the period. Our independent variables are three variables that capture industry attractiveness, three variables that capture the relevance and strength of preexisting firm-level resources and capabilities, and a set of control variables.

The first industry attractiveness variable is *industry concentration*, measured as the target industry's four-firm concentration ratio in the year preceding the entry period (from Trinet). The second is *industry growth*, measured in the two years before the entry period (i.e., growth from 1980 to 1981 for the 1983 entry sample, and growth from 1982 to 1983 for the 1985 entry sample). As stated above, we compute growth using Compustat data for the first period, Trinet data for second. In both instances industry growth is calculated as the percentage change in industry sales. For the Compustat data we use industry-segment data as well as firm-level data for single-segment firms. The third industry attractiveness variable is *industry profitability*, computed as total industry income divided by total industry assets (from Compustat data), again in the two years preceding the entry period.⁷ As with the industry-growth figures, we use industry-segment data as well as firm-level data for single-segment firms.

We now turn to the variables characterizing the relevance and strength of firms' preexisting resources and capabilities. For resource relevance, we use a survivor-based measure of *relatedness* that captures the similarity between the target industry and the mostly closely related industry in the focal firm's portfolio. Put differently, it obtains the minimum distance from any industry in the firm's existing portfolio to the potential target industry.⁸ To compute this we need a measure of the relatedness between all industries in the economy. The survivor-based approach estimates how often a given pair of industries is combined in practice, compared to the number of combinations we would expect if diversification patterns were random (adjusting for industry

⁷ We use this measure rather than average or median firm-level return on assets to get a size-weighted measure, capturing the return on the average dollar invested in the industry. Using average or median firm-level ROA yields essentially the same results.

⁸ We also experimented with including measures of how close the second closest industry is to the target industry. This variable is also highly significant and positively related to actual entry, but the coefficient is substantially smaller. When we do not report this, it is because including it means losing all observations of firms with only one preexisting industry. This would mean that we no longer have a population level study.

size). This difference captures the relatedness between any given pair of industries—industries are related to the extent that this difference is large and positive, and unrelated to the extent that it is negative. This procedure was originally developed by Teece et al. (1994) and was evaluated as a measure of relatedness by Lien and Klein (2009), who found it substantively and consistently superior to conventional methods of measuring relatedness using distance between SIC codes. While conventional measures focus on a single source or type of relatedness such as technological resources (Jaffe, 1986; Robins and Wiersema, 1995; Silverman, 1999) or human resource profiles (Farjoun, 1994), the survivor-based measure is general and flexible, capturing all sources and kinds of relatedness. The measure reflects what local decision makers perceive as related to what, and the ability of those combinations to survive the forces of competition.⁹ Details of how this measure is constructed can be found in the appendix. Note that we use the full set of all diversified firms for each year to compute the relatedness values for every industry pair in the relevant year. These values are then used to identify the highest scoring pair between any industries in the focal firm's existing portfolio and the target industry. The score of this pair constitutes our variable *relatedness*. We use Trinet data for the year preceding the entry period to calculate this variable.

The RBV suggests that firms prefer to diversify on the basis not only of relatedness, but also the strength of their relevant resources and capabilities. One measure of strength is whether the focal firm has above-average market share in the closest related industry. We calculate the variable *share strength* by measuring the market share of the focal firm in the industry most related to the potential target industry minus the mean market share of all firms in that industry, divided by the standard deviation of market share for firms in that industry. Of course, market share is not a perfect measure of resource strength, but it has the advantage of being measurable in a consistent way across all industries. Market share is also consistently reported as positively associated with economic performance (e.g. Gale, 1971; Gale and Branch, 1982; Shepard, 1972). This variable is also calculated using Trinet data for the year preceding the entry period.

Share strength measures the strength of the focal firm's resources relative to other firms. We also measure *intra-firm strength*, which is the strength of the focal firm's resources relative to

⁹ It does not, however, reveal why a pair of industries are related, i.e. what the nature of the gains from combining them are. This makes the measure flexible in the sense that it adapts to whatever is important in each case, but leaves us agnostic on what the gains are.

the other resources in its own portfolio, on the grounds that the firm will want to base expansion on the strongest of its in-house resources and capabilities. In other words; while share strength measures the strength of the resources relative to competitors, intra strength measures the strength of the relevant resources relative to other inhouse resources that could potentially be used as a basis for diversification. We assume that the businesses constituting the largest part of a firm's sales are the businesses with the strongest resources and capabilities. We construct the variable *intra-firm strength* as the share of total firm sales attributable to the industry that is most closely related to the potential target industry. The variable is calculated from Trinet data from the year preceding the entry period.

We also include firm scale and scope controls to account for the possibility that large, already diversified firms may make decisions differently than smaller, more focused firms. We control for two aspects of firm size. The first, *parent sales*, records total sales by the parent firm as reported in Trinet in the year immediately preceding the entry period (e.g. 1981 and 1983, respectively). The second is *parent diversity*, which records the number of industries participated in by the parent. This variable is also derived from Trinet in the year preceding the entry period.

The means, standard deviations and correlations of all variables are provided in table 1.

[Insert Table 1 about here]

Statistical approach

Our dependent variable is dichotomous—a potential target industry is entered or not—so we use a logistic regression. The general model is the following:

$$\begin{aligned} \text{Logit } Y = & \alpha + \beta_1 \text{ parent sales} + \beta_2 \text{ parent diversity} + \beta_3 \text{ industry} \\ & \text{concentration} + \beta_4 \text{ industry growth} + \beta_5 \text{ industry profitability} + \\ & \beta_6 \text{ relatedness} + \beta_7 \text{ share strength} + \beta_8 \text{ intra-firm strength} + \varepsilon \end{aligned} \quad (1)$$

Logit Y is the natural logarithm of the odds that an industry was actually entered :

$$\ln [p(Y = 1) / (1 - p(Y = 1))] \quad (2)$$

We have two main interests from equation (1). First, we are interested in the estimates of β_3 through β_8 . Through these we can, after suitable transformations, characterize how each affects the probability of entry or, put differently; how decision-makers weigh and trade off these different characteristics when choosing target industries. Moreover, we are interested in the contribution from the different variables in terms of explaining the dependent variable, analogous to R^2 in

linear regression. We are careful in interpreting both the variable coefficients and contributions to pseudo R^2 since logistic regression is not linear and the dependent variable is the logarithm of the odds of entry.

FINDINGS

Table 2 presents output from a series of logistic regressions. We run three sets of models. The first set, containing models 1 and 2, includes only the two control variables. Neither is statistically significant in either of the two samples. Next, we add the industry attractiveness variables. As seen with models 3 and 4 *industry concentration* is negatively signed, as expected, and *industry growth* is positively signed. Industry growth has a much larger coefficient in the second sample, but this difference in coefficient size disappears when the resource-based variables are added. What is most striking about the results of models 3 and 4 is the way *industry profitability* changes sign between the two samples. It is positive and statistically significant in the 1981–83 sample but negative and statistically significant in the 1983–85 sample. One interpretation is that unrelated diversification went out of fashion during this period. On the other hand, as seen with models 5 and 6, the negative coefficient in the second sample loses its statistical significance when the resource-based variables are added. Also, if relatedness had become more important to decision-makers during this period, we would expect the coefficient on *relatedness* to be larger in model 6 than in model 5, while it is actually slightly smaller. Finally, the negative coefficient on the control variable *parent diversity* in model 5 and 6 is also smaller in the later sample, in contrast to the idea that unrelated diversification became unfashionable. Our conclusion is therefore that high historical profitability is a weak and ambiguous signal of attractiveness. This is corroborated further below when we examine the coefficient sizes and explanatory contribution of the variables in greater detail.

[Insert Table 2 about here]

In general, in the full models 5 and 6 we can see that with the exception of *industry profitability* all the independent variables are statistically significant and have the expected signs. The coefficient sizes in model 5 and 6 are also quite similar across the two samples. All the resource-based variables are statistically significant and have the expected signs. What is also striking in Table 2 is how the model performance change. The regression with only the control variable is

not statistically significant. As we enter the industry attractiveness variables the model becomes statistically significant, with McFadden pseudo- R^2 values of 3.6% and 3.5%. When we add the three resource-based variables the pseudo- R^2 values jump to 29.8% and 25.4%. Evidently the latter group of variables contribute the most to the explanatory power of the model.

To test the robustness of these findings for unobserved firm- and industry effects, Table 3 presents conditional logistic regressions with industry fixed effects (Model 7 and 8) and firm fixed effects (Model 9 and 10). The pattern of dominance by the resource based variables is unchanged, and coefficient sizes are roughly the same.

[Insert Table 3 about here]

Table 4 presents the marginal effects of each coefficient, measured as the effect on the probability of entry of a one-standard-deviation increase from the mean of each independent variable (because logistic regression is non-linear, the coefficient estimates reported in Table 2 are difficult to interpret). We also show how the probability of entry changes when each independent variable increases from the mean by 10% and 100%. In each case we hold all other independent variables at their means.

[Insert Table 4 about here]

Table 4 shows that some of the statistically significant variables are not economically significant. Specifically, the industry attractiveness variables *industry growth* and *industry profitability* and the RBV-inspired variable *share strength* have very little impact on the probability of entry. It would take enormous changes in these variables to offset small changes in *industry concentration*, *relatedness*, or *intra strength*. Moreover, importantly for the RBV, inter-industry relatedness is by far the most important determinant of entry, quantitatively. A one-standard-deviation change in *relatedness* increases the probability of entry by somewhere between 25% and 29%. The next most important variable is *industry concentration*. A one-standard-deviation increase in *industry concentration* reduces the probability of entry by 5% to 6%. The third-most-important variable is *intra strength* (the share of total firm sales coming from the most-closely related industry). A one-standard-deviation increase in this variable increases the probability of entry by 3.24%.

We now turn to examine in greater detail the explanatory contribution from the individual variables. Following Menard (2002), we decompose the $-2 \cdot \text{Log Likelihood}$ scores from models

5 and 6 into the contribution from each independent variable.¹⁰ This is provided in Table 5 below. As seen in Table 5, 86–88% of the reduction in the $-2 \times \text{Log Likelihood}$ score comes from relatedness, 7–9% comes from industry concentration, and the contribution of the remaining variables is less than 2%. The relatedness variable is by far the most important source of the explanatory power of the results described in Table 2. The only other sizable contribution comes from industry concentration. In short, the choice of target industry is dominated by the relatedness/relevance of existing resources and capabilities, and diversifying firms show little willingness to trade off relatedness against other variables.

[Insert Table 5 about here]

The importance of resource relevance and resource strength may vary systematically with characteristics of the target industry, and the ability to understand and operate in particular types of industries could be a firm-specific capability that extends only across a limited set of related business activities. To examine these potential interactions we ran a series of regressions including interaction terms for different combinations of industry-level and firm-level variables. None of these interaction terms were significant, however. We also performed various nonparametric tests to examine whether the firms entering the most unrelated industries were more sensitive to target industry characteristics than those entering more related industries. Again, we did not find evidence of systematic interaction effects. Admittedly, including simple multiplicative terms in a logistic regression is not the ideal method for examining interactions, but we have not found a more complex approach that works well with our data.¹¹

CONCLUSIONS AND CAVEATS

Our aim here has been to explain how diversifying firms choose their target industries by decomposing the determinants of target-industry moves into external or market factors such as industry attractiveness and internal or firm-level factors such as the relevance and strength of firm-specific resources and capabilities. To do so we have examined two population-level datasets including

¹⁰ We use the backward conditional estimation procedure in SPSS to derive these estimates.

¹¹ Arend (2009) looks at the degree to which industry characteristics affect not only the first and second, but also the third moments of performance—in particular, how industry characteristics affect the kurtosis of the industry’s profitability distribution—and suggests that synergy between industry and firm effects is an important determinant of kurtosis.

virtually all diversification moves made in the US economy during the 1981–85 period, taking into account a random sample of potential target industries that were not entered. Our main finding is that decision makers seek destination industries in which existing resources and capabilities are relevant, while also considering entry costs. Our findings also support the idea that firms prefer to diversify on the basis of their largest existing businesses, which presumably contain the relatively stronger resources and capabilities in their corporate portfolios. The historic growth and profitability of the target market, and the market share performance of the firm in the closest related market, seem relatively unimportant.

We are surprised that the variable *share strength* did not have a bigger impact. This could be the result of measurement error—market share is obviously not an ideal measure of resource strength. Another possibility is that share strength is only relevant when relatedness is high. As noted above, we included interaction terms between the firm-specific characteristics and the relatedness of the potential target industry, but none of these variables were statistically significant.

Yet another possibility is that many firms making diversification decisions are trying to find new arenas to apply resources and capabilities that are performing poorly in their existing markets. This is consistent with the claim that the diversification discount is spurious, and arises because poorly performing firms are the ones most likely to diversify (Kampa and Keida, 2002; Maksimovic and Phillips, 2002; Villalonga, 2004a, 2004b). This might seem inconsistent with our argument that firms tend to diversify on the basis of the strongest internal resources and capabilities, but it might be the case that a poorly performing large business gives especially strong incentives to attempt diversification.

We do not have experimental data, so we are cautious regarding causal inference. In particular, the decision to diversify is endogenous (Kampa and Keida, 2002; Maksimovic and Phillips, 2002; Villalonga, 2004a, 2004b), so survivor-based relatedness incorporates managers' actions and beliefs. We are not too worried about reverse causality, however, as our dependent variable is measured a period after our independent variables; today's entry decisions cannot cause relatedness levels yesterday. Organizational inertia may drive firms to enter in consistent patterns over time, so that today's entry decisions are constrained by yesterday's, but our relatedness measure also incorporates the competitive selection pressures that mitigate such inertia.

Omitted variables is also a concern but, as we demonstrate in Table 3, our main findings are robust when controlling for unobserved firm- and industry characteristics using fixed-effect (clo-

git) regressions). Finally, there is the possibility of measurement error. For example, firms could cluster on similar diversification decisions, not because of relatedness, but because they are herding or under institutional pressure (Fligstein, 1991; Zuckerman, 2000; Lounsbury and Leblebici, 2004). Alternatively, firms may be positioning themselves in a manner similar to their competitors to reap benefits from mutual forbearance via multipoint competition (Karnani and Wernerfelt, 1985; Barnett et al., 1994; Phillips and Mason, 1996)..If these kinds of factors are driving diversification decisions, then what we here interpret as evidence of relatedness is really picking up something else. On this issue we follow Lien and Klein (2009, 2013) who evaluate the herding, institutional isomorphism, and mutual forbearance, and find evidence that relatedness, as measured here, seems to capture efficiency rather than noise from these mechanisms.

Still, there may be other omitted variables or measurement problems that influence our results. A population-level study such as this cannot account fully for idiosyncratic firm- and industry-specific characteristics, differences in organizational form, the prospect of diversification through alliance or partnership rather than integration, and similar factors (beyond capturing them with fixed effects). Future research should aim closer to an experimental design, by looking for example at exogenous changes in relatedness or industry profitability that affect diversification. Alternatively, more focused, intensive case studies may demonstrate how decision makers actually make diversification decisions. Here, we have made the conscious decision to report the broad patterns in the data, but we encourage future work that pursues both of these alternative approaches. Nonetheless, we think that this exercise, much like the variance-decomposition studies of firm profitability, provides valuable insight on economy-wide behaviors and trends that can direct researchers' attention to unique phenomena best studied with smaller, more focused samples.

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APPENDIX

The calculation of the survivor-based measure of relatedness between a given pair of industries is based on a procedure originally developed by Teece et al. (1994). Let the universe of diversified firms consist of K firms, each active in two or more of I industries. Let $C_{ik} = 1$ if firm k is active in industry i . The number of industries participated in by firm k is $m_k = \sum_i C_{ik}$ and the number of diversified firms present in industry i is $n_i = \sum_k C_{ik}$. Let J_{ij} be the number of diversified firms active in both industries i and j , such that $J_{ij} = \sum_k C_{ik}C_{jk}$. Thus J_{ij} is a count of how often industries i and j are actually combined within the same firm. J_{ij} will be larger if industries i and j are related, but will also increase with n_i and n_j . To remove the effect of the size of industries i and j , the number J_{ij} is compared with the number of expected combinations if diversification patterns were random.

The random diversification hypothesis can be operationalized as a hypergeometric situation where a sample of size n_i is drawn (without replacement) from a population of K firms. Those chosen are considered active in industry i . A second independent sample of size n_j is then drawn from the population the population of K firms. Those chosen are considered active in industry j . The number x_{ij} of firms active in both i and j is then a hypergeometric random variable with population K , special members n_i and sample size n_j . The distribution function for this variable is then:

$$\Pr(X_{ij} = x) = f_{hg}(x, K, n_i, n_j) = \frac{\binom{n_i}{x} \binom{K - n_i}{n_j - x}}{\binom{K}{n_j}} \quad (3)$$

The mean and variance of X_{ij} are:

$$\mu_{ij} = E(X_{ij}) = \frac{n_i n_j}{K}, \quad (4)$$

$$\sigma_{ij}^2 = \mu_{ij} \left(1 - \frac{n_i}{K}\right) \left(\frac{K}{K-1}\right). \quad (5)$$

A standardized measure of the relatedness between industries i and j is then constructed based on the difference between J_{ij} and μ_{ij} in the following fashion:

$$SR_{ij} = \frac{J_{ij} - \mu_{ij}}{\sigma_{ij}} \quad (6)$$

The measure SR_{ij} is thus a standardized measure of how much the actual number of combinations exceeds expected combinations under the random diversification hypothesis. Our variable *relatedness* is defined by identifying the highest score of SR_{ij} that can be constructed between a potential target industry and any industry the firm in question is already active in. The SR_{ij} score of that pair defines the variable *relatedness*.

Table 1: Means, standard deviations, and correlation coefficients of independent variables, 1981–83 sample

	<i>Mean</i>	<i>Stan- darddev.</i>	<i>Parent sales</i>	<i>Parent diversity</i>	<i>Industry conc.</i>	<i>Industry growth</i>	<i>Industry prof.</i>	<i>Relatedn.</i>	<i>Share strength</i>	<i>Intra-firm strength</i>
Parent sales	12,350	28,821	1							
Parent diversity	17.11	20.47	0.557 ^{***}	1						
Industry conc.	33.67	23.33	0.019 ^{***}	0.020 ^{***}	1					
Industry growth	0.20	1.08	0.003	-0.001	0.011 ^{**}	1				
Industry profitability	0.15	0.19	0.001	0.000	0.034 ^{***}	0.021 ^{***}	1			
Relatedness	8.95	9.84	0.139 ^{***}	0.236 ^{***}	-0.108 ^{***}	0.019 ^{***}	0.002	1		
Share strength	0.04	0.95	0.164 ^{***}	0.061 ^{***}	-0.005	0.002	0.006	0.051 ^{***}	1	
Intra-firm strength	0.16	0.25	-0.219 ^{***}	-0.369 ^{***}	-0.024 ^{***}	0.002	0.013 ^{**}	-0.043 ^{***}	0.209 ^{***}	1

***, **, and * represent statistical significance at the 1, 5, and 10 percent levels, respectively. N=31,357 for the 1981–83 sample.

Table 1 (Cont.): Means, standard deviations, and correlation coefficients of independent variables, 1983–85 sample

	<i>Mean</i>	<i>Standard dev.</i>	<i>Parent sales</i>	<i>Parent diversity</i>	<i>Industry conc.</i>	<i>Industry growth</i>	<i>Industry prof.</i>	<i>Relatedn.</i>	<i>Share strength</i>	<i>Intra-firm strength</i>
Parent sales	20,548	50,023	1							
Parent diversity	19.60	23.97	0.477 ^{***}	1						
Industry conc.	33.33	23.07	0.009	0.020 ^{***}	1					
Industry growth	0.32	0.54	0.000	0.001	-0.012 ^{**}	1				
Industry profitability	0.17	0.78	-0.003	-0.004	0.058 ^{***}	-0.005	1			
Relatedness	9.47	10.54	0.137 ^{***}	0.249 ^{***}	-0.105 ^{***}	0.078 ^{***}	-0.016 ^{***}	1		
Share strength	0.08	1.09	0.163 ^{***}	0.027 ^{***}	-0.013 ^{**}	-0.010	0.000	0.026 ^{***}	1	
Intra-firm strength	0.15	0.25	-0.203 ^{***}	-0.356 ^{***}	-0.029 ^{***}	0.000	-0.006	-0.057 ^{***}	0.233 ^{***}	1

***, **, and * represent statistical significance at the 1, 5, and 10 percent levels, respectively. N= 29,037 for the 1983–85 sample.

Table 2: Logistic regression output

<i>Variable</i>	<i>Model 1</i> 1981–83	<i>Model 2</i> 1983–85	<i>Model 3</i> 1981–83	<i>Model 4</i> 1983–85	<i>Model 5</i> 1981–83	<i>Model 6</i> 1983–85
Parent sales	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Parent diversity	0.000 (0.001)	0.000 (0.001)	0.001 (0.001)	0.001 (0.001)	-0.014*** (0.001)	-0.011*** (0.001)
Industry concentration			-0.023*** (0.001)	-0.023*** (0.001)	-0.023*** (0.001)	-0.022*** (0.001)
Industry growth			0.073*** (0.011)	0.194*** (0.026)	0.062*** (0.014)	0.056* (0.031)
Industry profitability			0.222** (0.089)	-0.071** (0.033)	0.232** (0.109)	-0.040 (0.032)
Relatedness					0.152*** (0.002)	0.125*** (0.002)
Share strength					0.071*** (0.017)	0.057*** (0.015)
Intra-firm strength					0.935*** (0.072)	0.891*** (0.073)
Constant	-1.374*** (0.018)	-1.380*** (0.019)	-0.737*** (0.030)	-0.764*** (0.030)	-2.328*** (0.046)	-2.096*** (0.044)
Model χ^2	0.52	0.03	1145.60***	1032.07***	9427.83***	7422.1***
McFadden R^2	0.000	0.000	0.036	0.035	0.298	0.254

Logistic regressions of the probability of entry into a potential target industry by a diversifying firm. Standard errors in parentheses. ***, **, and * represent statistical significance at the 1, 5, and 10 percent levels, respectively. N=31,357 for models marked 1981–83, N= 29,037 for models marked 1983–85.

Table 3: Conditional logistic regression output

<i>Variable</i>	<i>Model 5 1981–83</i>	<i>Model 6 1983–85</i>	<i>Model 7 1981–83</i>	<i>Model 8 1983–85</i>	<i>Model 9 1981–83</i>	<i>Model 10 1983–85</i>
Parent sales	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)		
Parent diversity	-0.014*** (0.001)	-0.011*** (0.001)	-0.012*** (0.001)	-0.005*** (0.001)		
Firm fixed effects	No	No	No	No	Yes	Yes
Industry concentration	-0.023*** (0.001)	-0.022*** (0.001)			-0.022*** (0.001)	-0.021*** (0.001)
Industry growth	0.062*** (0.014)	0.056* (0.031)			0.070*** (0.014)	0.053* (0.031)
Industry profitability	0.232** (0.109)	-0.040 (0.032)			0.233** (0.109)	-0.035 (0.032)
Industry fixed effects	No	No	Yes	Yes	No	No
Relatedness	0.152*** (0.002)	0.125*** (0.002)	0.152*** (0.003)	0.086*** (0.002)	0.155*** (0.002)	0.128*** (0.002)
Share strength	0.071*** (0.017)	0.057*** (0.015)	0.071*** (0.018)	0.057*** (0.016)	0.113*** (0.020)	0.085*** (0.019)
Intra-firm strength	0.935*** (0.072)	0.891*** (0.073)	0.996*** (0.079)	0.668*** (0.077)	0.713*** (0.099)	0.939*** (0.103)
Constant	-2.328*** (0.046)	-2.096*** (0.044)				
Model χ^2	9427.83***	7422.01***	5633.53***	3982.5***	9214.70***	7305.51***
McFadden R^2	0.298	0.254	0.253	0.197	0.358	0.308

Conditional logistic regressions of the probability of entry into a potential target industry by a diversifying firm. Standard errors in parantheses. ***, **, and * represent statistical significance at the 1, 5, and 10 percent levels, respectively. N=27,312 for models marked 1981–83, N= 25,492 for models marked 1983–85. Model 5 and 6 are reproduced from Table 2 for comparison.

Table 4: Change in the probability of entry for given changes of independent variables

	<i>+ 1SD</i> <i>1981–83</i>	<i>+ 1SD</i> <i>1983–85</i>	<i>+ 10%</i> <i>1981–83</i>	<i>+ 10%</i> <i>1983–85</i>	<i>+ 100%</i> <i>1981–83</i>	<i>+ 100%</i> <i>1983–85</i>
Industry concentr.	-5.46%	-5.40%	-0.93%	-0.91%	-7.25%	7.19%
Industry growth	0.85%	0.45%	0.01%	0.02%	0.16%	0.23
Industry profitability	0.55%	NA	0.04%	NA	0.46%	NA
Related- ness	28.89%	24.95%	1.79%	1.59%	25.40%	21.78%
Share strength	0.87%	0.81%	0.00%	0.00%	0.03%	0.04%
Intra-firm strength	3.24%	3.13%	0.19%	0.17%	1.99%	1.81%

Change in probability of entry for changes one-standard deviation, ten percent, and 100 percent changes in the independent variables, evaluated at the mean.

Table 5: Effects of adding each independent variable to Model 5

<i>Variable</i>	<i>Change in -2 * Log Likelihood</i>	<i>Significance of change</i>	<i>Percent of total of change</i>
Parent sales	0.411	0.521	0.00%
Parent diversity	157.74	0.000	1.73%
Industry concentration	702.45	0.000	7.70%
Industry growth	4.71	0.030	0.05%
Industry profitability	20.34	0.000	0.22%
Relatedness	8055.07	0.000	88.32%
Share strength	17.55	0.000	0.19%
Intra-firm strength	161.96	0.000	1.78%

Table 5 (Cont.): Effects of adding each independent variable to Model 6

<i>Variable</i>	<i>Change in -2 * Log Likelihood</i>	<i>Significance of change</i>	<i>Percent of total of change</i>
Parent sales	2.63	0.105	0.04%
Parent diversity	161.33	0.000	2.25%
Industry concentration	624.73	0.000	8.71%
Industry growth	3.16	0.075	0.04%
Industry profitability	1.79	0.181	0.02%
Relatedness	6223.11	0.000	86.73%
Share strength	14.28	0.000	0.20%
Intra-firm strength	144.18	0.000	2.01%

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Crisis, restructuring and growth: A macroeconomic perspective
SNF Report No 05/10

How do diversifying firms choose their target industries? We explore target-industry choice empirically by focusing on the relative importance of target-market characteristics and the focal firm's resources and capabilities. We avoid some key restrictions in earlier work by using a measure of relatedness that is highly general and flexible, using population-level data, and including measures of resource strength in addition to resource relevance. We find that the match between the acquiring and target firm's resources and capabilities is a much stronger predictor of diversifying entry than the attractiveness of the target market per se.



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