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Survival of high tech firms: The effects of diversity of product–market portfolios, patents, and trademarks

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ABSTRACT

High tech firms can mitigate potential risks by diversifying their product–market portfolios. A key research question is how such diversification influences firm survival. A firm exits the market in two ways, specifically, dissolution and acquisition. Here, we model how the diversity of a new firm's product–market portfolio influences the times to both types of exits. Specifically, we allow for interaction effects of the competitive intensity of a firm's environment and the diversity of a firm's product–market portfolio with its patents and trademarks. Using a competing risk hazard model, we estimate the effects of various covariates on the time to exit for 1435 US high tech firms.

We observed that a more diverse product–market portfolio, in conjunction with a larger number of patents, hastens the time to a firm's exit by dissolution (9% decrease in survival duration), while in conjunction with a larger number of trademarks, portfolio diversity delays the time to exit by dissolution (12% increase). A more competitive firm environment results in a greater effect on the portfolio's diversity in delaying its exit by dissolution (7% increase). On the other hand, a diverse product–market portfolio, combined with either a larger number of patents or trademarks, hastens the firm's exit by acquisition (19% and 11% decrease respectively).

1. Introduction

New firms, particularly those in the high tech industry, face many challenges resulting in high exit rates. While firms like 3Cube, Neteos, Officeclick.com and Tower Technology failed within a few years of their incorporation, others like Microsoft, Apple, Intuit and Imation have survived and evolved into successful, large enterprises. Still others like Transarc, Intersolv and SoftSolutions were acquired by other firms (i.e., they exited through acquisition). While many factors affect the survival of new firms, their marketing decisions are crucial to their existence. As Lodish (2001) noted, “Marketing decisions are the most important decisions entrepreneurs make—and they make them very badly.” Yet, there are few research-based insights on the effects of a new firm's marketing strategies on its survival.

New firms face uncertainties about the relative attractiveness of their offerings and the markets they serve and they attempt to mitigate the risks associated with those uncertainties by offering a range of products to diverse markets (Stevenson & Gumpert, 1985). However, new firms face resource constraints as they attempt to generate positive cash flows, even as they develop, commercialize and market new products. Hence, a key concern for new firms is their method of using scarce resources as they develop their product–market portfolios. Some researchers (e.g., Meyer & Roberts, 1986) suggest that new firms falter because of their inability to focus on a small set of product-markets, whereas others (e.g., Chaston, 2001) argue the opposite, i.e. that new firms are overly dependent on narrow product-markets. In this paper, we examine the relationship between the diversity of a new firm's product–market portfolio and its survival.

The survival of a new firm is a relevant issue from both managerial and policy perspectives. New firms are an important source of job creation in the United States and in Europe, accounting for over 70% and 40% of net new jobs in the 1990s, respectively (Bednarzik, 2000). In the United States, new firms accounted for more than 67% of all innovations and 95% of radical innovations since World War II (Kauffman Center for Entrepreneurial Leadership, 1999). Yet, estimates of firm exit rates in the United States range from 62% in the first six years to 90% in the first ten years (http://www.sba.gov). Romano Prodi, in a European Union speech, expressed similar concerns, noting that entrepreneurial activity is lower in Europe than in the US, yet Europe has twice the failure rate of the US (http://europa.eu.int).

While significant work relating the effects of marketing mix decisions of well-established firms exists (e.g. Buzzell & Gale, 1987),

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insights into new firm marketing strategies are generally restricted to market entry strategies (e.g., Golder & Tellis, 1993; Srinivasan, Lilien, & Rangaswamy, 2004). New firms face considerable uncertainties about their products' commercial viability and customer acceptance, which they manage, in part, by diversifying their scarce resources across products and markets (Ansoff, 1957). This area has seen little academic research, perhaps because most new firms are privately held with few mandatory reporting requirements, which limits data availability. Further, most new firms have negative cash flows in their early years, making it problematic to study their financial performance. We focus on the link between a firm's product–market portfolio decisions and its survival, as a means of addressing the lack of relevant financial performance information. Thus, we explore how a new firm's marketing strategy, as represented by the diversity of its product–market portfolio, influences its survival.

A firm may exit the market either by being dissolved as a legal business entity or it may be acquired by another firm. While few studies have explored different types of firm exits (e.g. Astebro & Winter, 2002; Mitchell, 1994), we were unable to locate prior work that studied the effects of a firm's marketing strategy on the timing of these two types of exit.

An important theme in the strategy literature is the fit between a firm's strategic use of its resources (Capon, Farley, & Hoenig, 1990; Gatignon & Hanssens, 1987) and its environment (Miller & Friesen, 1983) to optimize its performance. We adapt this concept of strategic fit to develop hypotheses about the interaction effects between the diversity of new firms' product–market portfolio and two key resources, their intangible technological and marketing assets—patents and trademarks, respectively—on the type and length of survival duration. We develop a competing risks survival model (Diamond & Hausman, 1984; Han & Hausman, 1990) to estimate the effects of the covariates on the two types of exit. We use data on 1435 U.S. firms incorporated between 1993 and 2002; 324 firms exited by dissolution and 226 exited by acquisition during that period.

Our results support the competing risks model of firm exit via dissolution or acquisition, compared to a model without competing risks. Although a greater diversity of a firm's product–market portfolio does not, by itself, affect its exit either by dissolution or acquisition, greater diversity combined with more patents shortens the time to dissolution, while greater diversity, in addition to more trademarks, lengthens the time to dissolution. Similarly, greater diversity plus more patents is associated with a shorter time to acquisition, and greater diversity and more trademarks are associated with a shorter time to acquisition. Hence, increasing the diversity of their product–market portfolios may be a good approach for new firms that have a large stock of either patents or trademarks and are positioning themselves for early acquisition. For a firm whose goal is sustained existence through organic growth, it may be better to choose a narrower product–market portfolio. If such firms do pursue a broad product–market portfolio, they can leverage their trademarks, rather than their patents, to prolong their survival.

We organize the paper as follows. In the next section, we develop the conceptual framework. We then describe the data collection, the model and estimation procedures, and the empirical results. We conclude by discussing the paper's contributions, summarizing its limitations, and identifying directions for further research.

2. Hypotheses

Three considerations underlie our hypotheses. First, although every firm is subject to dissolution and acquisition risks, these two types of exits are different, motivating a competing risks model formulation. Nevertheless, there may be some common drivers (e.g., diversity of product–market portfolio and its interactions with other variables) of these two types of risks. Second, our primary focus is on the effects of the firm's strategic choices (i.e., the diversity of product–market portfolio) on its survival. Therefore, we do not hypothesize the main effects of a firm's technological and marketing assets of patents and trademarks, respectively, on its exit. Third, given the limited empirical research on the marketing strategies of new firms, we look to several related literatures to frame our hypotheses. In some instances, the findings in the related literatures are conflicting. In such cases, we present the opposing arguments and resolve the conflict empirically.[3]

2.1. Diversity of product–market portfolio

Exit by dissolution. A more diverse product–market portfolio generates economies of scale in the firm's marketing activities (e.g., distribution, customer relationship management) and increases the efficiency of its research and development (R&D), manufacturing, and marketing investments (Cohen & Levinthal, 1990). In addition, in technology-intensive industries, where most new technologies fail to achieve market acceptance, a diverse product–market portfolio embedding diverse technologies may create strategic “real options” for the new firm (Kogut & Kulatilaka, 2001). For example, titanium dioxide can be formulated to be used in paint, in plastic, in toothpaste and in paper production, suggesting numerous product–market options. In such situations, a firm with a diverse product–market portfolio may leverage its multiple products/technologies, increasing its chances for survival.

However, a diverse product–market portfolio, entailing the creation, commercialization, and marketing of different products in multiple markets, could be viewed, from an organizational learning perspective, as an exploratory routine (March, 1991). The returns to exploratory organizational routines are potentially larger, but are riskier and may be lower for the firm in the short- and medium-term (March, 1991), the time horizon we study. Thus, a new firm that diversifies its product–market portfolio may be trading short- and medium-term performance for superior long-term performance, but jeopardizing its survival by hastening its exit by dissolution.[4]

Exit by acquisition. We expect a different dynamic in the relationship between the firm's diversity of product–market portfolio and its exit by acquisition. First, access to the new product development pipelines of a target firm is a key acquisition motive (Walter & Barney, 1990). A diverse product mix is attractive to potential acquirers in technology-intensive industries because of the uncertainty about which of several technological trajectories will emerge as the dominant design (Anderson & Tushman, 1990; Srinivasan, Lilien, & Rangaswamy, 2006). Thus, a firm with a diverse product–market portfolio may represent a lower risk for the acquirer firm. Second, a diverse product–market portfolio may also signal the new (target) firm's technological and marketing expertise to potential acquirers (Buono & Bowditch, 1989) increasing its desirability as an acquisition target. A diverse product–market portfolio may also increase the new firm's visibility to more potential acquirers, increasing its chances of an early acquisition. Thus, more diversity in a firm's product–market portfolio should hasten its exit by acquisition.

[3] The possibility for an endogeneity bias exists. Thus, rather than the diversification of product portfolio influencing survival duration, a firm that performs well (implying a longer survival duration) may choose to diversify its product–market portfolio. However, superior firm performance is a necessary, but not sufficient condition for product–market diversification (e.g., Hall, 1995). Furthermore, in our analysis, we cannot include all explanatory variables to control for potential endogeneity of the diversity of product–market portfolio.

[4] To rule out the possibility of a non-linear effect of the diversity of the new firm's product–market portfolio on its exit by either dissolution or acquisition, we re-estimated our model including a quadratic term; we found no support for non-linearity.