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Configurations of strategic R&D decisions and financial performance in small-sized and medium-sized firms

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ABSTRACT

This paper links the strategic decisions made in R&D during the financially turbulent period of 2009 to the firm's financial health in the period 2010–2013. The focus is on decisions made in R&D-active small and medium-sized enterprises in terms of absorptive capacity, open innovation, type of R&D, and the organizational structuring of R&D. Based on a representative set of R&D-active firms in Belgium, qualitative comparative analysis reveals that the outcomes in terms of financial performance related to optimal configurations of strategic R&D decisions depend on the firm's size and on the time-lag under consideration. Managers in small-sized firms are advised to pay particular attention to a more functionally-structured R&D approach in configurations of strategic R&D decisions. To increase medium-term financial performance, managers in medium-sized firms benefit from more engagement in research-oriented activities, more in-house innovation, and the enhancement of absorptive capacity in sets of strategic R&D decisions.

1. Introduction

The economic and financial crisis which started in 2008 was global in nature, but it particularly affected Europe (OECD, 2012). The crisis reached its peak in 2009, with negative changes in real GDP approaching −3% in the United States; −3.5% for OECD countries, and up to −4.5% in the Euro Area (OECD, 2016). From 2010 onwards, a gradual improvement took place with positive real GDP growth, but it deteriorated again in 2012 and 2013. Belgium, a small open economy in Western Europe, followed this trend with a negative real GDP growth of 2.4% in 2009, growth rates of 2.7% and 1.8% in 2010 and 2011 respectively, and stagnating (approaching 0% change) real GDP in 2012 and 2013 (OECD, 2016). This paper focuses on R&D-active firms in Belgium and links configurations of firm-level strategic decisions made in R&D in the year 2009 with the financial performance of firms in the period 2010–2013. In debate regarding the relationship between R&D and the financial performance of firms, the empirical literature is inconclusive concerning the role of firm size and time-lags between R&D inputs and financial outputs (see e.g. Kostopoulos, Papalexandris, Papachroni, & Ioannou, 2011). This paper addresses these issues by differentiating between small-sized and medium-sized firms and by including time-lags ranging from one to four years.

Venkatraman and Ramanujam (1986) refer to the multidimensional construct of firm performance including business performance, organizational effectiveness, and financial performance. Business performance measures market-related items including market share, growth, diversification and product development. It is a mixture of growth in existing business and future positioning in terms of new product development and diversification. Organizational effectiveness considers stakeholders and refers to quality and social responsibility. Financial performance is at the core of organizational effectiveness and is a necessary condition to define overall effectiveness (Bacidore, Boquist, Milbourn, & Thakor, 1997). Insights into the relationship between R&D and firm performance are limited and the results remain contradictory (Cañibano, Garcia-Ayuso, & Sanchez, 2000; Sundaram, John, & John, 1996) and depend on the time-frame under consideration (Latham & Braun, 2009). However, a positive link between innovation and financial performance can be expected for at least three reasons. First, firms responding to customer demands and impulsive consumer preferences are more likely to attain higher levels of sales and firm growth (Srinivasan, Pauwels, Silva-Risso, & Hanssens, 2009). Second, continuous innovation can yield indirect benefits in terms of being able to recognize and acquire new knowledge, with potentially new innovations leading again to financial benefits (Cohen & Levinthal, 1990). And third, the penetration of segments with high financial margins can allow the offsetting of potential costs relating to targeting and attracting new customers (Bayus, Erickson, & Jacobson, 2003).

The paper investigates what sets or combinations of strategic R&D decisions during a financially and economically turbulent period can be associated with successful outcomes in terms of the firm's future financial performance. It adds to the existing

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literature in three ways. First, attention is paid to shortcomings in the measurement of financial performance. Klingenberg, Timberlake, Geurts, and Brown (2013) question the appropriateness of return on assets (ROA), return on sales (ROS) or return on equity (ROE) — the most popular indicators used to measure financial success in terms of current profitability — to determine the link between research and the firm's financial performance. Lome, Heggeseth, and Moen (2016) use revenue growth and measure this for different time-lags over the period 2004–2009. In line with Fosfuri and Tribó (2008) and Lome et al. (2016) I use time-lagged financial indicators drawn from a separate database and an alternative measurement for financial performance is proposed based on simple intuitive models (Ooghe & Van Wymeersch, 2008). These ratios make use of four basic elements of financial health (liquidity, solvency, profitability, and value added), offer a more balanced measurement of the firm's financial position, and are largely available.

Secondly, the inconclusive empirical findings regarding the role of firm size and time-lag in the relationship between R&D decisions and financial performance are addressed (Kostopoulos et al., 2011). The focus is on a broad set of R&D decisions made during the financially turbulent period of 2009. The relationship between R&D and financial performance should be seen within a particular timeframe and depends on the period of analysis (Lantz & Sahut, 2005; Lome et al., 2016). In contrast with most studies that — due to data constraints — focus on short time-lags, time-lags up to four years are included to study the relationship between these R&D decisions and financial performance (in line with Nooteboom, Vanhaverbeke, Duysters, Gilsing, & van den Oord (2007) and Lome et al. (2016)). The firm size dimension is addressed by focusing on small-sized and medium-sized firms and by distinguishing between both size groups.

Thirdly, R&D is a broad concept and over the past decades, ample attention has been paid to management-related and organizational aspects of R&D. Insights from the literature on open innovation (Chesbrough, 2003), absorptive capacity (Cohen & Levinthal, 1990), the functional organization of R&D (Engelen & Brettel, 2012), and the focus on R versus D (OECD, 2002) are integrated. Since little is known about the interplay between these strategic dimensions, qualitative comparative analysis (QCA) is relied upon to investigate the relationship between sets of managerial R&D decisions and the financial performance of firms. Following Ragin (2008) and Woodside (2013) — fuzzy-set — QCA is used to analyse multivariate data. QCA makes it possible to examine the relationship between the outcome variable (financial performance) and all binary (Boolean) combinations of multiple R&D strategy-related predictors. This approach makes it possible to bring forward different combinations of causal variables providing separate pathways to arrive at given outcomes (or "equifinality" — see e.g. Wu, Yeh, Huan, & Woodside, 2014). QCA enables multiple pathways to an outcome and is highly appropriate to test models (each possible combination of factors at specific levels with a given outcome) involving a multitude of interacting factors. The QCA approach is highly relevant in strategic management research because it provides the ability to analyse complex relationships between different corporate-level mechanisms in predicting business success (Greckhamer, Misangyi, Elms, & Lacey, 2008).

The analysis is based on a representative sample of small-sized and medium-sized firms described as being R&D-active in 2009 in the official R&D repertory of the OECD business R&D survey for Belgium. Financial performance is taken from the firms' annual accounts for the period 2009–2013.

Section 2 reviews the literature on the relationship between the underlying strategic R&D dimensions and financial performance at firm level. Section 3 presents the empirical model and data. The results of the empirical analysis can be found in Section 4. Conclusions are made in Section 5.

2. Literature review

The literature review presents insights into the relationship between R&D and the financial performance of firms. Next, it addresses the theoretical arguments linking the four strategic R&D decisions to the firm's financial performance. It concludes by presenting the research framework.

2.1. R&D and the firm's financial performance

In comparison with innovation, the relationship between R&D investments and firm performance needs to be seen in a longer-term perspective. Lantz and Sahut (2005) report a short-term negative relationship between R&D investments and financial return. They highlight the role of R&D expenditures to 'announce' the strategic positioning of firms, but also indicate that these expenditures can significantly decrease financial performance in terms of net income, return and risk. Lome et al. (2016) report differences in the correlation between R&D and the firm's revenue growth depending on the time-lag under consideration. They report stronger effects after a three year time period. Innovating firms, in general, have strong growth, but potentially incur problems of liquidity and even bankruptcy, in particular if these firms are small and do not have the financial strength to absorb a crisis. This is especially the case in specialized laboratories in the manufacturing industry and for technological companies whose activities are based on the economic exploitation of R&D results (Lantz & Sahut, 2005). Also, involuntary spillovers can allow competitors to gain competitive advantage at a lower cost by means of imitation.

Cañibano et al. (2000) report a positive relationship between R&D expenditures and future firm profits, whereas Sundaram et al. (1996) arrive at the opposite conclusion. One of the factors explaining different results is that the findings depend on the period of study (Lantz & Sahut, 2005). Recessions represent one of the most significant environmental threats to an organization's continued profitability and survival (Pearce & Michael, 2006), and a firm's effective management of financial resources may be particularly amplified within such a context. Two opposite views exist (Audia & Greve, 2006). According to prospect theory, risk-taking will be stimulated when facing impending losses implicated by threatening environments (Kahneman & Tversky, 1979). By contrast, threat-rigidity suggests risk aversion behaviour and a tendency to focus on protection of the organization's position (Sitkin & Pablo, 1992). Latham and Braun (2009) reveal an important timing dimension. They find that firms with a higher degree of slack resources react more slowly to economic shocks, but by transferring resources to strategic activities (especially R&D) during recession, managers can smooth over short-term disturbances in the environment and speed recovery to secure a post-recessionary head start.

2.2. Strategic R&D decisions

In the R&D and innovation management literature, four relevant strategic R&D decisions can be identified when studying the relationship between R&D and financial performance. These include absorptive capacity, type of R&D, internal organization of R&D activities, and degree of openness in the R&D strategy.

2.2.1. Absorptive capacity

The tacit nature of innovation and the risks associated with loss of technological competitiveness require sufficient internal R&D activity (Cohen & Levinthal, 1990). The resource-based view of the firm demonstrates how innovation depends on the development and accumulation of internal capabilities (Spithoven & Teirlinck, 2015).

To absorb knowledge from the external environment, a firm needs organizational integration in which employees function as