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The effect of R&D on performance: Do R&D-intensive firms handle a financial crisis better?

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ABSTRACT

This empirical study investigates the effect of a high R&D intensity on performance during a financial crisis. Though the general positive connection between R&D and subsequent growth is well known, existing literature provide managers with limited guidance about the particular role of R&D in a recession. Using binary logistic regression on a sample of 247 Norwegian manufacturers, we find that firms who devoted considerable resources to R&D activities performed significantly better than other firms through the late 2000s financial crisis. This connection was even stronger than the one found during a period of normal growth, implying that the importance of R&D is accentuated during a crisis. We provide several possible explanations for this. This study also addresses gaps in the literature relating to the time lag between R&D investment and effect on revenue. We find a gap of two years, with an even stronger effect after three years.

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1. Introduction

There seems to be a general consensus in the literature that R&D has a positive effect on firm performance. However, knowledge about the effect of R&D activities on growth during a recession is scant and offer limited guidance to managers (Lilien & Srinivasan, 2010). Even though it has been argued that innovative activities are one of the main ways for firms to adapt to changing environments (Schoonhoven, Eisenhardt, & Lyman, 1990) and that knowledge-based resources are of greater importance in turbulent environments (Heeley, King, & Covin, 2006), hardly any studies have considered the role of R&D in handling a financial crisis. As recessions increase the environmental complexity, it means that firms constantly need to adapt to changing and unpredictable conditions. The dynamic capabilities needed to handle this and act on new opportunities are not necessarily the same as those needed to handle stable environments. Given the importance of knowledge about these matters, and the vast literature concerning the role of R&D in growth periods, this apparent gap is surprising.

In order to properly investigate the relationship between R&D activities and firm performance, it is important to first examine the time lag between R&D investment and its effect. R&D investment does not lead to immediate tangible results (Coad & Rao, 2010), and as pointed out by Pakes and Schankerman (1984) lags exist both in the development and commercialization of a R&D project. For managers comparing the expected returns of R&D to other investments, the length of this gap is of great interest. Unfortunately, knowledge about the time it takes from the R&D outlay to increased revenue is scattered, limited, and usually based on US data (Kafouros & Wang, 2008). Managers are therefore put in a difficult position not knowing when that extra dollar spent on R&D can be expected to show up on the top line.

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This article sets out to investigate how R&D investments helped firms cope with the late 2000s financial crisis, and whether the importance of R&D activities increase in recessions. We also want to address the gap presented by Kafouros and Wang (2008) and determine the time span managers can be expected to wait before R&D efforts make significant contributions to revenue growth. The goal is to provide managers with empirical evidence of the connection between R&D and growth that can aid them in the strategic allocation of scarce resources in the face of a recession.

This article proceeds with a section outlining the theoretical background, followed by a methodology chapter. The subsequent section provides the results from our analysis, before these results are discussed in light of the theoretical background. The article concludes with practical implications for business practitioners and future research.

2. Theoretical background

According to the resource-based view (Barney, 1986, 2001; Wernerfelt, 1984), a key determinant of firm performance is its ability to accumulate and apply the appropriate types of resources: firms that possess and combine resources which are valuable, rare, immobile and difficult to imitate are more likely to sustain a competitive advantage (Barney, 1991). In this perspective, R&D investments may be seen as additions to the firm's stock of knowledge, as it is an important resource both for creating innovations and developing knowledge capabilities (Somaya, Williamson, & Zhang, 2008). Similarly, Stam and Wennberg (2009) point out that R&D has "two faces": the conventional role of stimulating innovation and the enhancement of technology transfer by improving the firm's absorptive capacity, its ability to identify, assimilate and exploit outside knowledge. This was investigated by Cohen and Levinthal (1990) and Griffith, Redding, and Van Reenen (2004) who found evidence that R&D improves the firm's absorptive capacity and accelerates organizational learning, subsequently improving firm performance.

As noted by Cohen and Levinthal (1990), R&D can be seen as input into the production of firm-specific knowledge. R&D knowledge is intangible by nature and therefore difficult to replicate (Kostopoulos, Spanos, & Prastacos, 2002). As pointed out by Hitt, Bierman, Shimizu, and Kochhar (2001), intangible assets are more important from a strategic point of view as they are more likely to fulfill the requirement necessary for producing a sustainable competitive advantage. Additionally, the very nature of R&D knowledge is tacit and firm-specific. While the specific technology resulting from R&D may be traded, the idiosyncratic nature of a firm-specific asset precludes its tradability in open markets (Williamson, 1979). In total, R&D activities seem to lead to the development of resources which are unique, rare, immobile and difficult to imitate. Thus, investments in R&D are likely to lead to improved firm performance.

The connection between R&D activities and subsequent performance has been the subject of many empirical investigations, and studies across countries and industries seem to confirm the notion of R&D activities as a positive predictor for firm growth: in a study of 500 Italian manufacturing firms, Del Monte and Papagni (2003) found a significant difference in revenue growth rates of firms who performed R&D activities and those who did not. Lee and Shim (1995) compared the influence of R&D on firm growth in Japanese and American high-tech manufactures and concluded that the strength of this relationship was positive and similar for the two countries. Other empirical studies have confirmed the positive relationship for different performance indicators, such as revenue (Garciá-Manjón & Romero-Merino, 2012; Leonard, 1971; Zhao & Li, 1997), productivity (Griliches, 1985; Klette, 1996; Wakelin, 2001; Wang & Tsai, 2004) and profits (Leonard, 1971). In total, the empirical evidence clearly point to R&D as a positive influence on subsequent growth.

2.1. The effect of R&D in a financial crisis

There seems to be a general consensus in the literature, both from resource-based theories and empirical findings, about the positive effect of increased R&D activities on performance. However, limited attention has been given to whether this effect is also present during a recession. Do firms with high R&D investments fare better through a financial crisis? As pointed out by Lilien and Srinivasan (2010), in an empirical investigation of expenditures during recessions, existing literature on the appropriate R&D level in recessions offer limited guidance to managers. In developing an argument, we therefore have to rely on a wider range of literature. Dynamic capabilities refer to the firm's ability to integrate, build and reconfigure internal and external competences to address rapidly changing environments (Teece, Pisano, & Shuen, 1997). According to Wang and Ahmed (2007, p. 18), innovation is a key component of the dynamic capabilities concept, as it "underpins the firm's ability to integrate, reconfigure, renew and recreate its resources and capabilities in line with external change". The importance of dynamic capabilities may thus be accentuated during a financial crisis, as it is a time with high external change. Because R&D both is and contribute to building the firm's dynamic capabilities, R&D activities may make the firm better suited to handle a financial crisis.

Wang and Ahmed (2007) further outline adaptive capability, the firm's ability to identify and capitalize on emerging market opportunities (Miles & Snow, 1978), as another main component of dynamic capabilities. This can be of great help in a recession: even though recessions entail contractions in the demand, new opportunities arise for firms who are able to identify and grasp them. Kitching, Blackburn, Smallbone, Dixon (2009) and Kitching, Smallbone and Xheneti (2009) pointed out that recessions create opportunities for businesses in several ways: it decreases asset prices, purchasers often switch to new suppliers, and the exit of some firms leaves the survivors to compete for their "vacant share". Schumpeter (1950) argued that recessions could provide a platform for innovation, unleashing a process of "creative destruction". This would launch new technologies, remake existing industries and give birth to entirely new ones. Thus, it is clear that ample opportunities exist even during recessions, but the turbulent environment makes it more difficult to adapt and seize them. Freel (2000) noted that the presence of R&D activities creates an organization that is propitious to questioning, making them better at identifying and exploiting new

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