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Short- and long-run effects of internationalization and R&D intensity on firm performance

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ABSTRACT

Investing in building new knowledge and capability is likely to benefit a firm in the long run but has a negative effect on the firm's short-term performance. Firms that exploit their knowledge base across foreign markets better than their competitors should have superior firm performance. Using a dataset that covers all non-financial firms listed on US stock exchanges during the period 1990–2013, we show that the level of R&D intensity is negatively associated with operating performance and is positively correlated with firm value. The negative effect of R&D intensity on ROS is evident for high R&D firms and is not evident for low R&D firms. The level of internationalization has no effect on ROA, a positive effect on ROS, and a negative effect on both stock returns and Tobin's Q. Furthermore, we document some evidence for the moderating effect of internationalization on the relationship between R&D intensity and firm performance.

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1. Introduction

Innovation activities have been recognized as the most essential tasks for a firm to stay competitive and profitable.[1] A firm's innovation relies largely on its stock of knowledge that is accumulated through knowledge flows embedded in various activities within the firm. Of the numerous activities that a firm performs to build up its knowledge stock, conducting research and development (R&D, henceforth) and engaging in internationalization are regarded as two prevailing activities that can help a firm toward this aim (Chandler, 1994). In the United States, our sampled firms' R&D expenditure on average accounts for about 7% of their total assets during the period 1991–2013. There is a large increase in R&D expenditure over time, given that the mean ratio of R&D expenditure to total assets is about 3.7% in 1991, almost triples itself to about 10% in the late 1990s, and remains at around 7% until the early 2010s. In addition, there is an increasing degree of internationalization for U.S. firms, as the mean ratio of foreign sales to total sales is around 18.4% in 1990 and becomes 34.8% in 2013. These numbers clearly indicate the importance of R&D activities and internationalization for the U.S. firms. However,

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[1] See, for example, Grant (1996), Kessler and Chakrabarti (1996), and Erden et al. (2014) for a discussion of the effects of knowledge/innovation on competitive advantage and firm performance.

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they become less profitable over time, as the mean ROA is about 10% in the early 1990s and decreases to 2–3% in the early 2000s.

In this article, we contend that knowledge and innovation (e.g., as a result of R&D activities) improve firm performance in the long run and that firms that exploit their knowledge base across foreign markets relatively better than their competitors should have superior firm performance. Based on this logic, an international expansion strategy may not only have the direct effect on firm performance but may also have the moderating effect on the effect of R&D intensity on firm performance. That is, firms that expand their activities overseas can be seen as exploiting their knowledge base. With this view in mind, we consider R&D intensity as means by which firms engage in both explorative and exploitative forms of knowledge acquisition. Naturally, given a set of limited resources, there is a trade-off between explorative activities and exploitative activities. Investing in building new knowledge and capability is likely to benefit a firm in the long run but has a negative effect on the firm's short-term performance. Focusing on exploitative activities without sufficient investment in building knowledge and capability for the future may improve firm performance in the short run but is likely to have damaging performance consequences in the long run. In a nutshell, our interest lies in examining whether the level of internationalization moderates the effect of R&D intensity on short-term and long-term firm performance.

While the joint effect of R&D and internationalization on firm performance has been examined by other scholars (e.g., Chakrabarty and Wang, 2012; Filatotchev and Piesse, 2009; Zhang et al., 2007), results from different studies have not been consistent, indicating a more complex interaction between these two activities. Due to the substantial investments allocated to R&D as well as to international expansion, as well as the significant risks associated with both sets of activities, our study contributes to this important line of inquiry by examining these joint effects from a large dataset that covers all non-financial firms that are listed on US stock exchanges over the period 1990–2013. In doing so, we apply several alternative measures of R&D, internationalization, and of firm value to assess the robustness of the results.

In developing our model of the moderating effects of internationalization on the relationship between R&D and firm value, we draw upon and integrate theory and concepts from the strategy and international business literature (see e.g., Benner and Tushman, 2003; Grant, 1996; Nielsen and Gudergan, 2012; Tanriverdi and Venkatraman, 2005; Uotila et al., 2009). More specifically, we mainly employ a knowledge-based view of the firm and regard R&D and internationalization as means for firms to build up their knowledge stock toward developing a competitive advantage that lends to superior firm value. Empirically, we measure short-run firm performance as firm operating performance (measured as return on assets (ROA) or return on sales (ROS)) and define long-run firm performance as firm value (measured as stock returns and Tobin's Q).

Key findings of our paper can be briefly summarized as follows. First, the level of R&D intensity is negatively associated with firm operating performance (measured as ROA or ROS) and is positively associated with firm value (measured as annual stock returns or Tobin's Q). These findings are consistent with our hypothesis that R&D projects cause operating performance to deteriorate in the short run but improve the firm's competitive advantage and thus increase the value of the firm. Accordingly, these results provide further empirical support to the knowledge-based theory of the firm.

Second, the level of internationalization generally has no direct effect on ROA, a positive effect on ROS, and a negative effect on stock returns and Tobin's Q. These findings point to the notion of the liability of foreignness associated with an internationalization strategy. While venturing into foreign markets might help the firm improve its profitability (as measured as ROS) through economies of scales or economies of scope, the internationalization expansion might not necessarily be a positive-value-creating strategy from investors' perspective. For instance, levels of complexities arising from an internationalization expansion might become too high for some firm to cope with, resulting in the expected deterioration of firm performance in the future, which corresponds to lower firm value.

Third, we also find that the relationship between R&D intensity and firm operating performance is negative for high R&D firms (i.e., firm with R&D intensity higher than the industry-year median of R&D intensity) and is positive for low R&D firms (i.e., firms with R&D intensity equal to or lower than their industry-year median level). One plausible explanation for these findings is that the high R&D firms tend to often invest in large R&D projects that span over a long period of time, causing the relationship between R&D intensity and operating performance to be negative. On the other hand, the low R&D firms possibly invest in smaller and short-term R&D projects and thus might be able to quickly reap benefits from the R&D projects, causing the relationship between R&D intensity and operating performance to be positive.

Fourth, the negative effect of R&D intensity on ROA is evident for both small and large firms while the negative effect of R&D intensity on ROS is evident only for small firms (i.e., firms with total assets equal to or smaller than the industry-year median of total assets). Fifth, the positive effect of R&D intensity on stock returns and Tobin's Q is observed across different firm size samples. Overall, this set of findings suggests that investors appear to value the long-term benefits of R&D investments across different firm sizes.

Sixth, we also show that firms with high excess R&D intensity appear to have poorer firm operating performance. The findings suggest that the basic finding that R&D intensity has a negative effect on firm performance in the short run is robust to using alternative measure of R&D intensity. Lastly, there is some weak evidence for the moderating effect of internationalization on the relationship between R&D intensity and firm performance.

Our findings provide empirical support to the notion that while R&D activities have a negative effect on firm performance in the short run, they improve firm value and that while internationalization levels have a positive effect on ROS, they have a negative effect on firm value. One plausible explanation for our findings is that firms do not benefit directly from

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