



Factors affecting firm's R&D investment decisions[☆]

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ABSTRACT

This study investigates the decision factors regarding R&D investment activities. The subjects in this empirical study are from the countries of Taiwan, Japan, and Korea, which are all similar in the level of regional economic development and technology manufacturing. The research samples consist of the financial statements of public companies or OTC manufacturing companies trading in the above three countries, which are from the database of Compustat and TEJ. Through a literature review, this study focuses on a discussion of seven major factors that influence the decision making underlying the R&D investment process along with treating R&D investment behavior as a function of internal resources, such as financial, tangible and intangible resources. The main objectives of this study are to understand the R&D investment strategies of the three countries, to focus on specific internal strategic resources that explore the firms' R&D investment behavior, and to provide results to determine whether company size and intangible resources (such as goodwill, patents, and human and business resources) are important factors that affect the overall decision-making process of investing in R&D activities. The findings of this paper can serve as a valuable reference in academic research and the strategic thinking behind sustainable businesses.

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1. Introduction

East Asia usually refers to Japan, China, and the four NIEs (Korea, Taiwan, Hong Kong, and Singapore) as well as four ASEAN countries (Indonesia, Malaysia, the Philippines, and Thailand). Due to the rapid economic growth of these countries in the last decade, many scholars explore their total factor productivity (TFP) in order to observe their economic performance (Ang & Madsen, 2011; Mahmood & Afza, 2008). The relationship between research and development (R&D) and total factor productivity becomes an important research topic (Romer, 1986), as their growth rates are often as a technological progress indicator. Therefore, R&D and TFP may have a direct relationship (Ang & Madsen, 2011; Hall & Mairesse, 1995). In the decision-making process of R&D, companies naturally take their own certain characteristics into account, such as a company's TFP level and expected future production (Bravo-Ortega & García Marín, 2011).

Most of the empirical work focuses on Hong Kong, Korea, Singapore, Taiwan, and Japan (Ang & Madsen, 2011; Mahmood & Afza, 2008). These countries are the leading pioneers in economic growth within

the East Asian region, with Japan, Korea, and Taiwan being relatively close in terms of economic development and technology manufacturing. These three similar economies experience nearly three decades of rapid economic growth (Hung & Tang, 2008). Moreover, the similarities in the three countries include human and physical capital investment, average income and assets, and the rapid growth of exports. Although Japanese companies have the highest average level of TFP, the overall growth rate of TFP in the past two decades is relatively slow. On the other hand, the TFP growth rate of companies within certain industries in Taiwan and Korea is greater than Japan's (Fukao, Inui, Ito, Kim, & Yuan, 2011). In other words, these three countries are superior than other East Asian countries to the extent of the economic development and technology manufacturing.

Similarly, all three countries locate geographically in northeastern Asia, have relationships between competition and cooperation, and have a dominating position in high-tech and machinery-related manufacturing industries (Fukao et al., 2011; Hung & Tang, 2008). Therefore, the comparability between companies in these three countries in terms of R&D investment activities is beneficial to this study (Hung & Tang, 2008; Liu & Hsu, 2006).

According to the literature review of these three countries regarding R&D investment research, the focus is on business performance (Han & Chuang, 2011; Lee & Marvel, 2009), equity structure or corporate internal governance mechanism (Kim, Kim, & Lee, 2008; Kim & Park, 2012), the correlation between multinational companies and R&D investment decisions (Todo & Shimizutani, 2008; Tomiura, 2007), and governmental

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policy (Lee & Cin, 2010). Several articles summarize the major factors that affect R&D investment. According to the resource-based view (Barney, 1991; Wernerfelt, 1984), the difference in company performance comes from the long-term accumulation of internal specific resources and abilities within the organization, with the end goal of gaining more competitive advantages than the other companies in the industry. Therefore, this study focuses on the companies' controllable factors of internal specific resources and abilities and the importance of linking the R&D investment strategies. Galende and Suarez (1999), and Galende and Fuente (2003) also emphasize that the current rapid changes within the market, the internal specific resources of a firm, constitute a very important resource in the decision-making process when investing in R&D activities. Hence, the controllability of internal factors is far more important than the external factors. Furthermore, the resource-based view also suggests that R&D investment behaviors can be a function of internal resources, and these specific or strategic resources can determine the performance of a company (Barney, 1991; Wernerfelt, 1984). As a result, this study uses a literature review to focus on the discussion of internal resources by summarizing the internal factors that may affect R&D investment decisions before conducting an empirical study to illustrate how these important factors affect decision making of R&D investment activities.

2. Research hypotheses

This study finds that the controllability of the internal factors is far greater than that of the external factors (Galende & Fuente, 2003; Galende & Suarez, 1999), and therefore it focuses on the discussion of internal resources and factors. Moreover, by referring to the relevant literature, this study elaborates on the relevant research hypotheses and summarizes seven research hypotheses, as shown below.

An enterprise's financial situation is vital to the short- and long-term development of a company. Bhagat and Welch (1995) find that R&D and the previous year's asset-liability ratio have significant and positive correlations, and thus the enterprise's financial resources greatly affect the enterprise's tendency to engage in R&D activities. Investing in R&D activities requires capital resources; hence, when there are ample self-owned assets, the opportunities for investing in R&D activities will increase (Kim & Park, 2012; Kim et al., 2008). Thus, this study proposes the following hypothesis:

H1. Higher corporate financial autonomy will more effectively encourage investment in R&D activities.

An important internal determinant factor of investing in R&D is profitability (Coad & Rao, 2010). As R&D involves a high degree of risk and uncertainty, from the internal perspective of the enterprise, it generally requires a large amount of capital and long-term financial support. The companies that successfully support investments in R&D using company profits will expect to take financial risks relating to R&D by this model (Coad & Rao, 2010; Lev & Sougiannis, 1996). Therefore, this study proposes the following hypothesis:

H2. A higher degree of enterprise revenue or profitability will lead to more active R&D investment activities.

According to Fishman and Rob (1999), larger companies often have more capital with better management capabilities and, therefore, have more investments in R&D. Galende and Suarez (1999) also suggest that the larger companies are more likely to engage in R&D. Relevant empirical results also suggest that R&D expenditures will increase when sales and the number of employees increase (Park, Jaeun, & Kim, 2010; Tsai & Wang, 2004). Therefore, this study proposes the following hypothesis:

H3. Larger companies are more willing to invest in R&D-related activities.

Many scholars also find that a company's capital structure can also affect an enterprise's expenditure on R&D (Dalziel, Gentry, & Bowerman, 2011; Galende & Suarez, 1999). When the tangible resources of the enterprise are more valuable, they are more conducive to technological innovative investments. In the analysis of tangible resources of an enterprise, in addition to company size, it is necessary to measure the company's dependence on tangible assets such as the use of fixed assets and investments. Therefore, this study proposes the following hypothesis:

H4. A higher depreciation of an enterprise's capital structure will lead to a higher willingness to invest in R&D-related activities.

An enterprise's intangible assets include patents, goodwill, and brands. Arora, Ceccagnoli, and Cohen (2008) find that investment activities in R&D and profitable patents have a significant and positive relationship. Weerawardena, O'Cass, and Julian (2006) also find that a higher degree of innovation leads to a better brand performance. Therefore, an enterprise's goodwill and patents have a close relationship with investments in R&D. Hence, this study proposes the following hypothesis:

H5. Better enterprise goodwill and a higher degree of accumulated patents can lead to a higher degree of R&D activities.

If the human resources value of an enterprise is higher, the technological sensitivity and knowledge spillover effect can promote the absorption of information during the R&D process (Galende & Suarez, 1999). The research findings of Fleming (2001) also suggest that an enterprise's technical staff that have knowledge of technological fields can increase the opportunity of integrating knowledge to create new technology and development of R&D activities. Such human resources indicate that the integration of skills and knowledge in an organization can have a positive impact on the R&D activities of the enterprise (Coad & Rao, 2010; Fleming, 2001). Thus, this study proposes the following hypothesis:

H6. Better enterprise human resources can lead to a higher engagement in R&D activities.

Competition in international markets is fiercer than that in the domestic market. Wakelin (1998) distinguishes between companies with innovative activities and companies without innovative activities, finding that companies with investments in R&D have a higher level of exports than companies without investments in R&D. Relevant empirical results also show that an enterprise's export activities and expenditure in R&D have a positive correlation (Park et al., 2010; Tomiura, 2007). Therefore, we proposes the following hypothesis:

H7. Business resources such as an enterprise's export activities will positively affect the investment amount in the enterprise's R&D.

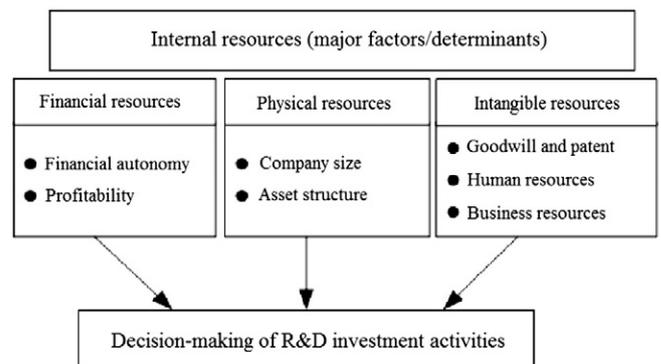


Fig. 1. Research framework.

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