



Does technological diversification matter to firm performance? The moderating role of organizational slack[☆]



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ABSTRACT

The first decade of the twenty-first century has witnessed a significant increase in technology strategy research related to innovation capacity and technological diversity. Recent studies in the field of innovation capacity investigate whether the underlying performance differential among firms is attributable to organizational slack resources. However, few scholars have examined the relationship between corporate technological diversification and firm performance with the moderating effect of organizational slack. In acknowledging the increasingly important role of the Taiwanese smart phone sector, this study follows the contingency approach to explore the impact of a strategic orientation toward corporate technological diversity on Taiwanese smart phone firms' performance in the context of different organizational slack conditions, absorbed and unabsorbed slack resources. The results of hypothesis testing confirm the existence of a significant and negative relationship between technological diversification and firm performance in terms of Tobin's *q* and MVA, but not of ROA and EVA. In addition, the organizational slack of a company moderates the relationship between technological diversification and firm performance in terms of EVA and MVA, but not of ROA and Tobin's *q*. The current findings indicate that Taiwanese smart phone firms adopting a different approach to technological diversity could utilize different slack resources to improve their firm performance. Based on different types of slack resources, the current results of different moderating roles of organizational slacks in affecting firm performance support the predictions of technological diversity and organizational theory.

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1. Introduction

The first decade of the twenty-first century has witnessed a significant increase in technology strategy research related to innovation capacity and technological diversity (Battistella, Biotto, & De Toni, 2012; Chen, 2010; Huang & Chen, 2010; Huang, 2010; Lisboa, Skarmas, & Lages, 2011). In terms of the innovation capacity issue, organizational slack resources are the firm-specific resources that can provide the flexibility to create and generate new resources or strengthen and extend existing resources for the achievement of organizational goals (De Carolis et al., 2009). Recent studies have investigated the relationship

between organizational slack resources and innovations in different approaches (e.g., Greve, 2007; Voss, Sirdeshmukht, & Voss, 2008; Yang, Wang, & Cheng, 2009). Thus, owing to the increasing importance of innovations to the competitive advantage of firms, previous research investigates whether the underlying performance differential among firms is attributable to organizational slack resources (Breschi, Lissoni, & Malerba, 2003; Garcia-Vega, 2006; Huang & Chen, 2010). However, few scholars have examined the relationship between corporate technological diversification and firm performance with the moderating role of organizational slack. Distinguishing how different organizational slacks influence the innovative activities is necessary and valuable (Nohria & Gulati, 1996). It is helpful to use a contingency perspective to specify the natures of different slacks when discussing their impacts on organizational outcomes (Tan & Peng, 2003), and innovation strategy (Huang & Chen, 2010). For example, Chen and Huang (2010) identify the moderating role of organizational slack on the innovation. Therefore, this study shifts the focus of attention from innovation performance to firm performance and examines how much the impact of organizational slack explains the effect of technological diversification on firm performance in the smart phone industry, which is the representative of consumer electronics' innovations, and has become very competitive and has demonstrated outstanding performance since the late 2000s.

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Ever since Apple Inc. launched the iPhone on June 29, 2007, the smart phone industry has surged. Even during the global financial crisis in 2008–2009, sales of smart phones continued to increase and resulted in total sales of 40,962,800 handsets, representing a growth of 27%, while other consumer electronic products encountered serious declines in that period (Market Intelligence & Consulting Institute, 2010). Beginning with the Blackberry model launched by RIM, smart phones have not only included the features of a mobile phone, music player, and digital camera, but also integrated the functions of software applications that are Internet-based. These features have not only satisfied the needs of businessmen around the world, but also fueled the demand from the public. With the good user experience of the iPhone and RIM, Google, the dominant Internet search engine player, has also entered the smart phone market by launching the Android platform with 33 related open handset alliances. While Apple, Nokia and RIM use the closed system to position themselves in the smart phone market, Google uses open source way to create the possibility for innovations in the smart phone industry.

Along with the structural characteristics of highly competitive dynamics, the smart phone players have taken many competitive actions/reactions to gain more competitive advantages in the market. For example, the patent lawsuit is an important strategy for a smart phone company to attack or respond to other's business behavior. The Finnish mobile phone giant Nokia sued the U.S. smart phone company Apple in the U.S. Delaware federal court in October 2009 because of iPhone infringements of Nokia's mobile phones as many as ten. These infringements cover the patents of wireless communications, speech coding, security, and encryption programs. In addition, Apple Inc. sued its smart phone competitive rivalry HTC, the emerging Taiwanese smart phone brand, against HTC's illegal practice of 20 related iPhone patent ownership of user interface, infrastructure, and hardware. After this patent lawsuit, HTC also immediately make a counter lawsuit against Apple. Thus, these competitive actions/reactions have made the smart phone industry much fiercer. Meanwhile, to respond to these highly competitive dynamics in the industry, smart phone players including designers and manufacturers have put more investments such as organizational slacks to develop new technologies and patents, and to establish a patent portfolio within the firm.

Since their success in the global production networks, Taiwanese smart phone firms are now formidable global market players and demonstrate a powerful mechanism of industrial clustering that illustrates geographic concentrations of interconnected firms and associated institutions in a similar field. For example, most Taiwanese smart phone companies are manufacturers of IC, photoelectric, passive, peripheral and mechanical components, as well as being engaged in assembly processes. From the perspective of innovating patents, Chen (2010) finds that the corporate technological diversification strategy matters to the development of the Taiwanese IT sector. Thus, we follow Chen's approach using information on patents from the United States Patent Office to estimate the technological diversification of patent portfolios for the Taiwanese smart phone industry.

In acknowledging the increasingly important role of the Taiwanese smart phone sector, this study follows the contingency approach in exploring the impact of a strategic orientation toward corporate technological diversity on the performance of Taiwanese smart phone firms in the context of different organizational slacks, absorbed and unabsorbed slack resources.

2. Conceptual development and research hypotheses

Scholars have recently focused on the technological diversification issues due to the increasing importance of technologies being the competitive advantages of firms (Garcia-Vega, 2006; Huang & Chen, 2010; Lin, Chen, & Wu, 2006; Miller, 2006; Suzuki & Kodama, 2004; Vega-Vazquez, Cossio, & Martin-Ruiz, 2012; Yu, 2011). Technological

diversification refers to the extent of diversification of a firm's technology scope (e.g., Breschi et al., 2003; Huang & Chen, 2010). Technological diversification can prevent a negative lock-in effect in one particular technology, and sustain the evolution and business renovation of the firm (Suzuki & Kodama, 2004).

Prior studies recognize the role of innovation in creating firm value and providing mixed results on the relationship between technological diversification and innovation performance (e.g., Griliches, 1981; Huang & Chen, 2010). For example, Griliches (1981) finds that investments in innovation can yield returns of 200% over the long run, and Huang and Chen (2010) show that an inverse U-shaped relationship exists between technological diversity and innovation performance. Thus, the role of technological diversification in relation to firm performance is not as clear.

From the perspective of coordination costs, previous studies find that excessive technological diversification has had a detrimental impact on firm performance (Argyres, 1996; Garcia-Vega, 2006; Lin et al., 2006; Vila, Perez, & Morillas, 2012). In other words, low technological diversification, which places great emphasis on accumulating technological competence in similar core fields and producing a high learning effect, is likely to enhance firm performance:

Hypothesis 1. Technological diversification negatively associates with firm performance.

Through the buildup and cultivation of organizational slack resources, previous studies use organizational slack in different forms as a predictor of innovation (Nohria & Gulati, 1996) and performance (Tan & Peng, 2003). Organizational slack involves two types of slack resources: absorbed slack and unabsorbed slack (Huang & Chen, 2010; Tan & Peng, 2003). Although many organizational slack studies focus on the relationship with performance, little research has been done to investigate the effect of organizational slack in explaining the variation in technological diversification on firm performance.

Based on the findings of the positive influence of organizational slack on innovation and performance (Greve, 2003) and the important and positive relationship among technological diversity, absorbed slack, and innovation performance (Huang & Chen, 2010), this study extends Huang and Chen's research and hypothesizes that absorbed slack positively moderates the relationship between technological diversification and firm performance. Thus,

Hypothesis 2. Absorbed slack positively moderates the strength between technological diversification and firm performance.

While absorbed slack is directly useful for developing innovations, unabsorbed slack is not as helpful as absorbed slack in the development of innovations. While unabsorbed slack can serve as a stimulus for management to support new innovative activities (Huang & Chen, 2010; Nohria & Gulati, 1996), a higher level of unabsorbed slack may cause premature termination of innovation projects due to its strict performance monitoring (Greve, 2007). In addition, a higher level of unabsorbed slack may cause inefficient problems in an over-diversified technology base (Huang & Chen, 2010; Tan & Peng, 2003; Vinces, Cepeda-Carrión, & Chin, 2012). Therefore, this study extends Huang and Chen's (2010) research and hypothesizes that unabsorbed slack negatively moderates the relationship between technological diversification and firm performance.

Hypothesis 3. Unabsorbed slack negatively moderates the strength between technological diversification and firm performance.

3. Methods and measures

This study collects the data for Taiwanese smart phone manufacturing firms from the Taiwan Economic Journal database, which covers

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