
DECISION SCIENCES INSTITUTE

Organizational Slack and R&D Investment in High-Technology Industries: The Moderating Role of Family Governance

Zonghui Li
Jacksonville University
Email: zli@ju.edu

ABSTRACT

Organizational slack affects firm innovation. This study examines how various types of organizational slack have impacts on R&D investment in high-technology firms. Findings in this study suggests that firms are heterogeneous concerning the way of redeploying organizational slack to foster innovation and that family involvement has distinctive impacts on this redeploying process.

KEYWORDS: Organizational slack, R&D investment, Family governance, High-technology firms

INTRODUCTION

Organizational slack denotes a pool of resources that in excess of the minimum necessary to produce a given level of organizational output (Nohria & Gulati, 1996). Prior study suggests that organizational slack can be both beneficial and detrimental for firm innovation (e.g., Geiger & Cashen, 2002; Kim, Kim, & Lee, 2008). On the one hand, organizational slack acts as a buffer necessary for organizational adaptation, allowing the pursuit of innovative projects with eased managers' concerns of the risk of failure (Geiger & Cashen, 2002). On the other hand, increasing organizational slack can be a waste of resources, as a consequence of top managers' pursuit of self-interested activities (e.g., pet projects) (Jensen, 1986; Nohria & Gulati, 1996). Thus, exploring the relationship between organizational slack and R&D investment can provide great managerial implications.

Inspired by this research question, prior studies argue and report a curvilinear relationship between organizational slack and R&D investment. While organizational slack can contribute to firm innovation to some extent, too much slack may be detrimental as well (e.g., Geiger & Cashen, 2002; Kim et al., 2008; Nohria & Gulati, 1996). However, the impact of organizational slack on firm innovation is influenced not only by the amount of organizational slack stocked within the firm but also by the unique way that the firm allocates its slack resources internally and leverages resources externally. Thus, according to the capability-based perspective of firm innovation, the impact of organizational slack on firm innovation is heterogeneous across firms due to distinctive resources allocation patterns and unique resource deployment capabilities associated with these firms.

This study has two primary objectives. First, following the capability-based perspective of firm innovation, this study examines the organizational slack-R&D investment relationship in a high-technology context. Second, this study investigates the moderating role of family governance. In particular, this study argues that family involvement in the business creates unique features within the firm (Chrisman, Chua, & Sharma, 2012), which facilitate or inhibit the deployment of various forms of organizational slack to pursue firm innovation.

LITERATURE REVIEW AND THEORETICAL DEVELOPMENT

Firms need surplus resources to grow (Penrose, 1959); organizational slack is among these resources. Organizational scholars distinguish various types of organizational slack regarding the difficulty of the resources to be recovered. Absorbed slack, or recoverable slack, refers to resources that are deeply embedded within the firm and widely assimilated into the firm; these resources need long term to recover and redeploy (Bourgeois, 1981; Singh 1986). Potential slack represents the ability of a firm to generate resources externally, probably through debt-financing in the future (Bourgeois, 1981; Singh 1986). Unabsorbed slack, or available slack, denotes resources available but not yet particularly allocated.

Organizational slack indicates unexploited opportunities to increase output in the future, such as margins and revenues to be gained from customers when needed (Nohria & Gulati, 1996). Thus, organizational slack, acting as a cushion, can be beneficial to firm performance and facilitate innovative activities. However, organizational slack consists excess inputs that are currently embedded within the firm and assimilated into the technical design of the organization (Bourgeois, 1981), such as redundant employees, unused capacity, and unnecessary capital expenditures. Regarded as a waste and inefficiency to some extent, organizational slack may be detrimental to firm performance (Jensen, 1986) and inhibit firm innovation as well.

Organizational Slack and R&D Investment in High-Technology Industries

Unique features are widely observed in high-technology firms, including high demand for R&D, fast diffusion of technological innovations, and intense use of technical knowledge (Zakrzewska-Bielawska, 2010). While excess inputs currently increase expenses and reduce efficiency, these slack resources, along with unexploited opportunities, may act as a buffer for innovation especially in high-technology industries.

High-technology firms require continual innovation. Absorbed slack, taking the form of excess costs and underutilized capacity (Geiger & Cashen, 2002), allows the firm to take adaptive actions and engage in continual innovative projects by using the embedded capacity (Geiger & Cashen, 2002). High-technology firms need high levels R&D investment and fast diffusion of technological innovations. Potential slack can leverage resources externally and use debt-financing to support R&D investment. R&D investment in high-technology firms has high levels of risks. Unabsorbed slack provides available but not yet allocated resources within the firm, helping to ease managers' concern on the risk of the failure of experimentation and to encourage explorative and risk-taking activities such as R&D investment (Bourgeois, 1981; Cyert & March, 1963). As such, this study argues that absorbed slack, potential slack, and unabsorbed slack contribute to high-technology firms' R&D investment to some extent.

However, the above-mentioned positive impact of organizational slack on R&D investment tends to be diminished with the increase of such slack (Nohria & Gulati, 1996). Absorbed slack needs long term to recover (Bourgeois, 1981; Singh 1986) and is difficult to be redeployed because of its nature of deep embeddedness (Sharfman, Wolf, Chase, & Tansik, 1988; Singh, 1986). Potential slack and unabsorbed slack, regarded as inefficiency to some extent, can be the consequences of managers' self-interested behavior and incompetency (Nohria & Gulati, 1996). Thus, this study hypothesizes a curvilinear relationship between organizational slack and R&D investment in high-technology industries.

Hypothesis 1a: An inverted U-shaped relationship exists between absorbed slack and R&D investment intensity in high-technology industries.

Hypothesis 1b: An inverted U-shaped relationship exists between potential slack and R&D investment intensity in high-technology industries.

Hypothesis 1c: An inverted U-shaped relationship exists between unabsorbed slack and R&D investment intensity in high-technology industries.

The Moderating Role of Family Governance

Family firms are ubiquitous around the world. Family governance has unique features deriving from the unification of ownership and control (Carney, 2005; Fama and Jensen, 1983). On the other hand, family owner-managers are deeply embedded within the firm through their daily-involvement in the business, giving rise to their deep firm-specific knowledge (Habbershon et al., 2003). Accordingly, family governance tends to have an impact on the way through which organizational slack is employed to facilitate firm innovation.

The extent of family involvement drives the family's embeddedness in the firm (Aldrich & Cliff, 2003). Family owner-managers' embeddedness within the business generates firm-specific human capital available through family members, which are beneficial to resource evaluation and resource enriching activities (Carnes & Ireland, 2013). Furthermore, family involvement in the business can create strong social capital, which helps to bring in tangible resources and facilitate intra-firm communications (Pearson, Carr, & Shaw, 2008). These deep firm-specific tacit knowledge can extend the firm's current capabilities and allow the firm to explore new opportunities through resource enriching activities (Carnes & Ireland, 2013).

Absorbed slack, as resources deeply embedded within the firm and widely assimilated into the firm (Bourgeois, 1981), can facilitate firm innovation when these resources are mobilized and redeployed within the firm. Even though prior study suggests that absorbed slack is difficult to be redeployed (Sharfman, Wolf, Chase, & Tansik, 1988; Singh, 1986), family firms, drawing on their family owner-managers' firm-specific knowledge gained through the family's deep embeddedness within the firm, are more likely to use internal underutilized capacities and redeploy these resources to support experiments and innovative projects. Accordingly, absorbed slack tends to have a strengthened impact on R&D investment in family firms.

Hypothesis 2a: Family governance strengthens the relationship between absorbed slack and R&D investment intensity.

Firm innovation requires substantial investment (Grossman & Helpman, 1993). The pursuit of innovation may result in the use of external financial arrangements. With regard to innovation in family firms, the use of external financial resources leads to the diluted family ownership and/or the sacrifice of family control (Gómez-Mejía, Campbell, Martin, Hoskisson, Makri, & Sirmon, 2014). Family firms, with the intention to maintain the family's control in the business, are less likely to pursue high levels of R&D investment even in high-technology industries (Gómez-Mejía, Haynes, Núñez-Nickel, Jacobson, & Moyano-Fuentes, 2007).

Potential slack, denoting external potential resources to the firm, can secure the need for capital input and ease the managers' concern on the risk of the failure. Family firms, however, are less likely to leverage this type of resources (i.e., potential slack) due to family firms' distinctive

concern on sustaining family control of the firm. Due to their unwillingness to use external financial resources, this study argues that the positive relationship between potential slack and R&D investment tend to be weakened in family firms with the comparison to nonfamily firms.

Hypothesis 2b: Family governance weakens the relationship between potential slack and R&D investment intensity.

Prior studies suggest that unabsorbed slack, denoting resources available but not yet particularly allocated, can facilitate firm innovation to some extent (Geiger & Cashen, 2002). Compared to absorbed slack, unabsorbed slack is easy to recover (Sharfman et al., 1988; Singh, 1986) and, thus, encourages managers to pursue innovative projects with promising outcomes. Family business literature suggests that the family usually aligns its long-term benefits with the firm's interests. This attribute encourages family firms to engage in long-term oriented activities and do business in a parsimonious way (Carney 2005; Lumpkin & Brigham, 2011). As a consequence, family firms are more likely to turn unabsorbed slack into R&D investment than nonfamily firms, leading to a strengthened relationship between unabsorbed slack and R&D investment intensity in family firms.

Hypothesis 2c: Family governance strengthens the relationship between unabsorbed slack and R&D investment intensity.

METHOD

Sample and Data

This study drew its sample from publicly traded firms in high-technology manufacturing industries that are listed on the United States stock markets. The analysis period spans five years, from 2010 to 2014. This study randomly selected 250 firms from the above-mentioned high-technology manufacturing industries that report R&D expenses in their annual report, generating about 1250 observations. Data were obtained from Compustat, firms' annual reports (10-K) and proxy statements (DEF 14A), and other sources such as Mergent Online and the company's website. A panel data set was constructed and used in this research.

Measures

This study measured *R&D investment intensity* as R&D spending divided by total assets in year *t*. *Absorbed slack* was measured as two-year lagged assets/liability ratio (Gómez-Mejía, Campbell, Martin, Hoskisson, Makri, & Sirmon 2014). *Potential slack* was measured as two-year lagged debt/equity ratio (low levels of debt/equity ratio indicates the firm's high potential ability to use the debt financing in the future). *Unabsorbed slack* was measured as two-year lagged ratio of current assets to current liabilities.

All the sample firms were identified as family or non-family firms. Family firms were identified based on family involvement in their ownership and management. The following criteria were applied in this first step: (1) a family owns 5% or more of the firm's stock and (2) at least one family member (a person related by blood or marriage to the owning family) is involved in the TMT. *Family governance* was coded as "1" for family firms, and, "0", otherwise. This study includes a set of control variables, such as *firm size* (i.e., the natural logarithm of the firm's total equity lagged at $t - 1$), *firm performance* (i.e., ROA lagged at $t - 1$), *firm age*, *board independence*, and *sales growth*.

Table 1: Organizational Slack, R&D Investment Intensity, and Family Governance

DV: R&D Investment intensity	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Intercept	21.03*** (5.28)	32.28 (4.72)	42.80*** (4.61)	20.88*** (5.30)	43.83*** (4.71)	40.31*** (4.64)	23.77*** (5.53)
Potential slack		-0.02*** (0.001)			-0.02*** (0.001)		
(Potential slack) ²		5.88e-06*** (5.70e-07)			5.76e-06*** (5.64e-07)		
Absorbed slack			0.05*** (0.01)			0.008 (0.01)	
(Absorbed slack) ²			-4.15e-05*** (4.80e-06)			-2.98e-05*** (4.71e-06)	
Unabsorbed slack				-0.07 (0.28)			0.14 (0.31)
(Unabsorbed slack) ²				-0.004 (0.01)			-0.005 (0.01)
Family governance					-3.36** (1.27)	-7.77*** (1.34)	-3.36† (2.05)
Family governance × potential slack					0.02*** (0.004)		
Family governance × absorbed slack						0.06*** (0.006)	
Family governance × unabsorbed slack							0.14 (0.26)
<i>Control variables:</i>							
Firm size	-4.53*** (0.53)	-7.42*** (0.51)	-5.30*** (0.47)	-4.42*** (0.55)	-6.92*** (0.51)	-5.24*** (0.44)	-4.37*** (0.56)
Performance	-0.01† (0.01)	0.03*** (0.007)	0.02** (0.007)	0.01† (0.007)	0.03*** (0.007)	0.03*** (0.006)	0.01† (0.01)
Firm age	0.05 (0.13)	0.25* (0.11)	0.14 (0.11)	0.05 (0.13)	0.19† (0.11)	0.04 (0.11)	0.01 (0.13)
Board independence	16.31*** (3.84)	1.51 (3.33)	2.53 (3.47)	16.32*** (3.84)	0.77 (3.31)	0.15 (3.29)	15.59*** (3.86)
Sales growth	-0.004† (0.002)	-0.005** (0.002)	-0.004† (0.002)	-0.003 (0.002)	-0.005** (0.002)	-0.004† (0.002)	-0.003† (0.002)
Number of observations	985	985	984	985	985	984	984
Adjusted R ²	0.827	0.879	0.867	0.827	0.882	0.882	0.827
F-statistics	22.37***	33.19***	30.02***	22.15***	33.81***	33.89***	22.01***

Note: 1. Unstandardized estimation coefficients are reported; 2. ***p<0.001; **p<0.01; *p<0.05; † p<0.10.

RESULTS

This study used Generalized Least Squares (GLS) regression with fixed-effect (FE) or random-effect (RE) models. The empirical results are reported in Table 1. A curvilinear relationship between R&D investment intensity and potential/absorbed slack is found, supporting Hypotheses 1a and 1b. Hypothesis 1c is not supported.

Family governance (1) strengthens the relationship between absorbed slack and R&D investment intensity, supporting Hypothesis 2a, and (2) weakens the relationship between potential slack and R&D investment intensity (i.e., family governance weakens the negative relationship between debt/equity ratio and R&D investment intensity), supporting Hypothesis 2b. No significant moderating impact is reported in this study; thus Hypothesis 2c is not supported.

DISCUSSION AND CONCLUSION

This study examines how various types of organizational slack have an impact on R&D investment intensity in high-technology firms. Further, this study contends that firms are heterogeneous concerning the way of redeploying and reallocating organizational slack to foster innovation and that family involvement has a distinctive impact on this redeploying/reallocating process. This study reports (1) a curvilinear relationship between potential/absorbed slack and R&D investment intensity in high-technology manufacturing firms, and (2) a moderating impact of family governance on this relationship.

The findings in this study contribute to literature in several ways. First, this study contributes to firm innovation literature by investigating the impact of organizational slack in the setting of high-technology firms. The findings extend the understanding of how various types of organizational slack have a distinctive impact on firm innovation to the context of high-technology industries. Second, this study contributes to the corporate governance literature by investigating the moderating role of family governance. Family governance, as a ubiquitous existence around the world, creates unique features. For instance, firm-specific tacit knowledge and family-centered non-economic goal can be generated through family owner-managers' embeddedness within the firm, which may facilitate or inhibit firm innovation. Third, the findings of this study shed light on the resource allocation literature, indicating that superior or inferior managerial capabilities can be generated through family governance.

Although this study offers notable insight into the relationship between organizational slack and R&D investment and the moderating role of family governance, the study is not without limitations. First, this study uses data from 2010-2014 and measures organizational slack using financial data. Second, the study distinguishes family firms from nonfamily firms with the attempt to explore unique patterns that family firms use to deploy organizational slack. However, family firms are heterogeneous as well. Third, the results noted herein should be interpreted within the boundary conditions of the firms studied. The firms examined, for example, are relatively large, publicly traded firms. Smaller firms are likely to have lower levels of slack and unique patterns for reallocating slack resources compared to larger, public firms.

REFERENCES

Aldrich, H. E., & Cliff, J. E. (2003). The pervasive effects of family on entrepreneurship: toward a family embeddedness perspective. *Journal of Business Venturing*, 18(5), 573-596.

- Bourgeois, L. J. (1981). On the measurement of organizational slack. *Academy of Management Review*, 6(1), 29-39.
- Carnes, C. M., & Ireland, R. D. (2013). Familiness and Innovation: Resource Bundling as the Missing Link. *Entrepreneurship Theory and Practice*, 37(6), 1399-1419.
- Carney, M. (2005). Corporate governance and competitive advantage in family-controlled firms. *Entrepreneurship Theory and Practice*, 29(3), 249-265.
- Chen, H. L., & Hsu, W. T. (2009). Family ownership, board independence, and R&D investment. *Family Business Review*, 22(4), 347-362.
- Chrisman, J. J., Chua, J. H., Pearson, A. W., & Barnett, T. (2012). Family involvement, family influence, and family-centered non-economic goals in small firms. *Entrepreneurship Theory and Practice*, 36(2), 267-293.
- Chua, J. H., Chrisman, J. J., Steier, L. P., & Rau, S. B. (2012). Sources of heterogeneity in family firms: An introduction. *Entrepreneurship Theory and Practice*, 36(6), 1103-1113.
- Cyert, R. M., & March, J. G. (1963). *A behavioral theory of the firm*. Englewood Cliffs, NJ.
- Fama, E. F., and Jensen, M. C. (1983), "Separation of ownership and control", *Journal of Law and Economics*, Vol. 26 No. 2, pp. 301-326.
- Geiger, S. W., & Cashen, L. H. (2002). A multidimensional examination of slack and its impact on innovation. *Journal of Managerial Issues*, 68-84.
- Gómez-Mejía, L. R., Campbell, J. T., Martin, G., Hoskisson, R. E., Makri, M., & Sirmon, D. G. (2014). Socioemotional wealth as a mixed gamble: Revisiting family firm R&D investments with the behavioral agency model. *Entrepreneurship Theory and Practice*, 38(6), 1351-1374.
- Gómez-Mejía, L. R., Haynes, K. T., Núñez-Nickel, M., Jacobson, K. J. L., & Moyano-Fuentes, J. (2007). Socioemotional wealth and business risks in family-controlled firms: Evidence from Spanish olive oil mills. *Administrative Science Quarterly*, 52(1), 106-137.
- Grossman, G. M., & Helpman, E. (1993). *Innovation and growth in the global economy*. MIT press.
- Habbershon, T. G., Williams, M., & MacMillan, I. C. (2003). A unified systems perspective of family firm performance. *Journal of Business Venturing*, 18(4), 451-465.
- Jensen, M. C. (1986). Agency costs of free cash flow, corporate finance, and takeovers. *The American economic review*, 76(2), 323-329.
- Kim, H., Kim, H., & Lee, P. M. (2008). Ownership structure and the relationship between financial slack and R&D investments: Evidence from Korean firms. *Organization Science*, 19(3), 404-418.
- Leibenstein, H. (1969). Organizational or frictional equilibria, X-efficiency, and the rate of innovation. *The Quarterly Journal of Economics*, 83(4), 600-623.
- Lumpkin, G. T., and Brigham, K. H. (2011), "Long-Term Orientation and Intertemporal Choice in Family Firms", *Entrepreneurship Theory and Practice*, Vol. 35 No. 6, pp. 1149-1169.
- Nohria, N., & Gulati, R. (1996). IS SLACK GOOD OR BAD FOR INNOVATION? *Academy of Management Journal*, 39(5), 1245-1264.
- Pearson, A. W., Carr, J. C., & Shaw, J. C. (2008). Toward a theory of familiness: A social capital perspective. *Entrepreneurship Theory and Practice*, 32(6), 949-969.
- Penrose, E. T. (1959). *The theory of the growth of the firm*. Sharpe, New York.
- Sharfman, M. P., Wolf, G., Chase, R. B., & Tansik, D. A. (1988). Antecedents of organizational slack. *Academy of management review*, 13(4), 601-614.
- Singh, J. V. (1986). Performance, slack, and risk taking in organizational decision making. *Academy of management Journal*, 29(3), 562-585.
- Zakrzewska-Bielawska, A. (2010). High technology company—concept, nature, characteristics. *Proceedings of the 8th WSEAS International Conference on Management, Marketing and Finance*, 93-98.