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Financial cash flows and research and development investment☆

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ABSTRACT

This paper empirically investigates how improvement in financial cash flows affects firms' research and development (R&D) investment using a sample of Japanese manufacturing firms where firms substantially increased cash holdings and reduced outstanding debt. We find that R&D–cash flow sensitivity among financially constrained firms is larger for financial cash flows than for operating cash flows. We also find that among financial cash flows, income gains/losses rather than capital gains/losses significantly affect R&D. These results suggest that improvement in financial cash flows enhance R&D investment by improving the predictable components of cash flows. Furthermore, the results show that decreases in interest payments, rather than increases in interest and dividends income, enhance R&D.

1. Introduction

There are two conspicuous phenomena in corporate finance of modern corporations. On the one hand, firms have increased their cash balances in recent years. Related studies present the evidence for precautionary demands for cash in which firms accumulate cash balances to prepare for possible cash flow shortfalls and unexpected investment opportunities (Almeida et al., 2004; Bates et al., 2009; Opler et al., 1999; Subramaniam et al., 2011).[1] The other phenomenon is the conservative debt policy symbolized by the prevalence of zero-leverage firms (Bessler et al., 2013; Dang, 2013; Graham, 2000; Korteweg, 2010; Strebulaev and Yang, 2013). In particular, Graham (2000) estimates that the typical firm could double tax benefits by issuing debt until the marginal tax benefit begins to decline. He also finds that large, liquid, profitable firms with low expected distress costs use debt conservatively, and conservative debt policy is persistent.[2] On the other hand, Strebulaev and Yang (2013) investigates the attributes of public US firms that adopt a zero-leverage policy and find that these firms are unlikely to face financing constraints.[3,4] Relatedly, Dasgupta et al. (2011) find that cash savings in the short run and debt reduction in both the short and the long run account for a substantial fraction of cash flow use and especially so when financing constraints tighten.

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[1] Related studies show that corporate governance is also an important determinant of corporate cash holdings (Dittmar et al., 2003; Harford et al., 2008).

[2] Graham (2000) also finds that product market factors, growth options, low asset collateral, and planning for future expenditures lead to conservative debt usage.

[3] Strebulaev and Yang (2013) find that zero-leverage firms pay substantially higher dividends and are more profitable. Their results suggest that the CEO and governance characteristics of firms are likely important determinants of the zero-leverage and low-leverage phenomena.

[4] Bessler et al. (2013) examine the determinants of the prevalence of zero-leverage phenomenon around the world and find that increasing prevalence of zero-leverage firms can be attributed to market-wide forces such as shifts in industry composition, increasing asset volatility, and decreasing corporate tax rates. They also find that countries with a common law system exhibit the highest percentage of zero-leverage firms.

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Increasing cash holdings and conservative debt policy will improve financial cash flows by increasing revenues from cash balances and decreasing interest payments for financial debt. However, less attention has been paid to the implications of the changes in financial cash flows associated with these two phenomena. Although many papers have investigated the impact of internal cash flows on investment (for a survey, see Stein, 2003), how the impact of financial cash flows on investment differs from that of operating cash flows is unclear. This paper investigates how changes in financial cash flows affect corporate investment by focusing on research and development (R&D) investment. Improvement of financial cash flows may increase R&D investment in which adjustment costs are unavoidable in the following ways.[5] First, financial cash flows are more predictable than operating cash flows from managers and therefore improving financial cash flows will increase the predictable component of cash flows that is suitable for financing R&D projects. Second, reducing financing cash outflows associated with debt service will make remaining cash flows less volatile by reducing financial leverage. Third, decreases in debt services may spur investment by boosting external financing ability (Lang et al., 1996). Therefore, we hypothesize that R&D–cash flow sensitivity is larger for financial cash flows than for operating cash flows.

We test this hypothesis using a sample from Japanese manufacturing firms for the fiscal years 2001–2011, where Japanese firms substantially increased their cash holdings and decreased the amount of debt (Fig. 1). Specifically, the average cash-to-total assets ratio had increased from 13.4% in 2001 to 15.9% in 2011. On the other hand, the average of debt-to-total assets ratios had decreased from 24.8% in 2001 to 17.7% in 2011. As a result, net cash balances, defined as cash holdings minus outstanding debt divided by total assets, had dramatically improved from −11.3% in 2001 to −1.8% in 2011 (Fig. 1). As a result of these phenomena, the average of financial cash flows-to-total assets ratio had improved from −0.31% in 2001 to −0.08% in 2011. Furthermore, the median of this ratio had improved from −0.27% in 2001 to −0.04% in 2011, suggesting that nearly half of the sample firms came to have positive financial cash flows. In fact, the percentage of firms with positive financial cash flows had grown from 23.8% in 2001 to 44.9% in 2011. On the other hand, R&D-intensified industries play an important role in the Japanese economy. In fact, the average of R&D expenditures amount to more than 62.8% of capital expenditures in our sample.[6,7] Therefore, our sample presents a unique opportunity to understand how improvements in financial cash flows associated with aggressive cash holdings and conservative debt policies affect R&D investment.

After controlling for adjustment costs associated with R&D and the possible endogeneity of cash flow variables as well as other resources of financing, we first find that R&D–cash flow sensitivity among financially constrained firms is larger for financial cash flows than for operating cash flows. This suggests that changes in financial cash flows have a larger impact on R&D than changes in operating cash flows do. Furthermore, we find that changes in net interest and dividends income have more clear impacts on R&D of financially constrained firms than changes in capital gains/losses do. These results suggest that improvement in financial cash flow enhance R&D investment by improving the predictable components of cash flows and reducing the volatility of remaining cash flows by decreasing financial leverage. Our results also show that decreases in interest payments rather than increases in interest and dividends income enhance R&D, suggesting that reducing debt, rather than increasing cash balances, is important in financing R&D. On the other hand, we find that equity issues do not affect R&D investment among Japanese firms, whereas debt financing partly finances R&D of Japanese firms.[8] This is inconsistent with the findings of recent studies that US firms finance R&D by external equity financing (Brown et al., 2009; Brown and Petersen, 2010). We also find that large firms smooth R&D by withdrawing cash, but this is not the case for small firms. This is consistent with the argument that bank-dependent firms maintain high levels of cash reserves to keep good relationships with banks (Nakajima and Sasaki, 2016; Pinkowitz and Williamson, 2001).

This paper contributes to the literature in the following ways. First, we contribute to the recent literature that examine the determinants of cash holdings (Bates et al., 2009; Opler et al., 1999; Subramaniam et al., 2011) and conservative debt policy (Bessler et al., 2013; Graham, 2000; Strebulaev and Yang, 2013) by showing that improvement of financial cash flows resulting from conservative debt policy, rather than large cash balances, enhances R&D investment. Second, this paper also contributes to the literature that examines R&D–cash flow sensitivity (Bond et al., 2003; Hall et al., 1999; Himmelberg and Petersen, 1994; Mulkay et al., 2001) by showing that changes in financial cash flows have a larger impact on R&D rather than changes in operating cash flows. The result is consistent with the argument of Himmelberg and Petersen (1994) that permanent component of cash flows is important in financing R&D, and we identify one source of the predictable component of cash flows.

This study is organized into five sections. Section 2 briefly reviews the literature and develops our hypothesis. Section 3 presents our analytical method and the sample used in this study. Section 4 presents the empirical results on the effects of internal resources on R&D investment. Section 5 contains the conclusion.

[5] Low probability of success, inherent asymmetric information, and lack of collateral value associated with R&D investment make it difficult to finance R&D projects with debt financing (Hall, 2002, Hall and Lerner, 2010). Relatedly, extant papers have shown that internal cash flows play an important role in financing R&D. Hall (1992) shows that in large U.S. firms, internal cash flows are the main determinant of R&D investment. Carpenter and Petersen (2002) show that investment of small high-tech firms is constrained by internal resources. They also show that new equity financing in the form of the initial public offering bring a major increase in firm size for small high-tech firms. More recently, Brown and Petersen (2009) show that the investment-cash flow sensitivity disappears for physical investment but remains comparatively strong for R&D investment.

[6] R&D expenditures among some Japanese firms in high-tech industries are greater than capital expenditures. For example, Toyota spent 730 billion yen for R&D investments, compared to 629 billion yen for capital expenditures in 2011. Panasonic spent 520 billion yen and 330 billion yen for R&D and capital expenditures, respectively, in the fiscal year 2011.

[7] Brown et al. (2009) present evidence that indicates that equity financing is an important resource for R&D among young US firms.

[8] Relatedly, Arikawa et al. (2011) find that large firms finance R&D investment partly from debt, whereas higher leverage leads to lower R&D investment among firms with relatively limited assets.