Debt, Ownership Structure, and R&D Investment：
Evidence from Japan

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September 2010

This paper is written as a part of RIETI's project on Corporate Governance in Japan. We thank Takuji Saito for his comment on earlier version of this paper. This research is supported by JSPS KAKENHI (Grant No. 19203017).

Abstract

Financial factors as well as ownership structure would be part of the determinants of corporate R&D investment. Taking listed firms in R&D intensive industries in the 2000s of Japan, this paper is to examine whether the financial factors and ownership structure explain the R&D investment in Japan. Following the methodology of Brown et al. (2009) which extends the dynamic investment model of Bond and Maghir (1994) to R&D investment, we find that only young and small firms mainly listed on newly established emerging markets face the financial constraint. We also find that large firms finance R&D investment partly from debt following the optimal debt policy. For firms with small asset, however, higher leverage leads to lower R&D investment. Lastly, we do not find any evidence that large shareholdings by foreign investors enforce myopic behavior on firms.

Keywords: R&D, Debt, Cash flow, Ownership

JEL Classification: D22, G32

1. Introduction

During a period of rapid economic growth, Japanese firms invested mainly on physical assets. However, they gradually have placed more importance on research and development (R&D, hereafter) investment since the middle of 1980s. Domestic physical investment peaked in 1991 and dropped sharply after the burst of the bubble and remained low even in the recovery period in the 2000s. R&D investment, on the other hand, has increased continuously and it surpassed physical investment between 2002 and 04 (METI, 2009). Currently, the size of R&D and physical investment is at comparable level in Japan.

From 1994 to 2004, firms which recently listed on the market accounted a large part of R&D investment in the US (Brown et al., 2009). Firms listed on the market at most 15 years ago account for 45.7% of the aggregate R&D in 1998 and 26.1% in 2004 in the US. By contrast, in Japan, mature firms which drove the high growth period are still the main players of R&D expenditure. While domestic emerging equity markets have been organized since 1999 and many new firms went public especially in Information Technology (IT, hereafter) related sectors, firms which went public after 1990 account for only 3% of total R&D spending in R&D intensive industries. On the other hand, large mature firms whose consolidated assets are more than 500 billion yen account for nearly 80% of total R&D spending in R&D intensive industries. For example, Toyota Motor, the top R&D spending firm in Japan, spent 890 billion yen in 2006, which was about 60% of its physical investment. The second largest R&D spending firm Matsushita Electric Industrial (now Panasonic) spent 580 billion yen and that was more than its physical expenditure of 420 billion yen.

The main purpose of this paper is to examine whether the financial factor explains the R&D investment in Japan. This paper focuses on three issues.

First, we explore whether the financial factor explains the little presence of R&D investment by small and young firms in Japan. Following Brown et al. (2009) we employ the dynamic investment model of Bond and Meghir (1994) to R&D investment, and examine whether the shift of internal fund can explain the change of R&D

investment. Then, we find that contemporaneous cash flow have no statistically significant effect on R&D investment of firms with larger asset. For young and small firms mainly listed on newly established emerging markets, however, the coefficient of contemporaneous cash flow is significantly positive, and this is consistent with the finding of Brown et al. (2009). On the other hand, we do not find any positive effect of equity finance on firms with small asset size. This result contrasts with the theoretical prediction as well as the US case in which the changes of equity finance by the young, high-tech firms explain most of the 1994 to 2004 aggregate R&D cycle (Brown et al, 2009).

Second, we examine the role of debt. We extend the work by Brown et al. (2009) by focusing on debt in addition to equity finance since debt is more important source of incremental funding than outside equity for most firms in Japan. If a debt is the marginal source of external finance, we expect that the credit restrictions affect corporate decisions seriously. Ogawa (2007) investigate the relationship between R&D investment and debt in Japan using the sample period from 1988-1991 and 1999-2001. Then, it shows that the ratio of debt to total assets had a significant, negative effect on R&D investment in the late 1990s, while the effect of the debt-asset ratio on R&D investment was insignificant in the late 1980s.

Using the sample period from 2001 to 2008, we find that the coefficient of lagged debt and lagged square debt is significantly negative as implied by tax-bankruptcy specification for firms with large asset. This result implies that large firms finance R&D investment at least partly from debt following the optimal debt policy. Contrast to large firms, estimation results for firms with small asset show that the coefficient of lagged debt is significantly negative, while that of lagged square debt is insignificant, suggesting that, only for firms with small size, higher level of debt financing leads to lower R&D investment.

Third, this paper highlights the effect of increasing foreign ownership on R&D investment. One characteristic of changes in corporate governance structure for Japanese firms was the shift from insider to outsider ownership (Miyajima and Kuroki, 2007). It is plausible that if an investor were myopic and his preference were biased toward immediate dividend, then managers may take into account these myopic investors and pay dividends by sacrificing R&D investment (Narayanan, 1985, and Stein, 1989). To study the effect of myopic investors on R&D investment, we add the interaction term between contemporaneous cash flow and foreign investor's shareholding ratio. Then, for small firms which face the financial constraint, we do not find any evidence that large shareholdings by foreign investors enforce myopic behavior on firms.

The remainder of this paper is organized as follows. Section 2 overviews R&D expenditure in Japan from the late 1990s. Section 3 summarizes the financial structures of R&D intensive firms. Section 4 describes the empirical model and Section 5 reports the estimation results. Section 6 concludes.

2. An Overview on R&D Investment

2.1 Macro Trend and R&D Intensive Industries

We first observe macro trend in R&D expenditure from 1980 with Figure 1 borrowed from METI (2009). While domestic physical investment reached its peak value of 20 trillion yen in 1991, plunged after the burst of bubble in 1991 and stayed around 13 trillion yen even in the recovery period in the 2000s, R&D expenditure steadily increased from 9 trillion yen in 1985 to 12 trillion yen in 2007. Now R&D investment in Japan has the same scale as physical investment.[1]

== Figure 1 about here ==

Table 1 shows industry-level R&D expenditure. Industry classification is based on Securities Identification Code Committee's 33 sectors (excluding financial sectors) (Syoken Code Kyogikai 33 Gyoshu).[2] The sample is all the listed firms contained in

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1 According to METI (2009), the composition of R&D spending by corporations in 2007 is labor 39.8%, material 18.4%, depreciation 7.3%, lease 0.7%, and other 33.7%.

2 According to *Basic Survey of Japanese Business Structure and Activities* by Ministry of Economy, Trade and Industry, the proportion of R&D expenditure by public firms is 87%.

Toyo Keizai dataset.[3] We did not take R&D spending data from profit-and-loss statement since it is argued that it under-evaluates R&D spending by not taking into account salaries for researchers. Table 1 shows that manufactures account for 94% of R&D expenditure. Electric appliances sector has the largest 38% R&D expenditure share, followed by transportation equipment (24%). Chemicals, machinery, precision instruments, and information & communication also have high R&D expenditure share.[4] Regarding R&D intensity (R&D expenditure/sales), pharmaceutical is by far the highest and electric appliances and precision instruments have intensity of over 4%. We define these seven industries as R&D intensive industries. The total R&D expenditure by the seven industries is 12.5 trillion yen which accounts for 94% of the whole sample in Toyo Keizai dataset.

== Table 1 about here ==

2.2 R&D Investment by Firm Type

Figure 2 summarizes the trend of R&D expenditure by the sample firms in the seven R&D intensive industries used in the empirical analysis below. The average of R&D spending-assets ratio is stable in the sample period, although it slightly goes up in the economic downturn and drops in the upturn. This is different from the US case where there was a R&D boom in the late 1990s and a sharp decline after the end of the 2000. While the R&D-assets ratio has been stable at around 4% since the late 1990s, the coefficient of variation has upward trend.

== Figure 2 about here ==

It is plausible that size and age of a firm would affect on its R&D investment

[3] The data is based on the Kaisha Shikiho (Japan Company Handbook) data. Branstter (1996) discusses quality of the data.

[4] Among firms in Information & Communication sector classified by Securities Identification Code Committee's 33 sectors, we only pick up firms in 3 major groups; Communications (37), Information Services (39), and Internet Based Services (40) in Division G: Information and Communications by Japan Standard Industrial Classification.

substantially. The economy of scale could work on R&D investment. Firms with large asset is likely to invest on R&D more than firms with small asset because large firms have high reputation in the capital market and the multi-divisional structure of a large firm could reduce business risks as a whole. In general, a newly emerged firm is likely to engage in R&D investment, while a matured firm is less likely to engage in R&D investment. Considering those points, we sprit sample into several groups based on firm size and age. We classify firms in the 1st or 2nd section of Tokyo Stock Exchange as Large if their consolidated assets are 300 billion yen or greater in 1999. We classify firms in the 1st or 2nd section of Tokyo Stock Exchange as Small if their consolidated assets are less than 100 billion yen in 1999. Firms are defined as Young if they went public after 1990 on the Tokyo Stock Exchange, Mothers, Hercules, or JASDAQ. We do not impose any condition on how long a firm is listed to be classified as a Large or Small firms. Thus, some firms are classified into both Large and Young (or Small and Young) at the same time.[5] Figure 3 shows that the main players of R&D are Large firms and Young firms account for only 1.4% in 2006, although they increase its composition. In the US high-tech industries, young firms account for 40% of R&D expenditure in the late 1990s.[6] The trend of US R&D expenditure since the middle of 1990s was largely influenced by the behavior of young firms (Brown et al., 2009). In contrast to the US case, most R&D in Japan was conducted by mature firms despite the increase of young firms in IT related sectors.

== Figure 3 about here ==

3. Financial Structure of R&D Intensive Industries

Figure 4 describes financial structure of the firms in R&D intensive industries. While financial variables fluctuate, R&D expenditure is fairly stable throughout the

[5] For example, a firm with total assets 50 billion yen which went public on Tokyo Stock Exchange 1st section in 1995 is classified as a Small as well as Young firm.

[6] In Brown et al. (2009), a firm is classified as young for the 15 years following the year it first appears in Compustat as a listed firm, and mature thereafter..

sample period. This tendency continues even after “Lehman shock” which accompanied drop in cash flow and increase in debt, as far as 2008 data is concerned. The dispersion in R&D-assets ratio increased especially after 2002, while leverage has been declined. The R&D-assets ratio slightly went down, but the standard deviation kept its level and coefficient of variation increased. This dispersion between firms got larger after Lehman shock.

== Figure 4 about here ==

Panel 1 of Table 2 provides descriptive statistics for the variables of the sample firms. All variables except for foreigner are scaled by beginning-of-period total assets. Total consists of all firms in the sample which is in the seven R&D intensive industries described above. Large firm has high R&D-assets ratio and smaller dispersion between firms. Small firm has lower R&D-assets ratio of about 2.9% on average, but has greater dispersion. Young firms have similar R&D-assets ratio to Small firms and greater dispersion compared to the former two groups. Firms in R&D intensive industries rapidly reduced their debts. According to Panel 2 of Table 2, they reduce their debt-assets ratio in the sample period. As a consequence, debt-assets ratio went down from 26% in 1999 to 13% in 2006. On the other hand, they experienced rapid increase in foreign and institutional investors and decrease in cross-shareholdings or stable shareholdings. Foreign shareholdings increased from 6.1% in 1999 to 13.7% in 2006.

== Table 2 about here ==

Observing by firm group, Large firms had high debt-assets ratio and bond accounted for the large part of debt finance in 1999. Regarding ownership structure, outsiders had high shareholding ratio. Large firms already had market based governance structure in the beginning of the sample period. Two important points can be seen in the change of corporate finance and governance structure for Large firms in the 2000s.[7] First, Large firms reduced debt rapidly. One of our interests after section 5 is how this reduction in debt affected their R&D investment. Second, ownership structure also changed rapidly. Foreign shareholding ratio and institutional investor ratio reached 30% and 44%, respectively in 2006. Moreover, variance in ownership structure declined. Coefficient of variation of foreign ownership dropped from 0.68 in 1999 to 0.39 in 2006. Ownership structure of Large firms became more homogeneous toward outsider oriented ownership.

Small firms reduced its debt-assets ratio and then it dropped 14% point from 1999 and became 12% in 2006. Reduction in bond also took place and the bond-assets ratio became 1% in 2006. Regarding outsider shareholdings, Small firms have higher dispersion than Large firms. How the differences in shareholding ratio by foreigners affect R&D investment is one of our interests in this research.

Lastly, we observe finance and ownership structure of Young firms. Considering many firms in this group went public between 1998 and 2006, we need to be careful when comparing data through time. Debt-assets ratio of Young firms remained relatively during the sample period. On the other hand, although Young firms finance by stock issue more than mature firms, the size is not large. They show the characteristics of entrepreneur firms; director's stock holding ratio is high. The ratio of shareholding by foreigners and institutional investors is low.

4. The Empirical Model and Data

In this section we explain the empirical specification for the following analysis. As Brown et al. (2009), we employ the dynamic investment model of Bond and Meghir (1994) to R&D investment. The empirical model is based on Euler equation which is derived from the dynamic optimization of investment of a firm under imperfect

[7] Arikawa and Miyajima (2007) investigate the change of corporate finance and governance of Japanese firms in the 1990s.

competition with convex adjustment cost.[8] The advantage of a structural approach is that it controls for expectation, and the Euler equation estimation approach eliminates terms in the solution to the optimization problem that depend on unobservable expectations. The baseline empirical specification including debt finance is as follows.

$$RD_{jt} = \beta_1 RD_{jt-1} + \beta_2 RD_{jt-1}^2 + \beta_3 S_{jt-1} + \beta_4 CF_{jt-1} + \beta_5 D_{jt-1} + \beta_6 D_{jt-1}^2 + d_t + \alpha_j + \upsilon_{jt}$$

where RD_{jt} is R&D spending for firm *j* in time *t*, RD_{jt-1}^2 is square of R&D spending and derived from the existence of nonlinear adjustment cost, S_{jt-1} is sales, CF_{jt-1} is cash flow, D_{jt-1} is the amount of debt at *t-1*, and D_{jt-1}^2 is square of debt. All variables are scaled by the beginning of period total assets. d_t is time effect on R&D spending; α_j is time invariant firm effect; and υ_{jt} is the error term. To the estimation we include aggregate year dummies for controlling movements in the aggregate costs capital and tax rates. We also estimate with the interaction terms of year and industry dummies to control for industry-specific changes in technological opportunities.

According to Bond and Meghir (1994), β_1 takes a positive and greater than 1, β_2 takes a value greater than 1 in absolute value, β_3 takes zero under perfect competition and takes positive values otherwise. The coefficient on the lagged cash flow, β_5, is negative.

The debt terms control for the non-separability between investment and borrowing decisions. Under the existence of bankruptcy costs and a tax advantage of debt, the firm raises debt until the tax advantages have been fully exploited. If the firm is under financial constraint, the optimal level of debt determines the level of investment directly. The coefficient on the square of debt term is supposed to be negative unless firms are in the case where Modigliani-Miller theorem does hold. We also add the lagged debt term to the Bond and Meghir (1994) model.

[8] Derivation of the estimation equation is referred to Bond and Meghir (1994) or Bond and Van Reenen (2007).

The specification in this paper has a dynamic panel structure which has a lag of dependent variable as an independent variable and we estimate it with system GMM of Blundell and Bond (1998). Here all independent variables are treated as endogenous variable and use t-3 and t-4 independent variables as instruments.[9]

We take financial variables from Nikkei NEEDS, and variables on ownership from Nikkei NEEDS-Cges (Corporate Governance Evaluation System). We use consolidated data for all variables. We construct an unbalanced panel of publicly traded firms listed on TSE 1st and 2nd section in these industries during 2001 to 2008.[10] We require firms to have at least five R&D observations. Panel 1 of Table 2 presents descriptive statistics of the estimation sample.

5. Estimation Results

5.1 Pooled Sample Estimates

The pooled sample estimation results are summarized in Table 3. Hansen's J test rejects the validity of the instruments in the regression of column (1), but do not reject with the result in column (2), (3) and (4). It seems that the dynamics implied by the structural model are not rejected partly. The coefficient on the lagged dependent variable is significantly positive and not different from one.

== Table 3 about here ==

We find the discrepancy between this model and the basic theoretical structure for several variables. In each regression result, the coefficient for cash flow is positive, although the theoretical model implies that this coefficient should be negative, under the assumption that the firm can raise as much fund as it want at a given cost. This positive coefficient is in line with other literature such as Fazzari et al. (1988), and may reflect

[9] In there is no autocorrelation, instruments dated t-2 can be used, but when the error is MA(1), the instruments must be at least dated t-3.

[10] Since we need two years lag, and the consolidated accounting formally went effective to the listed firms after 1999 in Japan, we could not extend our estimation much longer period of time.

liquidity constraint. We also find that the coefficient of debt and the square of debt are not significantly negative in the regression results.[11]

We find similar results when we include the lagged values of funds raised by new stock issues scaled by beginning-of-period total assets following Bond and Meghir (1994) and Brown et al. (2009). The column (3) and (4) of Table 3 shows that the coefficient for lagged cash flow is positive but insignificant, and the coefficient of debt and the square of debt are not significantly negative with the exception of the lagged debt in column (3). The coefficient of the lagged stock is also insignificant in both regression results.

5.2 Comparison of Large and Small Firms

To investigate the effect of financial variables on R&D spending further, we split the sample by a firm characteristic that is likely to be associated with financial constraints. Hadlock and Pierce (2010) argue that firm size and firm age are closely related to financial constraints while KZ index advocated by Kaplan and Zingales (1997) is unlikely to useful measure of financial constraints. Then, we split our sample into two groups, Large and Small, based on firm size. Here, we define firms as Large if total asset of a firm is larger than 300 billion JPY, and we define firms as Small if total asset of a firm is less than 100 billion JPY. Expecting that the cost of debt finance differs based on the size of firm, we compare the regression results between Large and Small firms.[12]

Column (1) and (2) of Table 4 shows the results. We find again that the coefficient for lagged cash flow is positive and insignificant for both Small and Large firms. We examine this insignificance in the next sub section further.

For Large firms, in column (3) and (4), we find that the coefficients of lagged debt and lagged square debt are also significantly negative in column (4) as implied by tax-bankruptcy specification. This suggests that Large firms finance R&D investment at

[11] The coefficient of the lagged square of RD and the lagged Sales is also insignificant.

[12] The median of total asset for sample firm is 71 billion yen. We also set the 200 billion yen as threshold to define Small, and results are basically same, but weaker.

least partly from debt according to the optimal debt policy. For Small firms, the coefficient of lagged debt is significantly negative, while that of lagged square debt is insignificant in each regression result; the relationship between debt and R&D investment is linearly negative. Firms with small size have no optimal leverage ratio, and rather higher leverage leads to lower R&D investment. Small firms are more likely to face financial constraint because of the lack of collateralized asset or the higher uncertainty of future profit. This makes the cost of debt finance outweigh its benefit as a whole for Small firms. Thus, higher leverage raises the capital cost of R&D investment and decrease R&D investment.

== Table 4 about here ==

To explore the relationship between leverage and R&D investment further, we conduct two additional tests. First, we investigate whether the firm with higher leverage on their balance sheet at the beginning of the investment decision is more likely to reduce R&D investment at period *t* when debt finance increase at period t-1. Then, we divide the sample into firms with high and low leverage by median debt-assets ratio at the beginning of the sample period. When firms increase the debt finance at one unit, the marginal increase of the cost of debt is likely to be higher for high levered firms than that of low levered firms because of the higher default probability. This difference of marginal cost of debt finance leads to the different results between high levered and low levered firms. Table 5 shows the results. Column (1) and (2) of Table 5 shows the result when firms have higher debt-assets ratio at the beginning of the sample period. We find that the coefficient of the lagged debt is significantly negative in the regression. On the other hand, for low levered firms at the initial period, the coefficient of the lagged debt term and the lagged square debt is insignificant. Thus, for high levered firms, the increase of debt financing leads to the reduction of R&D investment, while the larger debt financing does not have any effect on R&D investment for low levered firms.[13]

== Table 5 about here ==

Second, we explore how the negative relationship between the lagged debt and R&D investment differ across firms with different business risk as measured by the number of business unit for each firm. We assume here that having larger number of business unit in one firm contributes to the reduction of business risk. If the debt finance leads to the reduction of R&D investment because of the increase of default risk, we would expect to see a weaker relationship between the lagged debt and R&D investment in firms with more business units. When we introduce the interaction term between the lagged debt and the indicator variable that is equal to one if the number of business unit in a firm is more than four, and zero otherwise (not tabulated), we find that the coefficient of the interaction term is significantly positive only for small firms. In fact, the magnitude of coefficient is large enough to offset the negative effect of the lagged debt on R&D investment. These results suggest that the higher default probability for small firms increases the cost of debt financing, and that is the main reason of the negative relationship between debt finance and R&D investment.

5.3 Cash Flow and Financial Constraint

To explore the role of financing constraints on R&D investment further, we add contemporaneous cash flow, which is the standard measure of internal equity financing in the financing constraint literature following Brown et al. (2009).

$$RD_{jt} = \beta_1 RD_{jt-1} + \beta_2 RD_{jt-1}^2 + \beta_3 S_{jt-1} + \beta_4 CF_{jt} + \beta_5 CF_{jt-1} + \beta_6 D_{jt-1} + \beta_7 D_{jt-1}^2 + d_t + \alpha_j + \upsilon_{jt}$$

Table 6 presents the regression results. The column (1) gives the results with whole

[13] We also estimate the same model for the high- and low levered firms within small firms. The results on the lagged debt terms are similar to Table 5.

samples, and column (2) and (3) present regression results for small and large firms. In either regression, the contemporaneous cash flow variable has no significant effect, and the coefficient of lagged cash flow is also not significantly negative. In fact, we find the similar result with the specification without contemporaneous cash flow variable. The coefficient of lagged debt and lagged square debt is significantly negative for large firm, while only the coefficient of lagged debt is significantly negative for small firms.[14]

== Table 6 about here ==

To investigate further the sensitivity of R&D investment to contemporaneous cash flow, we add firms which are listed on "emerging market", JASDAQ, MOTHERS and Hercules (formerly NASDAQ Japan). These firms constitute a subset of Young firms defined in Section 2. These three markets, especially, MOTHERS and Hercules, are established for start-up firms. In terms of industry distribution, JASDAQ is more diverse and the two newer markets are highly oriented toward the IT industry (Arikawa and Immaddine, 2010). Moyen (2004) shows that the investment-cash flow sensitivities in the sense of Fazzari et al. (1988) hold only when constrained firms do not have enough funds to invest as much as they want. This might be the situation especially for firms listed on JASDAQ, MOTHERS and Hercules. We expect that Small firms including firms listed on emerging market are more likely to face severe financial constraint than other firms.

Column (4) of Table 6 shows that the coefficient of contemporaneous cash flow is significant.[15] This suggests that R&D investments are financially constrained, and marginal increase of internal fund leads to the increase R&D investment. Column (5) and Column (6) show the results when we divide the sample into Large and Small firms. We expect that only for Small firms, the contemporaneous cash flow have a significant effect. Consistent to our prediction, we find that the coefficient on contemporaneous

[14] The results are same when we use year dummy in the regression.

[15] The models which strictly follow Brown et al. (2009) model, namely models which have contemporaneous variables for all financial variables (both with and without debt terms), provide similar results.

cash flow is significantly positive for Small firms, while that of Large firms is insignificant. Thus, we can conclude that “emerging” firms with small size are likely to face financial constraint for R&D investment. Comparing the result between Column (2) and (4), it is clear that firm listed on JASDAQ, MOTHERS and Hercules face the severe financial constraint for R&D investment. This result corresponds to the result of US young firms in Brown et al. (2009).

We also find that the coefficient of lagged debt and lagged square of debt are both negatively significant for Large firms. On the other hand, for Small firms, we find no significant result in terms of the debt related variables. The result suggests that Small firms, especially start-up firms face the financial constraint, consequently they do not use debt finance for R&D investment because it is highly costly.

Finally, we find no significant result for the coefficient of the lagged external equity even we add “emerging” firms which listed on JASDAQ, MOTHERS and Hercules. In the US, Brown et al. (2009) point out that the supply of equity finance for young publicly traded firms in high-tech industries have driven much of the R&D boom in the 1990s. In Japan, we find no robust evidence that stock market is the important source of funds for technological development.

5.4 Ownership Structure and R&D Investment

One characteristic of changes in corporate governance structure for Japanese firms in the 2000s was the shift from insider to outsider ownership, as shown in Section 3. Then, it is natural question whether ownership structure would influence R&D investment or not. One of the perditions is that myopic investors influence R&D investment which requires long time before generating revenues (Narayanan, 1985, and Stein, 1989). If an investor is myopic and his preference is biased toward immediate dividend, then managers may take into account these myopic investors and pay dividends by sacrificing R&D investment. In this case, firms with more myopic investors are more likely to face underinvestment in R&D.[16]

[16] It is also possible that investors’ preferences are biased toward high R&D investment, and firms overinvest on R&D (Aghion and Stein, 2008).

To study the effect of myopic investors on R&D expenditure, we add foreign investor's shareholding ratio and the interaction term between the contemporaneous cash flow and foreign investor's shareholding ratio. Then, we estimate the following equation:

$$RD_{jt} = \beta_1 RD_{jt-1} + \beta_2 RD_{jt-1}^2 + \beta_3 S_{jt-1} + \beta_4 CF_{jt} + \beta_5 CF_{jt-1} + \beta_6 D_{jt-1} + \beta_7 D_{jt-1}^2 + \beta_8 FRGN_{jt} + \beta_9 FRGN_{jt} \times CF_{jt} + d_t + \alpha_j + \upsilon_{jt}$$

where $FRGN_{jt}$ is foreign shareholding ratio for firm *j* in period *t* and $FRGN_{jt} \times CF_{jt}$ is the interaction of foreign shareholding ratio and cash flow. If foreign investors demand excessive dividend myopically, we expect the interaction term takes positive coefficients.

Table 7 shows the estimation results. We use firms which are listed on TSE 1st and 2nd, JASDAQ, MOTHERS and Hercules. First, the estimation results for Small firms, Column (3) and (4), show that foreign investor's shareholdings ratio take significantly positive coefficients and their interaction terms with cash flow take significantly negative coefficients. Thus, for these firms, foreign investors does not decrease raises R&D expenditure and mitigates financial constraint. Second, regarding Large firms, Column (5) and (6), we find that the coefficient of foreign shareholder's ratio and its interaction terms with cash flow is insignificant.

In summary, we do not find any evidence that large shareholdings by foreign investors enforce myopic behavior on firms.

== Table 7 about here ==

6. Conclusion

In the progress of IT revolution, firms which recently listed on the market accounted a large part of R&D investment in the US. By contrast, in Japan, large and mature firms which drove the high growth period are still the main players of R&D expenditure. While domestic emerging equity markets have been organized since 1999 and many new firms went public especially in IT related sectors, firms which went public after 1990 account for only 3% of total R&D spending in R&D intensive industries. On the other hand, large firms whose consolidated assets are more than 500 billion yen account for nearly 80% of total R&D spending in R&D intensive industries.

In this paper, we examine whether the financial factor explains the little presence of R&D investment by small and young firms in Japan. Then, we find that contemporaneous cash flow have no statistically significant effect on R&D investment of firms with larger asset. For young and small firms mainly listed on newly established emerging market, however, the coefficient of contemporaneous cash flow is significantly positive. We also find that firms with large asset finance R&D investment partly from debt taking the optimal debt policy. For firms with small asset, higher level of debt financing leads to lower R&D investment.

One characteristic of change in governance structure of Japanese firms was the shift from insider to outsider ownership. If an investor is myopic and his preference is biased toward immediate dividend, then managers may take into account these myopic investors and pay dividends by sacrificing R&D investment. To study the effect of corporate governance factors on R&D expenditure, we add the interaction term between contemporaneous cash flow and foreign investor shareholding ratio. Then, we do not find any evidence that large shareholdings by foreign investors enforce myopic behavior on firms.

Finally, we do not find any positive effect of equity finance on firms with small asset size. This result contrasts with the US case in which the changes of equity finance by the young, high-tech firms explain most of the 1994 to 2004 aggregate R&D cycle (Brown et al., 2009).

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Figure 1: R&D and Physical Investments by Manufacturers

Borrowed from Ministry of Economy, Trade and Industry, *Basic Survey of Japanese Business Structure and Activities*. Unit: One billion yen.

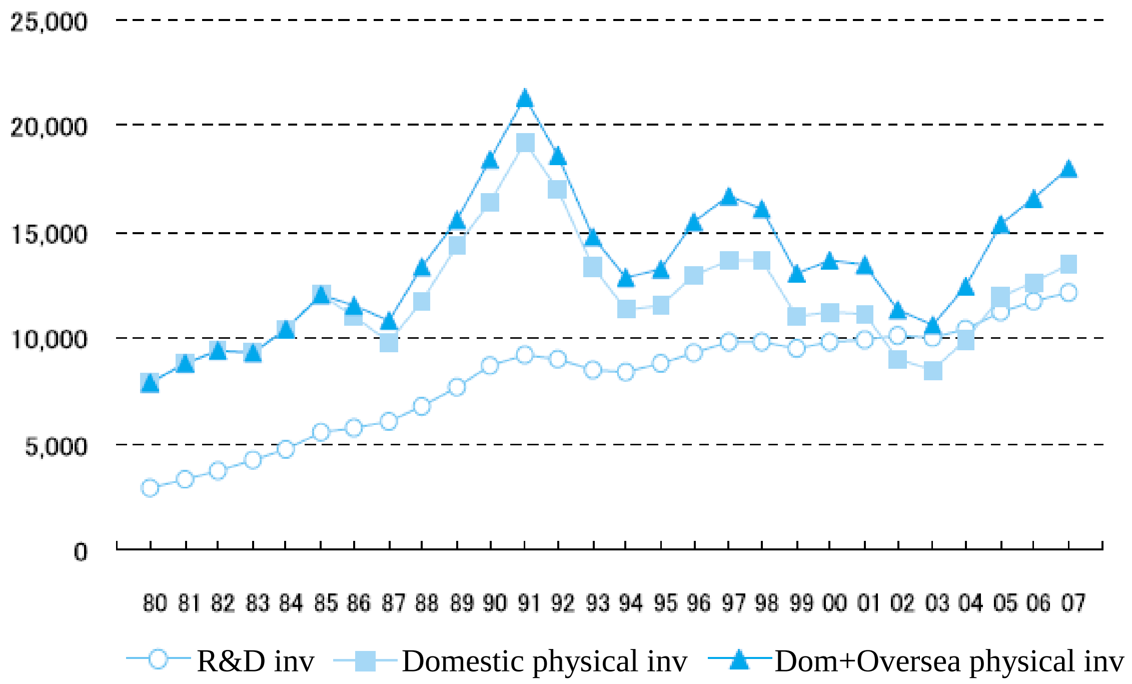

Figure 2: Trend of R&D Expenditure

The sample consists of firms in the seven R&D intensive industries in the 1st or 2nd section of Tokyo Stock Exchange and young firms in the same industries who went public after 1990 on the Tokyo Stock Exchange, Mothers, Hercules, or JASDAQ. The seven industries consist of chemicals, pharmaceutical, machinery, electric appliances, transportation equipment, precision instruments, and information & communication. Industry classification is based on Securities Identification Code Committee's 33 sectors (excluding financial sectors) (Syoken Code Kyogikai 33 Gyoshu). Among firms in Information & Communication sector, we only pick up firms in 3 major groups; Communications (37), Information Services (39), and Internet Based Services (40) in Division G: Information and Communications by Japan Standard Industrial Classification.

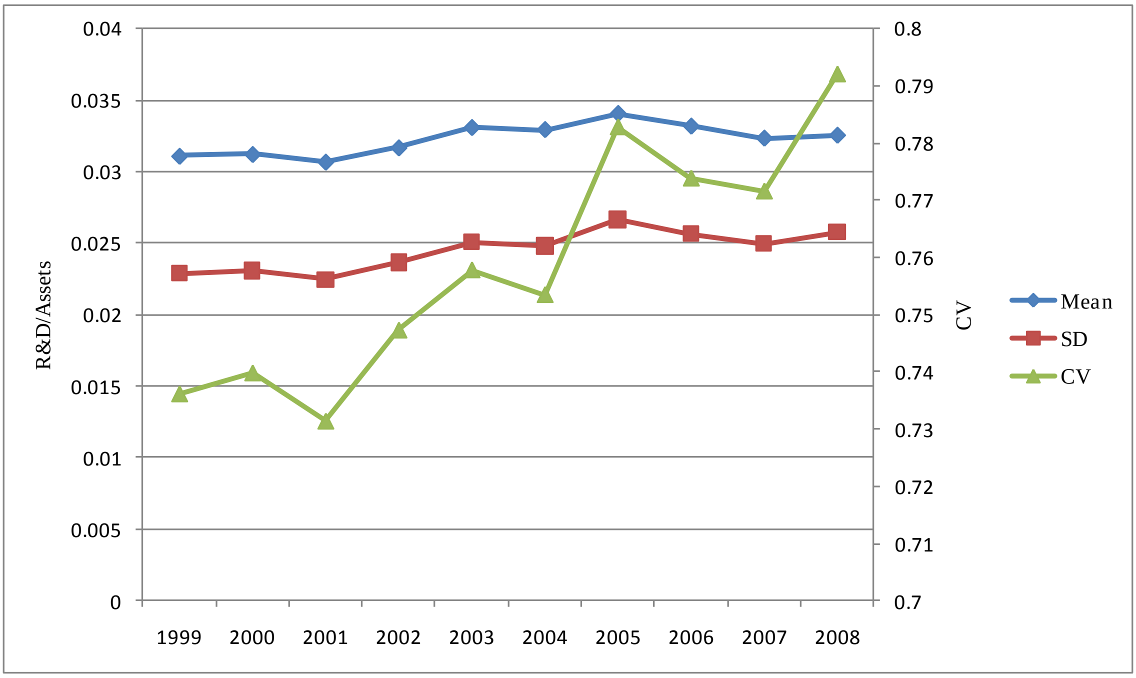

Figure 3: R&D Expenditure by Firm Size

The sample is firms in the seven R&D intensive industries. Large is firms in the 1st or 2nd section of Tokyo Stock Exchange and had consolidated assets 300 billion yen or greater in 1999. Small is firms in the 1st or 2nd section of Tokyo Stock Exchange and had consolidated assets less than 100 billion yen in 1999. Young is firms who went public after 1990 on the Tokyo Stock Exchange, Mothers, Hercules, or JASDAQ.

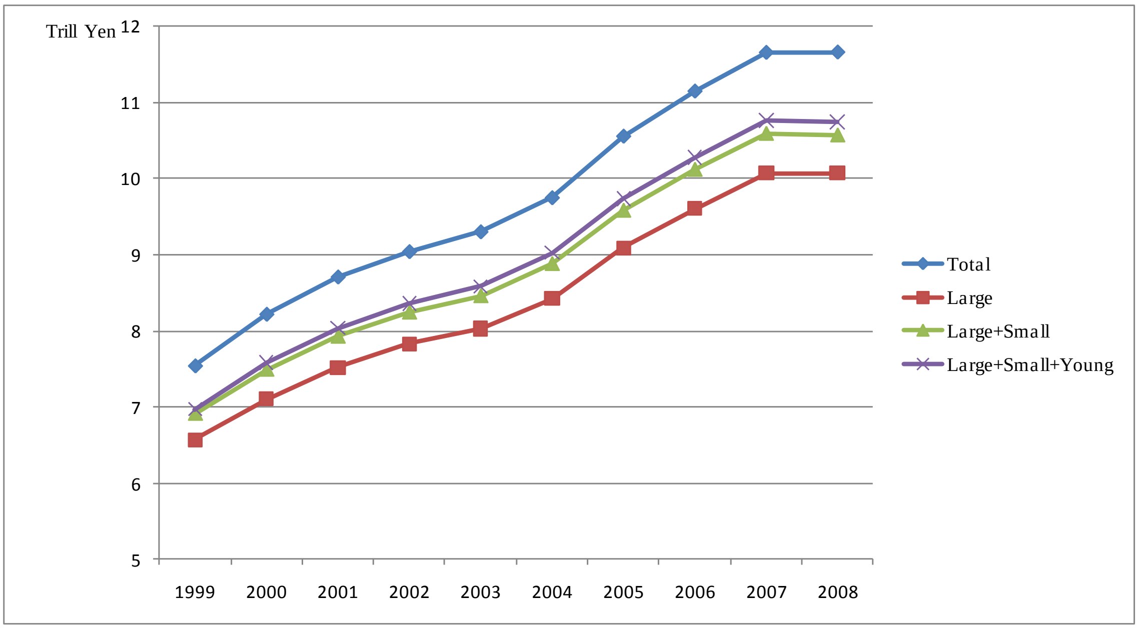

Figure 4: R&D Expenditure and Finance

The sample is firms in the seven R&D intensive industries. CF is cash flow. Debt is flow value.

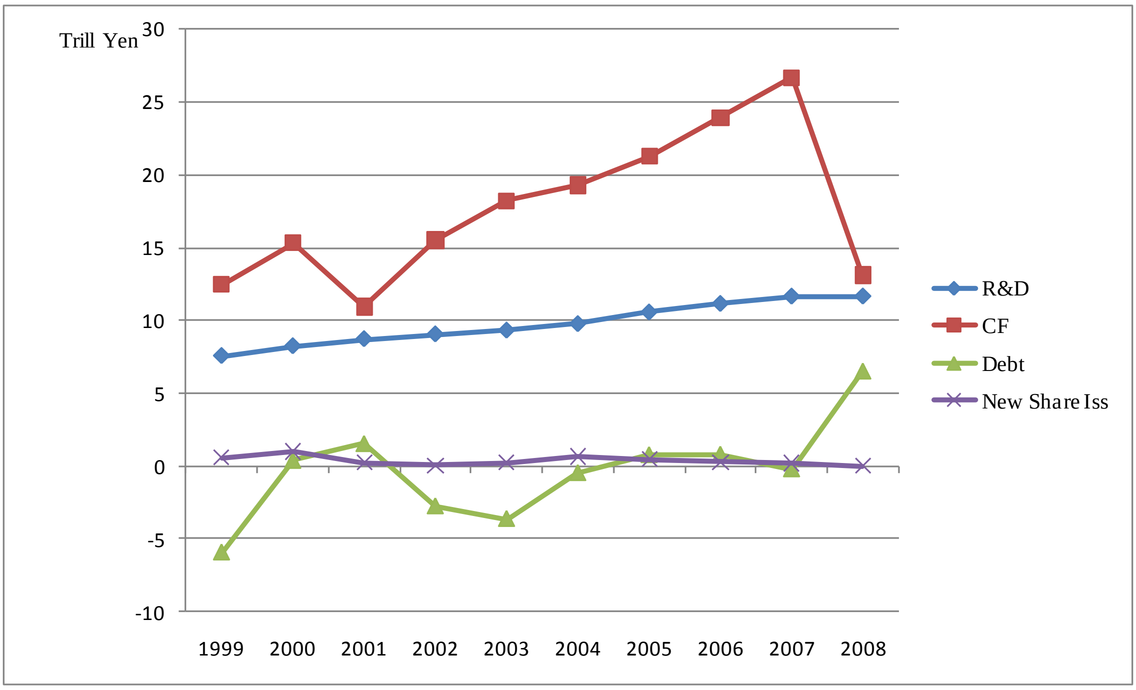

Table 1: R&D Expenditure by Industry

The sample is all listed firms in the Toyo Keizai dataset in 2006. Industry classification is based on Securities Identification Code Committee's 33 sectors (excluding financial sectors) (Syoken Code Kyogikai 33 Gyoshu). RD/S is R&D expenditure-sales ratio. SD and CV stand for standard deviation and coefficient of variation, respectively. The unit is 100 million yen.

Sector code	Sector name	Num. firm	Total R&D	R&D share	Av. R&D/S	SD R&D/S	CV
50	Fish., Ag. & Forest.	11	98	0.07%	1.29%	1.96%	1.52
1050	Mining	7	17	0.01%	0.53%	0.75%	1.43
2050	Construction	215	1,045	0.78%	0.24%	0.32%	1.35
3050	Foods	153	2,399	1.78%	1.11%	1.76%	1.58
3100	Textiles & Apparels	79	1,509	1.12%	1.08%	1.23%	1.13
3150	Pulp & Paper	27	307	0.23%	0.83%	0.91%	1.10
3200	Chemicals	215	10,745	**7.97%**	**2.95%**	2.35%	0.80
3250	Pharmaceutical	51	10,347	**7.67%**	**29.66%**	74.37%	2.51
3300	Oil & Coal Products	13	443	0.33%	1.23%	2.16%	1.76
3350	Rubber Products	21	1,465	1.09%	2.44%	1.22%	0.50
3400	Glass & Ceramics	71	1,283	0.95%	1.59%	1.45%	0.91
3450	Iron & Steel	56	1,633	1.21%	0.63%	0.74%	1.19
3500	Nonferrous Metals	43	1,598	1.19%	1.08%	0.88%	0.81
3550	Metal Products	97	911	0.68%	1.20%	1.14%	0.96
3600	Machinery	247	6,325	**4.69%**	**2.24%**	2.27%	1.01
3650	Electric Appliances	309	50,933	**37.77%**	**4.65%**	4.55%	0.98
3700	Transport Equip.	106	32,017	**23.74%**	**2.02%**	1.86%	0.92
3750	Precision Inst.	53	2,291	**1.70%**	**4.82%**	6.46%	1.34
3800	Other Products	116	2,105	1.56%	1.24%	1.48%	1.19
4050	Electric Power & Gas	25	1,349	1.00%	0.41%	0.35%	0.84
5050	Land Transport.	66	412	0.31%	0.05%	0.20%	3.96
5100	Marine Transport.	18	13	0.01%	0.01%	0.01%	2.86
5150	Air Transport.	6	5	0.00%	0.44%	0.34%	0.78
5200	Warehousing & Harbor	44	4	0.00%	0.04%	0.15%	3.51
5250	Info & Communication	359	4,791	**3.55%**	**2.28%**	5.55%	2.43
6050	Wholesale Trade	387	530	0.39%	0.29%	1.45%	4.93
6100	Retail Trade	384	37	0.03%	0.03%	0.19%	6.54
8050	Real Estate	132	15	0.01%	0.04%	0.23%	5.42
9050	Services	377	228	0.17%	1.38%	10.84%	7.84
Total		3,688	134,854	100.00%			

Table 2: Descriptive Statistics

The estimation sample is firms in the seven R&D intensive industries. The seven industries consist of chemicals, pharmaceutical, machinery, electric appliances, transportation equipment, precision instruments, and information & communication. Industry classification is based on Securities Identification Code Committee's 33 sectors (excluding financial sectors) (Syoken Code Kyogikai 33 Gyoshu). Among firms in Information & Communication sector, we only pick up firms in 3 major groups; Communications (37), Information Services (39), and Internet Based Services (40) in Division G: Information and Communications by Japan Standard Industrial Classification. The estimation period is from 2000-2008. We classify firms in the 1st or 2nd section of Tokyo Stock Exchange as Large if their consolidated assets are 300 billion yen or greater in 1999. We classify firms in the 1st or 2nd section of Tokyo Stock Exchange as Small if their consolidated assets are less than 100 billion yen in 1999. Firms are defined as Young if they went public after 1990 on the Tokyo Stock Exchange, Mothers, Hercules, or JASDAQ. Outliers in all variables which are three standard deviations away from their mean are eliminated from the sample. Firms which have five observations or less in the sample period are dropped. All variables except for ownership variables are scaled by beginning-of-period total assets. The numbers of firms for ownership related variables are in parentheses in Panel 2.

Panel 1: R&D Expenditure and Finance

	Total			Large			Small			Young		
	Mean	SD	CV	Mean	SD	CV	Mean	SD	CV	Mean	SD	CV
Obs		5,660			788			2,866			1,330	
R&D	0.032	0.025	0.761	0.044	0.024	0.552	0.029	0.022	0.768	0.031	0.027	0.875
Sales	0.938	0.318	0.339	0.942	0.286	0.303	0.932	0.305	0.327	0.935	0.374	0.400
Debt	-0.004	0.056	-13.856	-0.003	0.049	-17.608	-0.006	0.054	-9.335	0.001	0.059	42.604
CF	0.059	0.052	0.887	0.071	0.049	0.688	0.056	0.049	0.866	0.055	0.058	1.053
New Share Iss	0.002	0.019	7.794	0.002	0.011	6.228	0.002	0.013	7.180	0.005	0.031	6.338
Foreigner (%)	0.104	0.114	1.094	0.251	0.129	0.512	0.065	0.075	1.162	0.063	0.079	1.259

Panel 2: Ownership Structure

		Total			Large			Small			Young		
		1998	2001	2006	1998	2001	2006	1998	2001	2006	1998	2001	2006
Obs		584	595	647	86	88	88	278	297	329	123	120	161
Debt/Assets	Mean	0.26	0.20	0.13	0.30	0.23	0.16	0.26	0.20	0.12	0.22	0.15	0.11
	SD	0.19	0.15	0.11	0.17	0.14	0.11	0.20	0.16	0.11	0.18	0.14	0.12
Borrowing/Assets	Mean	0.21	0.17	0.11	0.20	0.16	0.12	0.22	0.18	0.11	0.20	0.13	0.10
	SD	0.18	0.15	0.10	0.16	0.12	0.10	0.19	0.16	0.11	0.18	0.13	0.11
Bond/Assets	Mean	0.05	0.03	0.02	0.10	0.07	0.04	0.03	0.02	0.01	0.02	0.02	0.02
	SD	0.07	0.05	0.03	0.07	0.05	0.04	0.06	0.04	0.03	0.04	0.05	0.04
Foreigner (%)	Mean	6.11	7.03	13.74	16.15	20.50	30.32	2.82	3.44	9.15	2.83	3.36	8.36
	SD	8.24	9.98	12.38	10.99	13.27	11.84	4.30	5.53	8.25	4.40	5.33	9.20
Inst investors (%)	Mean	13.18	14.40	22.89	22.23	31.37	43.91	6.72	7.49	16.93	8.15	12.79	14.01
	SD	10.90	14.20	17.30	11.24	14.47	13.49	6.35	8.80	12.82	3.81	10.76	12.64
Cross-holding (%)	Mean	13.44	11.42	9.15	12.70	9.52	7.48	13.97	12.11	10.70	6.02	7.18	5.08
	SD	7.88	8.21	8.00	7.11	6.97	5.59	8.17	8.58	8.67	3.32	6.83	5.38
Director share (%)	Mean	6.28	5.53	4.98	0.61	0.49	0.45	3.42	3.67	3.48	26.93	20.27	15.25
	SD	22.26	10.31	9.42	1.73	1.60	1.73	6.09	6.84	6.20	48.42	14.00	13.25

Table 3: Estimation Results (Baseline Model)

The dependent variable is R&D expenditure. Estimated by system GMM of Blundell and Bond (1998) using independent variables dated t-3 and t-4 as instruments. All variables are scaled by beginning-of-period total assets. Heteroskedasticity and autocorrelation robust z-values are in parentheses. Hansen is p-value of Hansen's J test for over-identification. AC1 and AC2 are p-values of the Arellano-Bond test for first and second order autocorrelation which have a null hypothesis of no autocorrelation and is applied to the differenced residuals. ***, **, * significant at the 1 %, 5 % and 10% level, respectively.

	(1)	(2)	(3)	(4)
RD_{t-1}	0.996	0.938	1.003	0.938
	(13.92)***	(12.16)***	(14.56)***	(12.72)***
RD^2_{t-1}	-0.24	0.047	-0.328	0.01
	(-0.32)	(0.06)	(-0.45)	(0.01)
$Sales_{t-1}$	-0.002	-0.001	-0.002	-0.001
	(-1.39)	(-0.50)	(-1.45)	(-0.66)
CF_{t-1}	0.014	0.003	0.013	0.006
	(1.32)	(0.33)	(1.41)	(0.60)
$Debt_{t-1}$	-0.019	-0.014	-0.018	-0.013
	(-2.07)**	(-1.52)	(-2.08)**	(1.56)
$Debt^2_{t-1}$	0.002	0.013	-0.034	-0.031
	(0.03)	(0.18)	(-0.41)	(-0.38)
Stk_{t-1}			-0.002	0.01
			(-0.08)	(0.33)
Year Dummies	YES		YES	
Year*Indust Dum.		YES		YES
AC1	0	0	0	0
AC2	0.278	0.226	0.305	0.251
Hansen	0.097	0.147	0.125	0.238
Observations	4632	4632	4615	4615

Table 4: Estimation Results by Firm Size

The dependent variable is R&D expenditure. Estimated by system GMM of Blundell and Bond (1998) using independent variables dated t-3 and t-4 as instruments. All variables are scaled by beginning-of-period total assets. The sample is divided by firm size in 1999. Large is firms in the 1st or 2nd section of Tokyo Stock Exchange and had consolidated assets 300 billion yen or greater in 1999. Small is firms in the 1st or 2nd section of Tokyo Stock Exchange and had consolidated assets less than 100 billion yen in 1999. Heteroskedasticity and autocorrelation robust z-values are in parentheses. Hansen is p-value of Hansen's J test for over-identification. AC1 and AC2 are p-values of the Arellano-Bond test for first and second order autocorrelation which has a null hypothesis of no autocorrelation and is applied to the differenced residuals. ***, **, * significant at the 1 %, 5 % and 10% level, respectively.

	Small (1)	Small (2)	Large (3)	Large (4)	Small (5)	Small (6)	Large (7)	Large (8)
RD_{t-1}	1.036	0.984	1.264	1.18	1.032	0.986	1.238	1.151
	(11.82)***	(10.09)***	(7.86)***	(8.10)***	(12.34)***	(10.94)***	(8.23)***	(7.88)***
RD^2_{t-1}	-1.246	-1.012	-2.358	-2.067	-1.184	-1.029	-2.11	-1.754
	(-1.26)	(-0.94)	(-1.54)	(-1.39)	(-1.25)	(-1.04)	(-1.45)	(-1.18)
$Sales_{t-1}$	-0.001	0	-0.005	-0.001	0	0	-0.004	0
	(-0.36)	(-0.15)	(-1.74)*	(-0.31)	(-0.10)	(-0.06)	(-1.64)	(-0.26)
CF_{t-1}	0.009	0.003	-0.002	0.012	0.007	0.005	0.001	0.012
	(0.83)	(0.28)	(-0.16)	(0.82)	(0.75)	(0.47)	(0.05)	(0.86)
$Debt_{t-1}$	-0.016	-0.013	-0.021	-0.031	-0.018	-0.016	-0.028	-0.037
	(-1.74)*	(-1.39)	(-1.76)*	(-2.93)***	(-2.15)**	(-1.93)*	(-2.32)**	(-3.53)***
$Debt^2_{t-1}$	0.017	0.01	-0.115	-0.241	-0.028	-0.04	-0.119	-0.241
	(0.24)	(0.15)	(-1.31)	(-2.21)**	(-0.47)	(-0.70)	(-1.29)	(-2.24)**
Stk_{t-1}					-0.008	-0.007	-0.008	-0.006
					(-0.31)	(-0.26)	(-0.21)	(-0.15)
Year Dummies	YES		YES		YES		YES	
Year*Indust Dum.		YES		YES		YES		YES
AC1	0	0	0	0	0	0	0	0
AC2	0.58	0.612	0.433	0.119	0.602	0.637	0.315	0.104
Hansen	0.328	0.516	1	1	0.525	0.775	1	1
Observations	2883	2883	761	761	2866	2866	761	761

Table 5: The Effect of Debt

The dependent variable is R&D expenditure. Estimated by system GMM of Blundell and Bond (1998) using independent variables dated t-3 and t-4 as instruments. All variables are scaled by beginning-of-period total assets. The sample is divided at the median value of debt-assets ratio in 1999. Heteroskedasticity and autocorrelation robust z-values are in parentheses. Hansen is p-value of Hansen's J test for over-identification. AC1 and AC2 are p-values of the Arellano-Bond test for first and second order autocorrelation which has a null hypothesis of no autocorrelation and is applied to the differenced residuals. ***, **, * significant at the 1 %, 5 % and 10% level, respectively.

	Above Med	Above Med	Below Med	Below Med
	(1)	(2)	(3)	(4)
RD_{t-1}	1.056	1.033	1.039	0.957
	(12.19)***	(9.90)***	(11.96)***	(10.45)***
RD^2_{t-1}	-1.038	-0.884	-0.784	-0.417
	(-1.02)	(-0.77)	(-0.94)	(-0.46)
$Sales_{t-1}$	0.001	0	-0.004	-0.001
	(0.37)	(0.20)	(-2.20)**	(-0.77)
CF_{t-1}	0.012	0.012	0.01	0.005
	(1.13)	(1.09)	(0.93)	(0.46)
$Debt_{t-1}$	-0.023	-0.018	-0.018	-0.006
	(-2.47)**	(-2.13)**	(-1.41)	(-0.56)
$Debt^2_{t-1}$	0.025	0.018	-0.127	-0.15
	(0.50)	(0.35)	(-1.00)	(-1.22)
Stk_{t-1}	-0.051	-0.047	0.005	0.017
	(-1.83)*	(-1.72)*	(0.12)	(0.37)
Year Dummies	YES		YES	
Year*Indust Dum.		YES		YES
AC1	0	0	0	0
AC2	0.322	0.464	0.632	0.665
Hansen	0.071	0.265	0.168	0.661
Observations	2274	2274	2341	2341

Table 6: Tests for the Existence of Financial Constraint

The dependent variable is R&D expenditure. Estimated by system GMM of Blundell and Bond (1998) using independent variables dated t-3 and t-4 as instruments. All variables are scaled by beginning-of-period total assets. The sample is divided by firm size in 1999. Large is firms in the 1st or 2nd section of Tokyo Stock Exchange and had consolidated assets 300 billion yen or greater in 1999. Small is firms in the 1st or 2nd section of Tokyo Stock Exchange and had consolidated assets less than 100 billion yen in 1999. Emerging is firms who went public after 1990 on the emerging markets; Mothers, Hercules, or JASDAQ. Heteroskedasticity and autocorrelation robust z-values are in parentheses. Hansen is p-value of Hansen's J test for over-identification. AC1 and AC2 are p-values of the Arellano-Bond test for first and second order autocorrelation which has a null hypothesis of no autocorrelation and is applied to the differenced residuals. ***, **, * significant at the 1 %, 5 % and 10% level, respectively.

	Total (1)	Small (2)	Large (3)	Total+Emerging (4)	Small+Emerging (5)	Large+Emerging (6)
RD_{t-1}	0.933	0.983	1.148	0.892	0.888	1.156
	(12.67)***	(10.73)***	(7.66)***	(13.53)***	(11.06)***	(8.15)***
RD^2_{t-1}	0.047	-1.036	-1.736	0.156	0.066	-1.814
	(0.06)	(-1.02)	(-1.15)	(0.34)	(0.09)	(-1.25)
$Sales_{t-1}$	-0.001	0	0	-0.001	0.001	-0.001
	(-0.73)	(-0.26)	(-0.22)	(-0.86)	(0.76)	(-0.37)
CF	0.004	0.021	0.004	0.036	0.046	0.017
	(0.30)	(1.32)	(0.26)	(2.29)**	(2.95)***	(1.08)
CF_{t-1}	0.004	-0.006	0.009	-0.005	-0.014	-0.005
	(0.29)	(-0.55)	(0.60)	(-0.40)	(-0.94)	(-0.36)
$Debt_{t-1}$	-0.013	-0.016	-0.037	-0.001	-0.006	-0.032
	(-1.46)	(-1.87)*	(-3.53)***	(-0.11)	(-0.47)	(-3.35)***
$Debt^2_{t-1}$	-0.032	-0.037	-0.242	-0.067	-0.082	-0.208
	(-0.4)	(-0.66)	(-2.26)**	(-1.17)	(-1.57)	(1.98)**
Stk_{t-1}	0.007	-0.015	-0.006	-0.019	-0.029	-0.005
	(0.23)	(-0.54)	(-0.15)	(-0.98)	(1.79)*	(-0.17)
Year Dummies						
Year*Indust Dum.	YES	YES	YES	YES	YES	YES
AC1	0	0	0	0	0	0
AC2	0.248	0.726	0.114	0.454	0.955	0.069
Hansen	0.201	0.768	1	0.266	0.627	1
Observations	4615	2866	761	5660	3848	788

Table 7: The Effect of Foreign Investors

The dependent variable is R&D expenditure. Estimated by system GMM of Blundell and Bond (1998) using independent variables dated t-3 and t-4 as instruments. All variables are scaled by beginning-of-period total assets. The sample is divided by firm size in 1999. Large is firms in the 1st or 2nd section of Tokyo Stock Exchange and had consolidated assets 300 billion yen or greater in 1999. Small is firms in the 1st or 2nd section of Tokyo Stock Exchange and had consolidated assets less than 100 billion yen in 1999. Emerging is firms who went public after 1990 on the emerging markets; Mothers, Hercules, or JASDAQ. Heteroskedasticity and autocorrelation robust z-values are in parentheses. Hansen is p-value of Hansen's J test for over-identification. AC1 and AC2 are p-values of the Arellano-Bond test for first and second order autocorrelation which has a null hypothesis of no autocorrelation and is applied to the differenced residuals. ***, **, * significant at the 1 %, 5 % and 10% level, respectively.

	Total+Emerging		Small+Emerging		Large+Emerging	
	(1)	(2)	(3)	(4)	(5)	(6)
RD_{t-1}	0.964	0.918	0.987	0.946	1.318	1.302
	(19.14)***	(15.86)***	(15.74)***	(13.53)***	(9.53)***	(10.49)***
RD^2_{t-1}	-0.192	-0.014	-0.576	-0.376	-2.889	-3.067
	(-0.53)	(-0.04)	(-0.93)	(-0.59)	(-2.18)**	(-2.45)**
$Sales_{t-1}$	-0.003	-0.001	-0.001	0.001	-0.006	-0.002
	(-1.83)*	(-0.83)	(-0.55)	(0.50)	(-2.19)**	(-0.87)
CF	0.046	0.046	0.057	0.058	0.006	0.03
	(2.80)***	(2.90)***	(3.19)***	(3.39)***	(0.30)	(1.44)
CF_{t-1}	-0.003	-0.008	-0.008	-0.012	-0.025	-0.016
	(-0.29)	(-0.69)	(-0.67)	(-0.91)	(-1.97)**	(-1.21)
$Debt_{t-1}$	-0.008	0	-0.009	-0.005	-0.03	-0.038
	(-0.81)	(-0.03)	(-0.8)	(-0.51)	(-2.88)***	(-3.97)***
$Debt^2_{t-1}$	-0.095	-0.095	-0.068	-0.075	-0.143	-0.178
	(-1.71)*	(-1.75)*	(-1.24)	(-1.42)	(-1.78)*	(-1.92)*
Stk_{t-1}	-0.023	-0.018	-0.032	-0.033	-0.002	-0.003
	(-1.26)	(-1.01)	(1.98)**	(2.25)**	(-0.09)	(-0.11)
$Frgn_{t-1}$	0.011	0.013	0.009	0.008	-0.005	0
	(2.63)***	(3.25)***	(1.48)	(1.52)	(-0.65)	(-0.07)
$Frgn{*}CF_{t-1}$	-0.153	-0.158	-0.228	-0.215	0.036	-0.043
	(3.30)***	(3.61)***	(2.41)**	(2.37)**	(0.53)	(-0.82)
Year Dummies	YES		YES		YES	
Year*Indust Dum.		YES		YES		YES
AC1	0	0	0	0	0	0
AC2	0.736	0.565	0.675	0.753	0.478	0.111
Hansen	0.089	0.334	0.173	0.261	1	1
Observations	5656	5656	3845	3845	787	787