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Abstract

Using a dataset of Japanese listed firms from 2002 to 2013, we examine how firms' asset structure in terms of the ratio of intangible to tangible capital is related to their choice of financing sources among bank loans, equity issues (seasoned equity offerings: SEO), and bond issues. We further investigate how the choice of financing is related to post-financing investment in tangible and intangible capital. We find that firms with higher intangible capital ratios are more likely to choose equity issuance and less likely to choose loans than bond issues. Using propensity score matching and difference-in-differences approach (PSM-DID), we further find that firms that chose loans invest less in intangible capital than those that did not. Finally, we also obtain results that are consistent with a number of existing theories on capital structure such as the market timing (mispricing) hypothesis on equity issuance, the tradeoff and the pecking order hypotheses on debt and equity, and the holdup hypothesis on bank loans.

Keywords: Intangible capital, External finance, Seasoned equity offering
JEL classification: E22; G30; G39

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Intangible Capital and the Choice of External Financing Sources

1. Introduction

The choice of external financing sources has been one of the central questions of corporate finance. While a huge number of theoretical and empirical studies have been accumulated on this issue, firm-level evidence on the effect of intangible capital on external financing is still scarce despite an increasing role of intangible capital in firm growth. This is possibly due to a lack in firm-level data on intangible capital except for research and development (R&D) expenditures. This paper tries to fill in this void using a large dataset of Japanese firms that enables us to construct firm-level data on intangible capital.

Tangible assets, such as property, plant, and equipment, are easier for outsiders to value than intangibles, leading to lower expected distress costs. In addition, tangible assets are difficult to substitute high-risk assets for low-risk ones, resulting in fewer debt-related agency problems. On the other hand, intangible capital, such as R&D stock, brand, and software, is rarely pledgeable as collateral, and hence likely to result in credit constraints (e.g., Kiyotaki and Moore, 1997; Almeida and Campello, 2007). Given its role in output and productivity growth (e.g., Brynjolfsson and Hitt, 2003), intangible capital may be suitable for equity financing.

A vast literature on capital structure provides evidence on the positive relationship between leverage and asset tangibility. Harris and Raviv (1991), a classical survey on capital structure, note that the available studies “generally agree” that leverage decreases with advertising expenditures and R&D expenditures (p.334), both of which are substantial parts of intangible investment. As an example of recent studies on capital structure, Frank and Goyal (2009) show that leverage is positively correlated with asset tangibility. However, leverage is a result of the choice of external financing sources and the accumulation of internal savings. As such, we cannot

distinguish equity financing and internal savings. We cannot tell the difference between bank loans and bond issues as well from the leverage from capital structure.

As for the choice of external financing sources, a number of studies have focused on the choice of public debt (e.g., corporate bonds) vs. private debt (e.g., bank loans and nonbank loans), as is detailed in Section 2. However, there is scarce literature on the choice of equity issues and debt issues. As for equity issues, Kim and Weisbach (2008) examine the motivations for public equity offers, finding that R&D is one of the primary motivations for them. However, few studies the choice among bank loans, bond issues, and equity issues.

We thus contribute to the relevant literature in two ways. First, we analyze the role of intangible assets on the choice of external financing sources by constructing firm-level data on intangible assets. In contrast, most of the preceding studies on leverage and external finance measure asset tangibility using the ratio of tangible fixed assets to total assets both based on balance sheets, meaning that a substantial part of intangible capital such as R&D, brand and software is not appropriately captured. Second, we analyze the choice among loans, bond issues, and equity issues.

We find that firms with higher intangible capital ratios are more likely to choose equity issuance and less likely to choose loans than to choose bond issues. Using propensity score matching and difference-in-differences approach (PSM-DID), we further find that firms that chose loans invest less in intangible capital than firms that did not choose loans. Finally, we also obtain results that are consistent with a number of existing theories on capital structure such as the market timing (mispricing) hypothesis on equity issuance, the tradeoff and the pecking order hypotheses on debt and equity, and the holdup hypothesis on bank loans.

The rest of the paper proceeds as follows. Section 2 presents hypotheses on equity and bond issues, while Section 3 reviews the related extant literature. Section 4 explains the data and the

selection of the sample we use for our analysis. Sections 5 presents the empirical methodology and the results for the ex-ante characteristics of the firms that choose financing sources. Section 6 presents the methodology and the results of the ex-post investment of the firms that issued equity and bonds. Section 7 concludes

2. Hypotheses

In this section we state the hypotheses on the choice of external financing source focusing on the role of intangible capital. We first present hypotheses on the choice of equity and debt and then those on the choice of private debt (bank- and non-bank loans) and public debt (e.g., corporate bonds).

2.1 Debt vs. Equity

Intangible assets is less likely to serve as collateral and retain less value in liquidation than tangible capital, increasing the agency costs of debt (like risk shifting). Therefore, the greater the proportion of intangible assets, the less willing should lenders be to supply loans. On the other hand, if firms with higher intangible asset ratios have richer growth opportunities, investors should be willing to invest in the shares of such firms. Based on these discussions, we test the following hypothesis.

H1. Firms with more intangible asset ratios depend more on share issues and less on loans or bond issues.

2.2 Private vs. public debt

Private debt such as bank and nonbank loans are beneficial especially for firms that are

susceptible to information and agency problems because private-debt holders are concentrated and hence have advantages in monitoring borrowers and renegotiating debt as compared to public-debt holders. Given that intangible capital involves with severe information problems, firms with higher ratios of intangible assets to total assets are likely to depend more on private debt and less on public debt (e.g., Diamond, 1984, 1991). Furthermore, if firms with higher intangible asset ratios have richer growth opportunities, monitoring by private lenders are particularly valuable for them (Myers, 1979).

However, private lenders may hold up borrowers based on their informational monopoly power. If this rent extraction is substantial, firms with rich intangible capital and growth opportunities may rely more on public debt or multiple private lenders and less on a single private lender to avoid the hold-up problem by the single private lender (Rajan, 1991).

Based on these arguments, we propose the two opposing hypotheses on role of intangible capital in the choice of private and public debt.

H2A. Firms with more intangible assets depend more on loans and less on bonds if the monitoring by private lenders is beneficial for them.

H2B. Firms with more intangible assets depend more on bonds and less on loans if the hold-up problem is costly for them.

3. Related Studies

There are three strands of literature that analyze the relationship between tangible or intangible assets and financing sources. The first one focuses on R&D among intangibles and studies the role of equity issuance as a financing source of R&D. The second one analyses the

effect of asset tangibility on the choice between private and public debt, while the last one examines the relation with asset tangibility and capital structure, although asset tangibility in these strands of literature has been typically measured by the ratio of tangible fixed assets to total assets based on firms' balance sheets. We briefly review each of these strands of literature below.

3.1 R&D and Equity Finance

Although almost all intangible assets are susceptible to information problems and not pledgeable as collateral, and hence likely subject to credit constraints, financing of R&D activities has been intensively analyzed by preceding studies. Many existing studies find that firms finance R&D expenditures mainly by equity issuance when they need external funds. Kim and Weisbach (2008), using a sample of both initial and seasoned equity offerings from 38 countries, find that firms use funds raised by equity issuance to increase capital expenditures and R&D as well as cash holdings. Brown et al. (2009), using data from US high-tech firms, estimate dynamic R&D models to find significant effects of cash flow and external equity for young, but not mature, firms. Martinsson (2010) estimate dynamic R&D regression models similar to Brown et al. (2009) for high-tech firms, separately for the U.K. and Continental Europe, and find a significant effect of external equity only for the new, high-tech firms in the U.K. Brown et al. (2012) study a sample of European firms to find evidence that the availability of finance matters for R&D after controlling for the use of external equity finance as well as for firm efforts to smooth R&D with cash reserve, suggesting a major role for equity issues. Brown et al. (2013), using a sample of firms across 32 countries, find that strong shareholder protections and better access to stock market financing lead to substantially higher long-run rates of R&D investment, particularly in small firms. Magri (2014) studies Italian unlisted high-tech firms to find that equity increases both the probability of undertaking R&D and the R&D-to-sales ratio. Hertzel et al. (2012) examine

financing activities of newly public firms in the US and find that initial public offering (IPO) proceeds relative to external financing requirements are smaller for firms with more intangible assets and more R&D-intensive firms. Asset intangibility and R&D intensity are also both negatively related with the length of time from a firm's IPO to its first post-IPO capital infusion. These results suggest that capital staging (or sequential financing) is employed to help control the overinvestment problem in public firms.

These studies all show that one of the primary uses for funds raised by equity issues is to finance R&D. We contribute to this strand of literature in three ways. First, unlike these studies, we study financing of intangible capitals, which is broadly measured, covering brand and software as well as R&D. Secondly, we compare the effects on intangible capital of equity issuance with those of bond issuance and loans while most of the preceding studies focus on equity. Lastly, we clearly identify the effect of equity- (, bond- or loan-) financing on investment by comparing financing firms and non-financing firms whose ex-ante characteristics are similar to financing firms. On the other hand, Kim and Weisbach (2008), who is the closes to our study in that they examine capital expenditures and R&D subsequent to equity issues, do not adequately control for ex-ante characteristics of the control group, i.e., non-financing firms (except for the firm size in terms of total assets, year, and country).

3.2 Asset Tangibility and Choice between Private and Public Debt

Evidences on the effects of asset tangibility on the choice of debt structure is mixed. Houseton and James (1996), using US data from Compustat and CRSP, support the hold-up hypothesis. Specifically, they find that among firms that use a single bank lender, there is a negative relationship between the proportion of bank financing and the growth opportunities, measured by the market-to-book ratio and the ratio of R&D to sales. They further find that

multiple banking relationships and access to public debt markets mitigate or even overturn the negative association between growth opportunities and bank financing. Johnson (1997), using data from Compustat firms, find that the fixed asset ratio is positively correlated both with the proportion of bank debt and that of publicly-held debt (except for firms that have highly specialized assets) while it is negatively correlated with the proportion of debt held by private nonbank lenders. Cantillo and Wright (2000), using data from Compustat and other US data sources, find that firms with higher tangible assets as a proportion of total assets are more likely to tap bond markets, consistent with the hold-up hypothesis. On the other hand, Denis and Mihov (2005) investigate the choice among public debt, non-bank debt, and bank debt by US public firms and find that firms with higher ratios of fixed assets to total assets and lower ratios of R&D expenditures to sales, both suggesting less severe information asymmetry, are more likely to select public debt rather than bank or non-bank debt.[1] Using data from Japanese firms listed on the First Section of the Tokyo Stock Exchange over the period of 1993 to 1997, Shirasu and Xu (2007) find that the ratio of tangible fixed assets to total liability is negatively associated with the ratio of bond financing to the sum of bond and loan financing for the period.

While these empirical studies measure the asset tangibility either by tangible fixed assets on the balance sheets or R&D expenditures, these measures are far from complete. In the case of tangible fixed assets, cash and deposits are included in total assets while little of R&D stock, and other intangible capital are not included in total assets. Using R&D expenditures captures a part of intangible assets but misses other intangible assets. We measure intangible capital including R&D, brand, and software. Furthermore, we analyze the choice among equity, public debt (i.e., corporate bonds), and private debt (loans) rather than the choice between the latter two.

[1] Denis and Mihov (2005) find that the market-to-book ratio is not significant in the choice of debt structure. On the other hand, Krishnaswami, Spindt and Subramaniam (1999), using data from US listed firms, find that the ratio of privately placed long-term debt to total long-term debt is positively associated with the market-to-book ratio, while, they do not analyze the effects of R&D or other intangible capital as a determinant of debt structure.

3.3 Asset Tangibility and Leverage

A number of empirical studies find a positive correlation between asset tangibility and leverage. Rajan and Zingales (1995), among others, use data from the major industrialized countries and find that the ratio of fixed assets to total assets is positively correlated with the debt-to-total assets in 6 or 5 out of 7 countries depending on whether capital is book-based or market-valued. More recently, Frank and Goyal (2009) show that leverage is positively correlated with asset tangibility.

While few studies explicitly analyze the role of intangible capital in leverage, R&D and advertisement expenditures are often taken into consideration as a determinant of leverage. Haris and Raviv (1991), summarize the empirical studies available then, stating that leverage decreases with advertising expenditures and R&D (p.334)

Although studies on leverage are related with our study on the choice of debt and share issuance, a lower (higher) leverage does not necessarily imply that firms issue more (less) shares, because a substantial part of the equity, either measured based on book or market-valued equity, consists of retained earnings.

4. Data Sources and Sample Selection

A. Financing Sources

Data sources for share issues, bond issues, new loans, and commercial paper (CP) issues are cash flow statements contained in the Nikkei Financial Quest, a database compiled by Nikkei Media Marketing. We use financial statements as well from the Nikkei Financial Quest. We refer to the Public and Corporate Bond Handbook published by the Japan Securities Dealers Association for the maturities of bonds when we classify bonds by maturity.

Cash flow statements are available for the firms listed on the first section of the Tokyo Stock Exchange from fiscal year 2002. The data we use for the determinants of loan issues, bond issues, and share issues cover the period from fiscal year 2002 to 2010 while those for the ex-post firm investment cover the period from fiscal year 2002 to 2013. We exclude banks, insurance, security firms and other financial institutions from our sample. From the 13,458 firm-year observations for which cash flow statements are available, we exclude outliers: those firms for which the variables required for estimation are not available, those whose market-to-book ratios, the growth rate of employment, the growth rate of tangible assets or the growth rate of sales lie in the top and bottom 0.5% ranges, those whose bond issues, new loans, or share issues are negative, those whose coverage ratios are negative, and those whose managerial ownership ratio exceeds unity. At this point, we are left with 9588 firm-year observations. Finally, we match these data with the data on intangible capitals from the Business Survey, reducing the number of observations to 7779.

Loans include nonbank loans and loans from affiliated firms as well as bank loans. Bonds include those issued domestically and abroad. They also include warrant bonds as well as straight bonds. However, warrant bond issues are rare: the share of the amounts raised by warrant bond issues is only 0.23% according to the Handbook. When we analyze bond issues by maturity, we cover only domestically issued bonds because the Handbook covers only them. All share issues are covered regardless of whether they are public offerings or allocation to third parties. We aggregate loans, bonds and shares within a year at the firm level.

B. Tangible and Intangible Assets

The data source for tangible and intangible assets is the Basic Survey of Japanese Business Structure and Activities (BSJBSA) published by the Ministry of Economy, Trade and Industry. The survey covers the universe of enterprises in Japan with more than 50 employees and

with paid-up capital of over 30 million yen. We apply the perpetual inventory (PI) method to such a large firm-level panel data set in order to construct the data for intangible capital. The sample period for measuring intangible capital is from 1994FY to 2013FY.

The data for tangible capital stock is constructed as follows. First, we define the initial capital input (K_{sIND}) as the nominal book value of tangible fixed assets from the BSJBSA multiplied by the book-to-market value ratio for each industry ($\alpha_{IND,t}$) at each data point corresponding to each K_{sIND}. We calculate the book-to-market value ratio for each industry ($\alpha_{IND,t}$) by using the data of real capital stock ($K^{JIP}_{IND,t}$) and real value added ($Y^{JIP}_{IND,t}$) at each data point taken from the Japan Industrial Productivity (JIP) database as follows:

$$\frac{Y^{JIP}_{IND,t}}{K^{JIP}_{IND,t}} = \frac{\sum_i Y^{\mathrm{BSJBSA}}_{IND,i,t}}{\sum_i BVK^{\mathrm{BSJBSA}}_{IND,i,t} * \alpha_{IND,t}} \tag{2}$$

In this expression, $\sum_i Y^{\mathrm{BSJBSA}}_{IND,i,t}$ denotes the sum of the firms' value added (*i* is the index of a firm), and $\sum_i BVK^{\mathrm{BSJBSA}}_{IND,i,t}$ is the sum of the nominal book value of tangible fixed assets of industry *IND* in BSJBSA. Second, we calculate the net capital stock of industry *IND* for the succeeding years by using the PI method. We use each firm's current purchase of property, plant, and equipment as the nominal investment. We deflate the nominal investment with the investment deflator in the JIP database. The sectoral depreciation rate is also taken from the JIP database.

In order to construct the variables that account for intangible capital stock, we follow the method used in Corrado et al. (2009) and measure the investment and the stock of three types of intangibles: software, R&D, and advertisement. Note that Corrado et al. (2009) classify intangible assets into the following three categories: computerized information, innovative property, and economic competencies. According to them, software investment, which comprises of custom software, packaged software, and own account software, is recognized as a major part

of the investment in computerized information; and R&D accounts for a large part of the innovative property, while advertisement represents a part of the investment in economic competencies, which comprises brand equity, firm-specific human capital, and organizational change. In this sense, the three items we measure for the present study account for the three categories of intangibles considered in Corrado et al. (2009).

To measure the abovementioned three items (i.e., software, R&D, and advertisement) for each firm, we follow Miyagawa et al. (2013). For software, first, the ratio of workers engaged in information processing to the total number of employees is multiplied by the total cash earnings in order to measure the value of software investment. Then, we add the cost of information processing to this number to compute the total software investment. Finally, we deflate the nominal software investment by the deflator for software investment obtained from the JIP database to obtain the real software investment. For R&D, we subtract the cost of acquiring fixed assets for research from the cost of R&D (i.e., in-house R&D and contract R&D) to compute the value of the investment in R&D. We use the output deflator for (private) research in the JIP database to deflate the nominal R&D investment. Finally, for advertisement, we obtain the data for advertising expenses from the BSJBSA. We use the output deflator for advertising in the JIP database as the deflator for advertising investments. Note that all of the information is obtained from the BSJBSA.

For all of the data in the three intangible investment categories, we use the PI method where we use FY1994 as the base year to construct a data series of intangible assets from FY2000. All of the depreciation rates used for this computation follow those of Corrado et al. (2012). The depreciation rates for software, R&D, and advertising are 31.5%, 15%, and 55%, respectively. We define the total intangible assets as the sum of software stocks, R&D stocks, and advertisement stocks. According to the JIP database, software, science and engineering R&D, and

brand equity account for about 70% of the total intangible assets in Japan.

5. Ex-ante Firm Characteristics and the Choice of Financing Sources

5.1 Specification

In this section, we examine the relationship between the ex-ante firm characteristics and the choice among loans, bond issues, share issues, and other funding sources. Specifically, restricting our sample firm-years to those who raise funds either by new loans, CP issues, bond issues and/or share issues, we estimate the following Tobit model censoring the upper limit of one and the lower limit of zero:

$$\frac{Financing\ Source_{it}^{j}}{Total\ Finance_{it}} = \alpha + \beta Intan_{it-1} + \gamma X_{it-1} + \text{Year}_t + Industry_s + \varepsilon_{it} \quad (1)$$

for j={Loans, Corporate bond, and Share issue}

The indices *i*, *t*, and *s* denote firm, year, and industry, respectively. The dependent variable, $\frac{Financing\ Source_{it}^{j}}{Total\ Finance_{it}}$, is the ratio of the amounts raised by either by new loans, bond issues, or share issues (SEOs) to the total amounts of external funds raised, i.e., the sum of the amounts raised by new loans, bond issues, CP issues, and share issues. $Intan_{it-1}$ is the ratio of intangible assets to tangible assets, while X_{it-1} is a vector of control variables that potentially affect firms' financing sources. Year_t is a year dummy that absorbs macroeconomic shocks. We also control for the industry dummy, $Industry_s$, based on the JIP industry classification, because some preceding studies suggest that industry-specific technological factors may affect the choice of financing

sources.[2] ε_{it} is a disturbance term.

As control variables, we include Size, Profit, Growth, DefaultProb, Leverage, Collateral, and ManageOwn. representing the firm's size, profitability, growth opportunities, default probability, leverage, collateral, and managerial ownership. We explain the control variables in details below.

The Size variable is the logarithm of total assets. A larger firm is less likely to be affected by asymmetric information problems because securities analysts and rating agencies analyze a larger firm more elaborately. Moreover, a larger firm tends to raise a larger amount and hence incurs relatively smaller unit costs of bond and share issuance. Given such tendencies, a larger firm is expected to raise a larger share of funds by issuing bonds and equity.

The Growth variables are the market-to-book ratio of equity, the growth rate of sales from the previous year, the growth rate of fixed tangible assets from the previous year, and the ratio of research and development (R&D) to sales. The debt-overhang hypothesis posits that a firm with more abundant growth opportunities raises funds less by debt, i.e., loans and bonds (Myers, 1977). The market-timing hypothesis, on the other hand, posits that a firm that is more highly appreciated at the stock market and hence faces a higher market-to-book ratio tends to raise funds more by share issuance (Baker and Wurgler, 2002). Finally, the hold-up hypothesis postulates that a firm with abundant growth opportunities is likely to depend less on bank loans and more on bond issues to avoid banks' rent extraction when it raises funds by debt (Rajan, 1992). [3]

The Profit variable is earnings before interest taxes, depreciation, and amortization (EBITDA), calculated as the sum of before-tax earnings, extraordinary items, interests paid, and depreciation,

[2] Rajan and Zingales (1998) use the industry-level external financing dependence ratio as a proxy for the demand for external finance to examine the effect of financial development on sectoral growth, while Claessens and Laeven (2003) use the industry-level intangible-to-fixed asset ratio as a measure of asset structure to investigate the effect of property rights on sectoral growth.

[3] In Diamond (1991) and Rajan (1992), the choice among debts depends on the firm's quality. That is, high quality firms tend to conduct financing in the open markets while mid-level firms choose loans. In the case of low-level firms, however, the choice is corporate bonds because the benefits of bank loans are outweighed by the costs of monitoring.

as a ratio of total assets. According to the hypotheses that stress the role of banks in information production or renegotiation, a less profitable firm relies more on bank loans and less on bonds (Diamond, 1984; Fama, 1985; Berlin and Loeys, 1988; Chammanur and Fulghieri, 1994). To the extent that EBTDA is positively correlated with free cash flow given total amounts of investment, the hypothesis that asserts the role of debt in disciplining firms predicts that a firm with a higher EBITDA raises funds more by debt (i.e., loans and bonds) and less by equity (Jensen, 1986; Aghion and Bolton, 1992).

The DefaultP rob variables are the indices of default probability, which we call SAF dummies B, C, and D, and the low coverage ratio dummy. SAF dummies are proxies for ratings based on the SAF indices proposed by Shirota (2003). For the construction of SAF indices and SAF dummies, see Appendix. SAF A, which we use as a benchmark, shows the lowest default probability while SAF D shows the highest. The coverage ratio is defined as the ratio of operating profits to the sum of interest paid and discount expenses. We construct a low coverage dummy that takes one if the coverage ratio is less than two, following Hosono (2003) and Shirasu and Xu (2007). The hypotheses of banks' information production and renegotiation predict that a firm with a lower ability of debt repayment and a higher probability of default depends more on bank loans and less on bond issues (Diamond, 1984; Fama, 1985; Berlin and Loeys, 1988; Chammanur and Fulghieri, 1994).

The Leverage variable is the ratio of book-valued debt to book-valued total assets. The trade-off theory of capital structure (Kraus and Litzenberger, 1973; Scott 1976) and the pecking order theory (Myers and Majluf, 1984) predict that a firm with a higher leverage ratio relies more on equity than on debt as a source of external finance. Moreover, as the leverage ratio is higher, a firm is more likely to face severe debt-overhang problems and hence depends more on bank loans and less on bond issues if it raises funds by debt. On the other hand, Denis and Mihov (2003)

posit that a higher leverage reflects higher reputation in credit markets and hence that a firm with a higher leverage can issue bonds with more favorable conditions.

The Collateral variable is the ratio of fixed tangible assets to total assets. A firm with a higher fixed tangible asset ratio can repay more when it defaults, and hence is expected to depend more on debt (i.e., loans and bonds) than on share. Although this variable is far from complete as a measure of asset tangibility, as we discuss above, we include this variable to compare our result from many previous studies.

The ManageOwn variable is the share of stocks owned by managers in total outstanding stocks. This variable measures the degree to which the interests of managers and shareholders coincide with each other. The hypothesis of managerial discretion predicts that a firm with a higher managerial ownership tends to depend more on loans and less on bonds.

5.2 Descriptive Sample Statistics

Table 1 shows share of each financing sources in total external funds raised. The average share of long-term loans is the largest, 44%, followed by short-term loans, 26%, CPs 14%, bonds 13%, and equity the smallest, 3%.

We classify the firm-year observations by the four categories: (1) no funding, (2) new loans, (3) bond issues, and (4) share issues, and show in Table 2 the median values of the variables used in the estimation for each category. If a firm funds by two or more sources within a year, we count the observation for each funding source. Table 2 shows that the intangible asset ratio is the largest for equity-issuing firms, followed by loan-issuing firms, and bond-issuing firms the smallest. Bond-issuing firms are larger in size and exhibit higher values for the fixed tangible asset ratio, the leverage ratio, and the default probability in terms of (the inverse of) the SAF index than non-bond-issuing firms or no-external-funding firms. Share-issuing firms, on the other

hand, exhibit higher values for the growth opportunities measured by the market-to-book ratio, and the growth rates of sales and tangible fixed assets. Finally, firms that choose loans exhibit lower EBITDA ratio and the market-to-book ratio, but exhibit higher values for the growth rates of sales and tangible fixed assets than bond-issuing firms.

Table 3 shows the amounts raised by loans, bond and share issues. The median amounts of bond issues per year are 6.5 billion yens, which amounts to 6.46% of the previous year's fixed tangible assets and 2.91% of the previous year's sales, while the median amounts of share issues per year are 300 million yens, which amounts to 2.24% of the previous year's fixed tangible assets and 0.37% of the previous year's sales.

5.3 Results

Table 4 shows the estimation results of the Tobit models for loans, bond and share issues. The observations cover the period from fiscal year 2002 to 2010. The intangible asset ratio, *Intan*, takes negative, though not significant, coefficients for new loans and bond issues, while it takes a positive and significant coefficient for share issues. Firms with a higher intangibles ratio tend to depend more on share issues than those with lower intangibles ratio. These results are consistent with Hypotheses 1, but do not distinguish 2A and 2B.

The Size variable, the logarithm of total assets, takes a positive and significant coefficient for bond issues, while it takes negative and significant coefficients for loans and share issues. Larger firms take advantage of the benefit from relatively small unit costs of security issues in the case of bond issuance.

Among the Growth variables, the market-to-book ratio takes a negative and significant coefficient for new loans, while it takes positive and significant coefficients for bond and share issues. These results are consistent with the banks' hold-up hypothesis and the market-timing

hypothesis, respectively, but not necessarily supportive of the debt-overhang hypothesis positing that a firm with abundant growth opportunities relies less on debt. The R&D intensity and the sales growth rate are not significant for any of the financing sources, while the tangible fixed asset growth rate takes a positive and marginally significant coefficient for new loans.

The Profit variable, the EBITDA-to-asset ratio, takes negative and positive coefficients both with marginal significance levels for new loans and bond issues, respectively, which is consistent with the banks' information production hypothesis. The EBITDA-to-asset ratio also takes a positive and significant coefficient for share issues, which is not consistent with the hypothesis emphasizing the role of debt in disciplining managers.

Among the Default Prob variables, the coefficients of SAF dummies B, C and D are all positive and significant for bond issues. The size of the coefficient is the largest for SAF D, followed by SAF C and SAF B. Given that these coefficients measure the differences from SAF dummy A, which represents the safest class, this result suggests that the share of bond issues is higher for the class of firms with higher default probability. On the other hand, the coefficient on SAF B is positive and marginally significant for new loans, but neither of the coefficients on SAF C or D is significant for new loans. These results do not support the hypothesis positing that banks can renegotiate debt contracts with firms in financial distress better than bondholders, The coefficients on SAF B and SAF C are negative and significant and the coefficient on SAF D is negative and marginally significant for share issues. Firms depend more on share issues when they are ranked at either A, the safest, or D, the riskiest. There may be two types of firms that issue shares: one type of firms are financially healthy and issue share through a public offering while the other face financial difficulty and issue share through allocation to third parties. The other default measure, the low coverage dummy, takes a positive and significant coefficient for share issues..

The Leverage variable, the debt-to-asset ratio, takes a negative and significant coefficient for new loans and a positive and significant coefficient for bond issues. These results are not consistent with the hypothesis based on banks' renegotiation ability. Rather, the results are consistent with the hypothesis positing that leverage reflects reputation in the credit market. On the other hand, the debt-to-asset ratio takes a positive and significant coefficient for share issues, which is consistent with the trade-off theory of capital structure and the pecking order hypothesis.

The Collateral variable, the ratio of fixed tangible assets to total assets, takes a positive and significant coefficient for bond issues, while it takes a negative and significant coefficient for share issues. It does not take a significant coefficient for new loans, suggesting that fixed assets other than land may not be suitable as collateral of bank loans as compared to cash, securities and other liquid assets.

Finally, the ManageOwn variable, the share of stocks owned by managers in total outstanding stocks, is not significant either for bond or share issues, which do not support the managerial discretion hypothesis.

We now summarize the results from the control variables and compare them with the preceding studies. As for share issues, we have obtained the results that are consistent with the market-timing hypothesis like the preceding studies. We have also obtained the results that are consistent with the trade-off theory of capital structure and the pecking order hypothesis. Further, we have found that firms depend more on share issues when their default probability is very low or high.

As for bond issues, we have obtained results that are consistent with the banks' hold-up hypothesis, but we have not obtained results supporting the hypotheses based on banks' information production and renegotiation ability. The latter result is different from preceding studies. Shirasu and Xu (2007), for example, examine the funding choices by Japanese listed firms

during 1993-1997, and find that firms with high leverage tend to choose loans while firms with low leverage tend to choose bonds. Shimatani et al. (2005) investigate the funding choices of Japanese firms during 1996-2003 and find that firms with high ratings tend to choose bonds while firms with low ratings tend to choose loans. The difference between these preceding studies and our results may be accounted for by the difference in the observation periods. The bond market in Japan has gradually become deeper and spread widely since the beginning of the 2000s and now even firms that are not financially sound can issue bonds like in the US bond market, while only those firms that were highly rated could issue bonds in the 1990s in Japan. In fact, examining the U.S. firms' funding choices during 1995-1996, Denis and Mihov (2003), like us, find that a firm with a higher leverage ratio is more likely to issue debt.

6. Post-funding Investment

6.1 Methodology

In this section we analyze how post-funding investment differs across funding sources. To this aim, we first estimate a Probit model for each of loan, bond and share issues, and obtain the estimated probability, score, for issuing each of them. Then, we select firms in the control group using the propensity score matching (PSM), in particular, the nearest-neighbor matching. Finally, we compare changes in tangible and intangible capital investment between firms in the treated group, i.e., those firms that raised funds by one of the three sources with firms in the control group, i.e., those firms that did not raise funds by that source using the difference-in-differences (DID) approach. When we choose firms in the treated and control groups of loans, we select only those firms that did not issue loans, bonds or shares from t-1 to t+5 except for the firm in the treated group in t, where t denotes the year of bond (share) issuance in order to lessen the effect of the other funding sources than loans. When we choose firms in the treated and control

groups of bonds (or shares), we select only those firms that did not issue bonds or shares from t-1 to t+4 except for the firm in the treated group in t, where t denotes the year of bond (or share) issuance. For the bond and share issuance, we do not exclude those firms that borrowed loans from t-1 to t+4 because such exclusion would greatly reduce the number of observations. The explanatory variables for the Probit model estimation are the same as those in the Tobit model (equation (1)). Those firms that raised no external funds are included now in the sample of the Probit model while they are not in that of the Tobit model.

Based on the estimation results of the Probit model, we use the PSM to select firms in the control group from those who are included in our sample in year t and fall into the same industry s, and whose probability of issuing loans (bonds, or share) is close to the loan- (bond-, or share-) issuing firms but did not issue loans (bonds, or shares) at all. We then conduct DID analyses using all the firms in the treated group and the corresponding firms in the control groups whose data is available for each period from t to t+4. In other words, we do not restrict our sample to the firms whose data is available throughout the period from t to t+4.

We analyze the accumulated tangible capital investment ratio, the accumulated intangible capital investment ratio, and cash and debt, respectively, as a proportion of assets. Specifically, we analyze the following variables for $S = 0, \dots 4$:

Accumulated tangible capital investment ratio: $\frac{\sum_{s=0,S}^{S} I_{it+s}^{tan}}{K_{it-1}^{tan}} - \frac{I_{it-1}^{tan}}{K_{it-2}^{tan}}$

Accumulated intangible capital investment ratio: $\frac{\sum_{s=0,S}^{S} I_{it+s}^{intan}}{K_{it-1}^{intan}} - \frac{I_{it-1}^{intan}}{K_{it-2}^{intan}}$

Cash ratio: $\frac{Cash_{it+S}}{Asset_{it-1}} - \frac{Cash_{it-1}}{Asset_{it-1}}$

Debt ratio: $\frac{Debt_{it+S}}{Asset_{it-1}} - \frac{Debt_{it-1}}{Asset_{it-1}}$

6.2 Results

Table 5 shows the estimation results of the Probit model for loans, bond, and share issues with data from fiscal year 2002 to 2010. The results for the Probit model are similar to those of the Tobit model in many respects, Importantly, the coefficient on the intangible asset ratio is positive, though not significant, for the probability of equity issues, and it is negative and significant for the probability of loan issues. The latter result is consistent with Hypothesis 2B in section 2.2. However, there are some differences between the two models, which we explain below. For loans, the coefficients on the asset size, the three SAF dummies, the leverage ratio, and the fixed asset ratio are all positive and significant. Although the coefficients of the SAF dummies and the leverage ratio for the loan issuing probability may be consistent with the banks' renegotiation hypothesis, it should be noted that the coefficients on the three SAF dummies for bond issuing probability are also significant and larger in size. For the bond issuance probability, no qualitative difference can be observed between the Tobit and the Probit models. Lastly, for the share issuing probability, the growth measures of the R&D intensity, the sales growth and the tangible fixed asset growth are all positive and significant, while the fixed asset ratio is negative but not significant.

Table 6A shows the results for the DID analysis of loans. For loan-issuing firms, the tangible capital investment ratio is not significant for any year, while the intangible capital investment ratio becomes negative and significant in year t+3 and t+4. The accumulated intangible capital investment ratio is significantly lower for loan-issuing firms by 0.444 in year t+3 and 0.836 in year t+4, suggesting that it is lower by about 0.1-0.2 per annum. These are economically significant considering that the counterparts of the control group are 1.361 and 2.076 in year t+3 and year t+4, respectively (or about 0.3-0.4 per annum). The cash ratio remains insignificant, while the debt ratio is negative and significant for the first three years subsequent

to issuing loans. These results suggest that funds raised by loans are spent mainly on reimbursement of debt outstanding.

Table 6B shows the results for the DID analysis of bonds. Tangible and intangible capital investment ratios are both negative, but not significant up to t+4. The cash ratio is positive and marginally significant in t+2, while the debt ratio is not significant in any year. These results suggest that bond issuing-firms hoard cash after bond issuing.

Finally, Table 6C shows the results for the DID analysis of shares. The tangible capital investment ratios turn from positive to negative from t+3, but none is significant. The intangible capital investment ratios are positive up to t+4, but not significant. The cash ratios are positive for t+1 and t+2. Share-issuing firms seem to spend the funds raised on cash holding, which is consistent with the market-timing hypothesis. It is also consistent with the hypothesis of the precautionary motives for cash holdings positing that firms that have ample investment opportunities have strong incentives to hold on to cash because a lack of funds could lead to missed investment opportunities (McLean, 2010).

7. Conclusion

Using a dataset of Japanese listed firms from 1995 to 2013, we examine how firms' asset structure in terms of the ratio of intangible to tangible capital is related to their choice of financing sources among bank loans, equity issues (seasoned equity offerings: SEO), and bond issues. We further investigate how the choice of financing are related to post-financing investment in tangible and intangible capital. We find that firms with higher intangible capital ratios are less likely to choose loans and more likely to choose equity issuance than to choose bond issues. Using propensity score matching and difference-in-differences approach (PSM-DID), we further find that firms that finance by loans invest less in intangible capital than firms that do not finance by

loans. Such a negative impact of loans is economically significant. Finally, we also obtain results that are consistent with a number of existing theories on capital structure such as the market timing (mispricing) hypothesis on equity issuance, the tradeoff and the pecking order hypotheses on debt and equity, and the holdup hypothesis on bank loans.

Our results have shed a new light on firms' choice of external financing sources from the viewpoint of intangible capital. Our results are also suggestive of the relationship between financial development and firm growth: development of stock markets is beneficial while development of banking system is not sufficient for growth through the accumulation of intangible capital.[4]

One possible future work is to use exogenous shocks that increased investment opportunities for intangible capital in order to more clearly identify how firms choose financing sources to invest for intangible capital investment.

[4] As a related work, Claessens and Laeven (2003) find that strong property rights lead to higher sectoral growth in the sector where intangible-to-fixed asset ratios are higher, suggesting that property rights lead to higher growth through improve asset allocation. However, they do not examine the difference in bank loans and bond or stock markets in improving asset allocation.

Appendix. Construction of Default Probability (SAF dummies)

We construct a measure of the default probability, SAF, following Shirata (2003) and group it into four categories: SAF A to D.

First, SAF is measured as follows:

$$SAF = 0.01036X1 + 0.02682X2 - 0.06610X3 - 0.02368X4 + 0.70773$$

, where

X1= Retained earnings/ total assets (as the average at beginning and end of the period) ×100

X2＝Current before-tax profit/ total assets (as the average at beginning and end of the period) ×100

X3＝inventory (as the average at beginning and end of the period) ×12 / sales

X4＝interests and discounts paid / sales ×100

Next, we group SAF values into the following four categories.

Category	Criteria	Default Probability
SAF A	1.44<SAF	Low
SAF B	0.9<SAF<1.44	↕
SAF C	0.7<SAF<0.9	
SAF D	SAF<0.7	High

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Table 1. Share of External Financing Sources by Listed Firms in Japan: 2002-2010

Long-term loans	44%
Short-term loans	26%
Commercial Papers	14%
Bonds	13%
Equities	3%

Source: NEEDS-Financial QUEST

Table 2. Descriptive Sample Statistics: Median

	No loan, debt and equity issues	Loan issues	Bond issues	Equity issues
Observations	31	7,469	1,719	904
Intangible asset ratio	0.764	0.720	0.642	0.765
log(Total Assets)	11.580	11.486	12.324	11.104
EBITDA/Total Assets	0.081	0.082	0.083	0.098
Market-to-book ratio	1.023	1.125	1.137	1.363
Sales growth	0.002	0.021	0.017	0.055
Tangible fixed assets growth	-0.017	-0.004	-0.008	0.007
R&D/Sales	0.015	0.010	0.009	0.005
SAF(inverse measure of default probability)	1.002	0.975	0.857	1.049
Low coverage ratio dummy	0.000	0.000	0.000	0.000
Leverage ratio	0.467	0.573	0.665	0.553
Fixed assets ratio	0.370	0.504	0.549	0.475
Insider ownership	0.000	0.000	0.000	0.000

Table 3. Amounts of Funds Raised by Loans, Bonds, and Equity

	No. of Obs.	Mean	Median	Std. dev.
Amount of loans(million yen)	7,469	21631.33	3848.00	85999.08
Amount of loans(t)/Tangible fixed assets(t-1)	7,469	0.70	0.13	11.16
Amount of loans(t)/Sales(t-1)	7,469	0.09	0.04	0.23
Amount of bond issues(million yen)	1,719	48379.29	6479.00	187702.20
Amount of bond issues(t)/Tangible fixed assets(t-1)	1,719	0.22	0.06	1.62
Amount of bond issues(t)/Sales(t-1)	1,719	0.07	0.03	0.14
Amount of equity issues(million yen)	904	7596.67	299.50	38894.11
Amount of equity issues(t)/Tangible fixed assets(t-1)	904	0.49	0.02	5.20
Amount of equity issues(t)/Sales(t-1)	904	0.05	0.00	0.38

Table 4. The Share of External Funds Raised: The Two-sided Tobit Models

	Loans		Bonds		Equities	
	Coef.	Std. Err	Coef.	Std. Err.	Coef.	Std. Err
Intangibles						
Intangible asset ratio	-0.007	0.004	-0.004	0.005	0.014	0.007 **
Size						
Total assets	-0.100	0.008 ***	0.132	0.009 ***	-0.095	0.016 ***
Growth						
Market-to-book ratio	-0.238	0.023 ***	0.052	0.028 *	0.343	0.037 ***
R&D/Sales	0.121	0.457	-0.073	0.513	0.685	0.809
Sales growth	-0.076	0.094	0.048	0.104	0.223	0.170
Tangible fixed assets growth	0.127	0.073 *	-0.063	0.083	-0.047	0.123
Profit						
EBITDA/Total Assets	-0.474	0.287 *	0.556	0.332 *	1.514	0.491 ***
Default Probability						
SAF D	-0.061	0.067	0.533	0.085 ***	-0.201	0.117 *
SAF C	0.046	0.058	0.466	0.077 ***	-0.540	0.102 ***
SAF B	0.077	0.047 *	0.357	0.066 ***	-0.320	0.075 ***
Low coverage ratio dummy	-0.021	0.034	-0.019	0.036	0.208	0.068 ***
Leverage						
Leverage ratio	-0.426	0.078 ***	0.282	0.086 ***	0.776	0.145 ***
Collateral						
Fixed assets ratio	-0.066	0.069	0.395	0.078 ***	-0.519	0.124 ***
Ownership						
Managerial Ownership	0.151	1.471	-52.132	49.445	-1.030	2.081
Year						
Year2003	-0.088	0.042 **	0.104	0.044 **	0.121	0.091
Year2004	-0.159	0.042 ***	0.081	0.044 *	0.381	0.087 ***
Year2005	-0.224	0.042 ***	0.085	0.045 *	0.540	0.086 ***
Year2006	-0.111	0.043 **	0.013	0.047	0.448	0.086 ***
Year2007	-0.064	0.044	-0.040	0.048	0.373	0.087 ***
Year2008	0.071	0.044	-0.044	0.047	0.056	0.091
Year2009	-0.023	0.043	0.045	0.045	0.112	0.092
Year2010	-0.021	0.045	0.008	0.047	0.177	0.094 *
Constant	2.936	0.193 ***	-2.611	0.220 ***	-1.102	0.355 ***
Industy dummy	Yes		Yes		Yes	
Numberof obs	7,582		7,582		7,582	
LR chi	945.82		960.63		808.99	
Prob >chi2	0		0		0	
PseudoR2	0.0855		0.1169		0.1361	

Note : *** , ** , and * denote the significance levels of 0.01, 0.05, and 0.1, respectively.

Table 5. The Probability of External Financing: The Probit Models

	Loans		Bonds		Equities	
	Coef.	Std. Err	Coef.	Std. Err.	Coef.	Std. Err.
Intangibles						
Intangible asset ratio	-0.013	0.006 **	-0.009	0.008	0.005	0.007
Size						
Total assets	0.142	0.015 ***	0.269	0.014 ***	-0.093	0.017 ***
Growth						
Market-to-book ratio	-0.104	0.034 ***	0.066	0.045	0.328	0.037 ***
R&D/Sales	1.195	0.625 *	-0.201	0.797	1.594	0.811 **
Sales growth	0.162	0.147	0.145	0.163	0.519	0.176 ***
Tangible fixed assets growth	0.713	0.121 ***	0.103	0.131	0.241	0.129 *
Profit						
EBITDA/Total Assets	0.102	0.426	0.856	0.514 *	1.380	0.514 ***
Default Probability						
SAF D	0.476	0.100 ***	0.956	0.132 ***	0.006	0.124
SAF C	0.529	0.084 ***	0.834	0.119 ***	-0.344	0.107 ***
SAF B	0.332	0.059 ***	0.571	0.103 ***	-0.108	0.078
Low coverage ratio dummy	-0.107	0.061 *	-0.026	0.059	0.209	0.073 ***
Leverage						
Leverage ratio	1.768	0.117 ***	1.053	0.133 ***	1.258	0.151 ***
Collateral						
Fixed assets ratio	1.789	0.111 ***	1.176	0.123 ***	-0.014	0.128
Ownership						
Managerial Ownership	-1.669	2.000	-48.557	70.854	-0.087	2.254
Year						
Year2003	0.047	0.070	0.152	0.071 **	0.113	0.095
Year2004	0.111	0.071	0.143	0.072 **	0.379	0.091 ***
Year2005	0.089	0.071	0.165	0.074 **	0.544	0.089 ***
Year2006	0.152	0.072 **	0.080	0.076	0.461	0.090 ***
Year2007	0.179	0.072 **	-0.002	0.077	0.395	0.090 ***
Year2008	0.325	0.072 ***	0.036	0.076	0.101	0.095
Year2009	0.075	0.069	0.088	0.073	0.071	0.096
Year2010	0.045	0.070	0.004	0.076	0.114	0.099
Constant	-2.151	0.356 ***	-5.447	0.385 ***	-1.607	0.369 ***
Industy dummy	Yes		Yes		Yes	
Numberof obs	9,312		9,357		9,317	
LR chi	1670.68		1709.4		713.57	
Prob >chi2	0		0		0	
PseudoR2	0.1674		0.194		0.1221	

Note : *** , ** , and * denote the significance levels of 0.01, 0.05, and 0.1, respectively.

Table6. The Effect of External Financing on Post-funding Investment: Difference-in-differences

A. Loans

Variable	Treated	Controls	Difference	S.E.	
Accumulated tangible capital investment ratio_from (t-1) to (t)	-0.012	-0.045	0.034	0.054	
Accumulated tangible capital investment ratio_from (t-1) to (t+1)	0.436	0.399	0.037	0.091	
Accumulated tangible capital investment ratio_from (t-1) to (t+2)	0.961	1.015	-0.054	0.174	
Accumulated tangible capital investment ratio_from (t-1) to (t+3)	1.546	1.597	-0.051	0.284	
Accumulated tangible capital investment ratio_from (t-1) to (t+4)	2.224	1.975	0.250	0.433	
Accumulated intangible capital investment ratio_from (t-1) to (t)	-0.028	-0.080	0.053	0.041	
Accumulated intangible capital investment ratio_from (t-1) to (t+1)	0.303	0.293	0.010	0.064	
Accumulated intangible capital investment ratio_from (t-1) to (t+2)	0.626	0.707	-0.081	0.100	
Accumulated intangible capital investment ratio_from (t-1) to (t+3)	0.917	1.361	-0.444	0.210	**
Accumulated intangible capital investment ratio_from (t-1) to (t+4)	1.239	2.076	-0.836	0.317	**
Cash ratio_from (t-1) to (t)	0.004	0.007	-0.002	0.004	
Cash ratio_from (t-1) to (t+1)	0.008	0.009	0.000	0.006	
Cash ratio_from (t-1) to (t+2)	0.012	0.003	0.009	0.008	
Cash ratio_from (t-1) to (t+3)	0.016	0.016	0.000	0.011	
Cash ratio_from (t-1) to (t+4)	0.022	0.008	0.014	0.015	
Debt ratio_from (t-1) to (t)	-0.100	0.112	-0.212	0.078	**
Debt ratio_from (t-1) to (t+1)	-0.185	0.213	-0.398	0.147	**
Debt ratio_from (t-1) to (t+2)	-0.275	0.473	-0.748	0.183	**
Debt ratio_from (t-1) to (t+3)	-0.249	0.070	-0.319	0.193	
Debt ratio_from (t-1) to (t+4)	-0.363	0.132	-0.495	0.393	

B. Bonds

Variable	Treated	Controls	Difference	S.E.	
Accumulated tangible capital investment ratio_from (t-1) to (t)	-34.270	-0.057	-34.213	34.254	
Accumulated tangible capital investment ratio_from (t-1) to (t+1)	-42.881	0.481	-43.362	43.294	
Accumulated tangible capital investment ratio_from (t-1) to (t+2)	-56.173	1.073	-57.246	57.160	
Accumulated tangible capital investment ratio_from (t-1) to (t+3)	-75.351	1.796	-77.147	77.086	
Accumulated tangible capital investment ratio_from (t-1) to (t+4)	-109.401	2.855	-112.256	111.825	
Accumulated intangible capital investment ratio_from (t-1) to (t)	-0.874	-0.031	-0.843	0.864	
Accumulated intangible capital investment ratio_from (t-1) to (t+1)	-0.742	0.353	-1.094	1.090	
Accumulated intangible capital investment ratio_from (t-1) to (t+2)	-0.757	0.762	-1.520	1.437	
Accumulated intangible capital investment ratio_from (t-1) to (t+3)	-0.889	1.017	-1.907	1.931	
Accumulated intangible capital investment ratio_from (t-1) to (t+4)	-1.446	1.381	-2.827	2.797	
Cash ratio_from (t-1) to (t)	0.004	0.004	0.000	0.003	
Cash ratio_from (t-1) to (t+1)	0.012	0.003	0.009	0.005	*
Cash ratio_from (t-1) to (t+2)	0.013	0.006	0.007	0.006	
Cash ratio_from (t-1) to (t+3)	0.016	0.012	0.004	0.008	
Cash ratio_from (t-1) to (t+4)	0.019	0.013	0.006	0.009	
Debt ratio_from (t-1) to (t)	-0.147	-0.001	-0.146	0.132	
Debt ratio_from (t-1) to (t+1)	-0.144	-0.115	-0.029	0.185	
Debt ratio_from (t-1) to (t+2)	-0.153	-0.290	0.137	0.402	
Debt ratio_from (t-1) to (t+3)	0.079	-0.119	0.197	0.399	
Debt ratio_from (t-1) to (t+4)	0.084	-0.164	0.248	0.540	

C. Equity

Variable	Treated	Controls	Difference	S.E.	
Accumulated tangible capital investment ratio_from (t-1) to (t)	0.005	-0.016	0.021	0.074	
Accumulated tangible capital investment ratio_from (t-1) to (t+1)	0.483	0.415	0.068	0.122	
Accumulated tangible capital investment ratio_from (t-1) to (t+2)	0.974	0.914	0.061	0.188	
Accumulated tangible capital investment ratio_from (t-1) to (t+3)	1.469	1.943	-0.474	0.398	
Accumulated tangible capital investment ratio_from (t-1) to (t+4)	2.100	2.584	-0.484	0.535	
Accumulated intangible capital investment ratio_from (t-1) to (t)	-0.015	-0.020	0.005	0.066	
Accumulated intangible capital investment ratio_from (t-1) to (t+1)	0.370	0.342	0.028	0.121	
Accumulated intangible capital investment ratio_from (t-1) to (t+2)	0.922	0.787	0.135	0.186	
Accumulated intangible capital investment ratio_from (t-1) to (t+3)	1.322	1.095	0.227	0.239	
Accumulated intangible capital investment ratio_from (t-1) to (t+4)	1.683	1.640	0.042	0.339	
Cash ratio_from (t-1) to (t)	0.007	0.000	0.008	0.006	
Cash ratio_from (t-1) to (t+1)	0.018	0.001	0.017	0.008	**
Cash ratio_from (t-1) to (t+2)	0.024	0.006	0.018	0.010	*
Cash ratio_from (t-1) to (t+3)	0.026	0.021	0.005	0.014	
Cash ratio_from (t-1) to (t+4)	0.028	0.025	0.003	0.014	
Debt ratio_from (t-1) to (t)	-0.088	-0.126	0.038	0.112	
Debt ratio_from (t-1) to (t+1)	-0.076	-0.091	0.015	0.118	
Debt ratio_from (t-1) to (t+2)	-0.108	0.036	-0.143	0.191	
Debt ratio_from (t-1) to (t+3)	-0.111	0.145	-0.256	0.362	
Debt ratio_from (t-1) to (t+4)	-0.091	0.815	-0.906	0.624	

Note: ** t-statistics>2.0, * 1.7<= t-statistics <2.0