Financial reporting frequency and external finance: Evidence from a quasi-natural experiment

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Abstract: Using a unique institutional background of Japan, this study first examines the effects of the increase in the reporting frequency on corporate financing. From Difference-in-Difference (DiD) analysis, I show that the increase in the reporting frequency increases external finance but not finance from bank. Next, I find that the positive effects of the increase in the reporting frequency are stronger in firms with a) financial constraints, b) ex-ante information asymmetry, and c) more external capital demand. I also find that the firms a) do not change the cash holding intensity, b) invest more, and c) payout more. Unlike prior literature, these findings suggest that the increase in the reporting frequency enhances firm activities.

JEL Classification: G31, G32, M41

Key words: financial reporting frequency, quarterly reporting, quasi-private firms, external finance, pecking order theory

1. Introduction

This study examines the effects of the financial reporting frequency on corporate financing. Prior literature has shown that more frequent financial reporting improves the stock market efficiency (Fu et al., 2012) and agency problems in terms of cash holding (Downer et al., 2018), suggesting that the frequent reporting mitigates information friction. However, little literature investigates economic consequences of the reduced cost of capital on corporate decision making. Thus, this study sheds light on the new aspects of economic consequences of frequent financial reporting, i.e. corporate capital funding.

Pecking order theory provides the perspective on the relation between information friction and corporate finding. Myers (1984) and Myers and Majluf (1984) document that the information asymmetry of insiders and outsiders of a firm increases the cost of capital of external finance resource, suggesting that managers prefer financing from internal capital to avoid the relative higher cost. A bulk of empirical studies provide the evidence consistent with Myers' discussion.[1]

From the perspective of pecking order theory, the decline of cost of capital enhances the ability of firms to finance from external sources. The cost of external capital can be mitigated by mitigating the information asymmetry. Prior literature shows the negative relation between information quality and cost of capital. Lee and Masulis (2009) show that information asymmetry measured by lower accounting quality increases the flotation costs. Biddle and Hilary (2006) and Balakrishnan et al. (2014) show that higher accounting quality mitigate financial constraints driven by information friction, suggesting that accounting information decreases external finance costs.

Frequent financial reporting can mitigate the information asymmetry. AICPA (1994) discusses that more frequent financial reporting conveys relevant information to security market

[1] Myers (2003) and Frank and Goyal (2008) are good reviews.

participants. Consistent with this discussion, a bulk of studies find the evidence that more frequent financial reporting provides relevant information. Fu et al. (2012) find that more frequent reporting reduces information asymmetry and the cost of equity.

Extending these findings, I expect that the increase in financial reporting frequency increases external finance, but not less costly capital source. Frequent financial reporting decreases information asymmetry between insiders and outsiders, decreasing cost of external capital. Consequently, firms can access more external finance. On the other hand, I expect that the reporting frequency weakly or no longer relates loans and internal capital funding, since public information might not be an important information source for bank loans. First, firms privately negotiate the loan contract with banks. Second, when banks require firms to disclose corporate information, firms do not necessary disclose the information publicly. For instance, Regulation FD requires firms to convey their information through public disclosure for equity market, but not necessarily debt market (Petacchi, 2015). Third, from pecking order perspective, the decrease in information asymmetry substantially increase external finance, but not internal finance and bank loans.

To test the expectation, I focus on the increase in the frequency of financial reporting in Japan, since it gives a natural set of control firms for my Difference-in-Difference (DiD) design. This study uses Japanese quasi-private firms (Baderscher et al., 2019). Quasi-private firms are the firms required to disclose 10-K and semi-annual financial reporting. Stock exchanges in Japan started requiring listed firms to report quarterly financial reporting (as Form 10-Q in the U.S.), but not for private firms including quasi-private firms.

My DiD approach shows that the initiation of quarterly financial reporting increases corporate external finance, but not bank loan finance. This positive effect is stronger for firms with 1) financial constraints, 2) serious information asymmetry, and 3) higher demand for external

finance. These results suggest that more frequent financial reporting mitigates information problem or agency problem. I next examine how the firms use the raised capital, and show that the frequent financial reporting increases corporate investment and payout, but not cash holding. These findings indicate that more frequent reporting promotes corporate capital turnover.

The main contribution of this study is to nest a plausible mechanism linking financial reporting frequency and corporate activities, especially capital raising. Financial economists have shown the link between reporting frequency and security market efficiency. Their findings imply that the increase in reporting frequency help firms access to external capital. Despite the importance of the controversy, there is little evidence on the relation between the frequency of reporting and corporate capital raising. This study complements prior literature by showing a new evidence on the economic consequences of frequent financial reporting. Specifically, frequent financial reporting enhances corporate external financing through mitigating external cost of capital.

The other contribution is to shed light on the bright side of frequent financial reporting. Several prior studies show the cost of frequent reporting: managerial short-termism. Kraft et al. (2018) and Ernstberger et al. (2017) show that firms reduce long-term investment to increase short-term profit. However, this study finds that, at least in Japan, frequent reporting increases corporate external finance and enhances their activities including investment and payout. These findings are consistent with the idea that frequent reporting conveys relevant information to security market participants, then help firms finance external capital.

This study is organized as follows. The next section describes the institutional background of Japanese disclosure regulation. In section 3, I describe the data, regression model and finance measure. Section 4 represents the results of main analyses and their robustness tests. Section 5 explains the research design of additional analyses and their results. Finally, Section 6 concludes

this study.

2. Institutional Background

This study uses quasi-private firms as the counter factual of listed firms which are required to report the quarterly financial statements as my research setting. Quasi-private firms are the firms with over 1,000 shareholders or the firms issuing public security. Japanese Financial Instrument Exchange Act mandates these firms to disclose annual and semi-annual financial reporting (like Form 10-K and the second quarter Form 10-Q in the U.S., respectively).[2] Thus, the quasi-private firms report the same frequency and the information contents before the initiation of quarterly financial reporting.

In 2003, Japanese stock exchanges (e.g., Tokyo Stock Exchange) mandated listed firms the quarterly financial statements, and effective from the first quarter after April 1, 2003. In 2008, the revised Financial Instrument Exchange Act mandated all the listed firms to report quarterly financial reporting. However, unlisted firms, including the quasi-private firms, are not mandated to report the quarterly financial reporting.

This difference regulatory background of semi-annual and quarterly financial reporting offers an advantage to examine the effects of the increase in reporting frequency on corporate financing. By comparing the quasi-private firms with the listed firms that were mandated to change the reporting frequency, I can identify the effects of the changes in the reporting frequency and mitigate endogeneity concerns associated with the choice of reporting frequency. The fact that the listed and the quasi-private firms are required to publish the same frequency and level of financial reporting prior to 2003 gives us a natural set of control firms for my DiD analysis. Figure 1

[2] Please see French et al. (2019) for the institutional backgrounds of quasi-private firms in Japan.

describes my DiD research framework.

Insert Figure 1 here

3. Research Design

3.1 Sample and matching procedure

The initial sample comprises all of Japanese non-financial firms in Nikkei NEEDS Financial QUEST (FQ) during the fiscal years (FY) 2000 March through 2009 February. FQ contains the financial data of Japanese listed and quasi-private, and a part of data of purely-private firms. Since I use lagged variable in my analysis, the sample contains the data from FY 2001 March through FY 2009 February. Following prior literature (Ernstberger et al., 2017; Kraft et al., 2018), I exclude the treatment year (FY 2004 March to FY 2005 February) from the analyses. I also exclude from the sample firms a) following any other accounting standards than Japanese GAAP; b) reporting 10 K containing the financial information less than 12 months or more than 12 months. I identify the unlisted firms which do not have exchange ID (EXCHANGE in FQ code). To exclude purely-private firms from my sample, I limit the unlisted firms reporting a) cashflow statement and b) ownership structure, since purely-private firms do not disclose them.

Following the approach of prior literature, I identify a matched quasi-private firm for each treatment firm as control firm that did not change reporting frequency during the treatment year. I use caliper-based nearest neighborhood matching to identify the set of control firms. Specifically, I limit the firms with data available in the analyses during the periods three years prior to and three years after the treatment year. I estimate a propensity score model using firm size (*size*) for each industry in the beginning FY of my test (FY 2001April to FY 2002 February) to identify a control firm for each treatment firm. I employ nearest-neighbor matching and drop observations with propensity scores outside the common support to ensure high match quality. Once a match is

formed, it is kept in subsequent years to ensure the panel structure remains intact.

The final sample consists of 2,317 firm-year observations. The number of observations is odd since several firms drop from the sample 4 years after the treatment year. A t-test of differences in the mean level of firm size (*size*) across treatment and control firms before the treatment year does not reject the null hypothesis of equal means ($|t| = 0.0096$). To mitigate the effects of outliers, I winsorize all variables at the 1st and 99th percentiles.

3.2 Financing measurements

This study uses three corporate financing measurements. Total financing (*fin_tot*) is the sum of the cash inflow from loan, issues of bond, compatible bond, and stock. This measurement represents the total corporate financing behavior. External financing (*fin_ex*) is the sum of the cash inflow from issues of bond, compatible bond, and stock. This captures the corporate external financing. Bank loan financing (*fin_loan*) is the increase in short- and long-term debt. All the measures are scaled by the sum of the tangible and intangible assets. Since several firms report the net amount of cashflow from these financing, I take net of cash inflow from each financing resource.

3.3 Regression

My baseline regression for testing my hypothesis is as follows:

$$finance_{it} = \alpha_1 post + \alpha_2 treat \times post + \boldsymbol{\Gamma}\, \boldsymbol{z} + \boldsymbol{fe} + \varepsilon_{it} \quad (1)$$

where *finance* is a measure of corporate financing behavior; *treat* is an indicator variable for treatment firms i.e., listed firms; *post* is an indicator variable that equals 1 for periods after the treatment year, and 0 for periods prior to the treatment year. The vector $\boldsymbol{z}$ represents the control variables, which include sales growth (*sg*), operating cash flow (*cfo*), natural logarithm of lagged total assets (*size*), natural logarithm of lagged firm age (*age*), and lagged cash holding (*cash*),

lagged leverage (*lev*), lagged retained earnings (*retain*). To mitigate the heteroskedasticity, all the variables except sales growth, firm age and firm size are scaled by the sum of tangible and intangible assets. The vector ***fe*** represent the time-invariant firm fixed effects. The standard errors clustered by firm.

The variable in interest is the interaction term between the treatment indicator and the post indicator (*treat*×*post*). The coefficient on the interaction measures the change in firm's financing behavior for treatment firms around the reporting frequency increases compared to corresponding changes in financing of control firms. My main hypothesis predicts that the external financing increases after the reporting frequency increases. Consequently, I expect that $\alpha_2 > 0$ in Model (1) when the dependent variable is external finance. On the other hand, bank loans which exhibit lower costs might not change in response to the change in reporting frequency. Thus, I expect that α_2 is statistically indistinguishable from zero, which is consistent with my expectation (but do not support my expectation).

4. Results

4.1 Descriptive statistics and univariate analysis

Table 1 presents descriptive statistics for each of the main variables. Prior to the change in reporting frequency, treatment firms finance more than control firms from any financing sources. These differences increase following treatment, which support my expectation.

Insert Table 1 here

4.2 Frequent reporting and financing

Table 2 reports the regression results from estimates of the Model (1). In Column (1), the dependent variable is total financing (*fin_tot*). The coefficient on the interaction term is positively significant, suggesting the increase in reporting frequency increases corporate financing behavior.

In Column (2), the dependent variables are external financing (*fin_ext*). The coefficients on interaction term are positively significant. This suggests that firms increase external financing after initiation of quarterly financial reporting. On the other hand, Column (3) presents that loan finance does not change following the increase in reporting frequency, suggesting that the reporting frequency does not enhance the financing from bank.

Insert Table 2 here

To test the persistence of the effects of the increase in the reporting frequency, I divide the treatment period indicator (*post*) into two periods (*post(+1,+2)* and *post(+3,+4)*). Column (1) presents that the effects of the increase in financial frequency on total finance continue through following two years. Column (2) suggests that the positive effects of frequent financial reporting are temporary. Bank loan still does not change (Column (3)), which support the idea that firms do not change the financing strategy from lower cost financing sources.

Next, I test the parallel trend assumption underlying my DiD estimation. The parallel trend assumption states that both treatment and control groups would follow the parallel movements if treatment were not initiated. Following prior literature, in Columns (7) – (9), I include pre-treatment time period indicator variables (*before(-1)*) to explore whether investments in treatment and control groups exhibit any differential changes prior to the treatment year. The coefficients on the interaction between treatment indicator and pre-treatment time period indicator (*treat×before(-1)*) are statistically insignificant. The coefficients on the treatment between treatment indicator and post periods indicator are significantly positive for total finance and external finance, but not significant for bank loans. These findings suggest that treatment and control firms exhibit parallel trends in investments prior to the reporting frequency increase, but these trends diverge only after the reporting frequency increase.

4.3 Robustness tests

In this section, I check the robustness of the results. First, to address the endogeneity problem to be listed, I run the treatment effect model. The effect of treatment (being listed) might be different across firms and could affect the probability of firms going listed. Therefore, following Acharya and Xu (2017), I apply the treatment effect model which can adjust for the selection bias by using the inverse Mills ratio. The treatment effect model is the two-step approach. In the first step, I regress the treatment indicator on the determinants to go listed (Model (2)):

$$\begin{aligned} &Pr\ (treat_{it} = 1) = \beta_0 + \beta_1 \boldsymbol{w} + \varepsilon_{it} \\ &mills := treat_{it}\ \lambda(\beta_0 + \beta_1 \boldsymbol{w}) + (treat_{it} - 1)\ \lambda(\beta_0 + \beta_1 \boldsymbol{w}) \end{aligned} \tag{2}$$

where $\boldsymbol{w}$ is a set of firm characteristics variables that might affect a firm's choice to be listed. I include log of sales, sales growth, ROA, age, and leverage. Using matched sample, the coefficients are estimated from the probit model.

The inverse mills ratio (*mills*) computed from the model (4) is added to model (1) to correct the selection bias:

$$finance_{it} = \gamma_1\ post + \gamma_2\ treat \times post + \gamma_3\ mills + \boldsymbol{\Gamma z} + \boldsymbol{fe} + \varepsilon_{it} \tag{3}$$

where *finance* is a measure of corporate financing behavior; *treat* is an indicator variable for treatment firms i.e., listed firms; *post* is an indicator variable that equals 1 for periods after the treatment year, and 0 for periods prior to the treatment year. To address the endogeneity problem, inverse mill's ratio is included. The vector $\boldsymbol{z}$ represents the control variables, which include sales growth (*sg*), operating cash flow (*cfo*), natural logarithm of lagged total assets (*size*), natural logarithm of lagged firm age (*age*), and lagged cash holding (*cash*), lagged leverage (*lev*), lagged retained earnings (*retain*). To mitigate the heteroskedasticity, all the variables except sales growth and firm size are scaled by the sum of tangible and intangible assets. The vector $\boldsymbol{fe}$ represent the

time-invariant firm fixed effects. The standard errors clustered by firm.

The results are reported in Columns (1) – (3) of Table 3. The coefficients on the interaction terms are positively significant in Columns (1) and (2), but not statistically significant in Column (3). These results suggest that the main findings are robust after adjusting for the endogeneity problem on the choice to be listed.

Insert Table 3 here

I further examine the robustness of my main findings by using alternative matching procedures. I use alternative variables to match a quasi-private firm to each listed firm. In Columns (4) – (6) in Table 3, I use industry, size, firm age, and leverage to identify a matched sample. And, in Columns (7) – (9), I use industry, size, age, leverage, cash holding, and sales growth. The results show that the initiation of the quarterly financial reporting increases total financing and external financing, but not change bank loans. These results suggest that my findings are not sensitive to matching procedures.

5. Additional tests

5.1 Heterogeneity

To specify whether my expectation can explain the increase in external financing after the reporting frequency increases, I perform multiple additional analyses. First, I test the financing of financial constrained firms. If financial reporting frequency mitigates financial constraints, the effects of change in reporting frequency are stronger for firms facing more serious financial constraints. Next, I investigate the relation between the ex-ante information asymmetry the effects of the reporting frequency. The seriousness of financial constraints depends on information asymmetry between insiders and outsiders. Thus, ex ante information asymmetry enhances the effects of frequent financial reporting on external finance. Finally, I focus on external finance

demand. Firms with intense external capital demand face more serious financial constraints. On the other hand, if firms have lower external capital demand and have enough internal capital with relatively low cost, the frequent financial reporting no longer matters for these firms. Thus, I expect that the effects of frequent financial reporting are stronger for firms with higher external finance demand.

To examine the expectations, I regress the estimation mode as follows:

$$finance_{it} = \delta_1 post + \delta_2 treat \times post + \delta_3 X \times treat \times post + \boldsymbol{\Gamma}\, \boldsymbol{z} + \boldsymbol{fe} + \varepsilon_{it} \qquad (4)$$

where *finance* is a measure of corporate financing behavior; *treat* is treatment indicator; *post* is an indicator variable that equals 1 for periods after the treatment year, and 0 for periods prior to the treatment year. X is the variable of the factors changing the effects of treatment. I use firm size and Hadlock-Pierce index as the proxy of financial constraints (Hadlock and Pierce, 2010; Farre-Mensa and Ljungqvist, 2015). Amihud's (2002) illiquidity index is uses as the proxy of ex ante information asymmetry of firms. Firm size also proxies the seriousness of adverse selection (Frank and Goyal, 2003). In external finance demand test, I use Rajan and Zingales' (1997) external capital dependence measure.

The vector $\boldsymbol{z}$ represents the control variables, which include sales growth (*sg*), operating cash flow (*cfo*), natural logarithm of lagged total assets (*size*), natural logarithm of lagged firm age (*age*), and lagged cash holding (*cash*), lagged leverage (*lev*), lagged retained earnings (*retain*). To mitigate the heteroskedasticity, all the variables except sales growth and firm size are scaled by the sum of tangible and intangible assets. The vector $\boldsymbol{fe}$ represent the time-invariant firm fixed effects. The standard errors clustered by firm.

Insert Table 4 here

Panel A of Table 4 reports the results of Model (4). Columns (4)-(6) show the results of

Model (4) using Hadlock-Pierce index as the proxy of financial constraints. The coefficients on the interaction between treatment and post indicators and Hadlock-Pierce index (*treat*×*post*×*hp*) is positively significant for total finance and external finance, but not statistically significant for bank loan. These findings suggest that the positive effects of quarterly financial reporting are stronger for firms with more financial constraints problem. This evidence is consistent with my expectation.

5.2 How do firms use the capital?

My main findings do not exclude another explanation that firms raise capital not to increase firm value. For instance, if firms increase the capital and hold it as cash reserve on hand, the financing does not enhance firm's business activities. To examine how the firms use their raised external capital, I examine the effects of the change in financial reporting frequency on other aspects of corporate activities. I focus on three aspects of corporate behavior: cash holding, investment, and payout. To test the effects, I regress the equation as follows:

$$activity_{it} = \eta_1 post + \eta_2 treat \times post + \boldsymbol{\Gamma}\, \boldsymbol{z} + \boldsymbol{fe} + \varepsilon_{it} \qquad (5)$$

where *activity* is a measure of corporate activities. I use cash holding (*cash*), net cash holding (*net_cash*) as the proxies of corporate cash holding intensity. To measure corporate investment (*investment*), I estimate the cash outflow to purchase the tangible and intangible assets. The measurement of payout (*payout*) is the sum of cash dividends paid and stock repurchase paid. To address the heteroskedasticity concern, all the measure of corporate activities is scaled by scaled by the sum of the tangible and intangible assets. I control the same variables ($\boldsymbol{z}$) in the model (1). Time-invariant firm fixed effects are also controlled, and I report the standard errors clustered by firm.

Insert Table 5 here

I first investigate the effects of the increase in the reporting frequency on cash holding intensity. Columns (1) and (2) of Panel B in Table 5 display the results from estimations of equations (5) in which *cash* and *net_cash* are the dependent variable, respectively. In both regressions, the coefficients on the interaction term between the treatment indicator and the post treatment year indicator (*treat*×*post*) are not statistically significant, implying that firms do not change their cash holding intensity. Next, following the same research setting of Fujitani (2019), I examine the corporate investment behavior. In Column (3), the coefficients on the interactions are positively significant, suggesting that the firms might use the capital to investment. As discussed by Fujitani (2019), unlike the U.S. and EU, the frequent financial reporting enhances corporate investment in Japan. Third, I examine the effects of the increase in the reporting frequency on payout. Column (4) shows that the coefficients on the interactions are positive. This suggests that the firms increase payout after the reporting frequency increases.

Overall, my findings suggest that the firms increase financing with reporting frequency not to enjoy their own quiet life or to build empire, but to enhance their corporate activities.

6. Conclusion

This study investigates the effects of the increase in the frequency of financial reporting on corporate financing. I show that more frequent reporting increases external financing but not bank loans. This finding is consistent with my expectation based on pecking order theory: by mitigating information asymmetry, frequent financial reporting enhances corporate external finance.

The implications of my findings are twofold. The first is that frequent reporting beneficial not only for security market participants but also for corporations. Most prior studies focus on the benefits of frequent reporting from the perspective of stock market efficiency. On the other hand,

from the perspective of corporate real activities, most studies have shown that costs exceed the benefits of the frequent reporting. This study extends the stock market perspective and show the bright side of frequent reporting from the real perspective.

The other implication is for practitioners. Not only Japanese regulatory institutions, also the U.S. institutions consider quitting quarterly financial reporting. Their rational to quit the reporting regime is that the frequent reporting worsens corporate efficiency. However, this study suggests that quarterly financial reporting is beneficial for corporate activities. Taking together with the findings of Fujitani (2019), quarterly reporting enhances Japanese corporate activities, such as capital raising, payout, and investment. These findings imply that regulatory institutions should consider both the benefits and costs of frequent financial reporting.

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Tables and figures

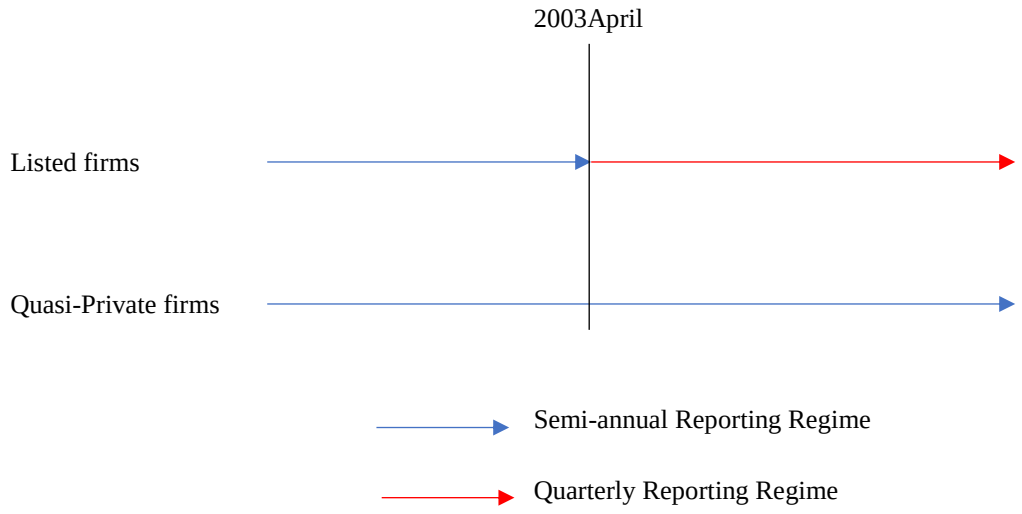

Figure 1. Research Setting
This figure describes the research setting of this study. The blue arrow represents the semi-annual financial reporting regime where the firms are required to report semi-annually, but not to report quarterly. The red arrow represents the quarterly financial reporting regime where the firms are required to report quarterly.

Table 1 Descriptive statistics

This table reports the descriptive statistics of the variables in this study. Column (1) (Column (2)) reports the mean, median, and standard deviation of treatment (control) group. Column (3) presents the differences in mean and median values and their significance levels. I report the significance levels of the difference in mean (median) using t test (Wilcoxon rank sum test). * and *** indicate the significance levels are 10% and 1%. Panel A (Panel B) presents the descriptive statistics of treatment and control groups and their difference between these groups before (after) the treatment period.

Panel A: ***Before***

	(1) Treat			(2) Control			(3) Difference			
	Mean	Median	SD	Mean	Median	SD	Mean		Median	
fin_tot	0.4793	0.1715	1.2937	0.3780	0.0985	1.3773	0.1013		0.0731	***
fin_ext	0.0803	0	0.3846	0.0219	0	0.2004	0.0585	***	0	***
fin_eq	0.0344	0	0.2002	0.0112	0	0.1168	0.0232	***	0	***
fin_bond	0.0222	0	0.0867	0.0055	0	0.0263	0.0167	***	0	***
fin_loan	0.3329	0.1268	0.6555	0.3220	0.0867	0.9621	0.0108		0.0401	***
sg	0.0251	0.0077	0.1542	-0.0044	-0.0193	0.1372	0.0295	***	0.0270	***
cfo	0.1642	0.1209	0.7231	0.1043	0.0894	0.3455	0.0598	*	0.0315	***
size	10.2226	10.0387	1.3306	10.2029	10.1344	1.3421	0.0197		-0.0957	
age	3.8046	3.9512	0.5232	3.9480	3.9890	0.3807	-0.1434	***	-0.0377	***
cash	1.2204	0.3658	3.4106	0.5715	0.2732	0.8966	0.6489	***	0.0926	***
lev	0.3013	0.2714	0.2143	0.2938	0.2756	0.2221	0.0076		-0.0042	
retain	0.6498	0.4238	1.8795	0.8374	0.4855	1.1777	-0.1876	*	-0.0618	

Panel B. Post

	(1) Treat			(2) Control			(3) Difference			
	Mean	Median	SD	Mean	Median	SD	Mean		Median	
fin_tot	0.6452	0.1627	1.8907	0.3059	0.0743	0.9991	0.3393	***	0.0883	***
fin_ext	0.0917	0	0.4064	0.0116	0	0.0452	0.0802	***	0	***
fin_eq	0.0396	0	0.2176	0.0018	0	0.0199	0.0379	***	0	***
fin_bond	0.0284	0	0.1010	0.0098	0	0.0408	0.0186	***	0	***
fin_loan	0.4817	0.1187	1.3196	0.2849	0.0662	0.8860	0.1968	***	0.0525	***
sg	0.0707	0.0463	0.1451	0.0259	0.0160	0.1157	0.0448	***	0.0303	***
cfo	0.1438	0.1401	0.7907	0.1474	0.0973	0.4306	-0.0036		0.0428	***
size	10.3789	10.1501	1.3473	10.1344	10.0210	1.4159	0.2445	***	0.1291	***
age	3.9209	4.0431	0.4349	4.0323	4.0775	0.3472	-0.1114	***	-0.0345	***
cash	0.8523	0.3510	1.5957	0.5322	0.2109	0.9685	0.3201	***	0.1401	***
lev	0.2494	0.2156	0.1956	0.2426	0.2232	0.2037	0.0068		-0.0076	
retain	1.0165	0.6097	2.7161	0.8387	0.4767	2.0030	0.1779		0.1330	***

Table 2 Frequency of financial reporting and corporate capital raising

This table presents the results of DiD analyses on the relation the increase in financial reporting frequency and corporate capital raising. Columns (1)-(3) present the results of the baseline DiD specification. In Column (1) ((2) and (3)), the dependent variable is total fiancé (external finance and bank loan).

Columns (4)-(6) report the results of persistence tests, where the post periods (*post*) are decomposed into two periods (*post(+1,+2)* and *post(+3,+4)*).

Columns (7)-(9) present the results of reverse causality tests, where the before period (*before(-1)*) and its interaction with treatment (*treat×before(-1)*) are included.

In each specification, control variables include sales growth (*sg*), operating cash flow (*cfo*), natural logarithm of lagged total assets (*size*), natural logarithm of lagged firm age (*age*), and lagged cash holding (*cash*), lagged leverage (*lev*), lagged retained earnings (*retain*). I also control for the time-invariant firm fixed effects. Standard errors in parentheses are obtained by clustering at the firm level. *, **, *** indicate significance at the 10, 5, 1% levels, respectively, using a two-tailed test. All variables are defined in Table A1.

	DiD			Persistence			Reverse Causality		
	fin_tot	*fin_ext*	*fin_loan*	*fin_tot*	*fin_ext*	*fin_loan*	*fin_tot*	*fin_ext*	*fin_loan*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
treat×post	0.0842***	0.0511***	0.0104						
	(0.0311)	(0.0166)	(0.0234)						
treat×before(-1)							0.0361	0.0126	0.0322
							(0.0582)	(0.0264)	(0.0408)
treat×post(+1,+2)				0.0859**	0.0698***	-0.0090	0.0971**	0.0738***	0.0017
				(0.0381)	(0.0225)	(0.0261)	(0.0452)	(0.0219)	(0.0294)
treat×post(+3,+4)				0.0730**	0.0184	0.0359	0.0838**	0.0223	0.0464
				(0.0356)	(0.0144)	(0.0301)	(0.0420)	(0.0151)	(0.0357)
post	-0.0892**	-0.0169	-0.0764***						
	(0.0419)	(0.0161)	(0.0292)						
before(-1)							-0.0465	-0.0144*	-0.0265
							(0.0289)	(0.0085)	(0.0272)
post(+1,+2)				-0.0919**	-0.0287*	-0.0657**	-0.1132**	-0.0352*	-0.0764**
				(0.0445)	(0.0161)	(0.0298)	(0.0515)	(0.0184)	(0.0357)
post(+3,+4)				-0.1277**	-0.0532**	-0.0738*	-0.1519**	-0.0604**	-0.0853*
				(0.0609)	(0.0229)	(0.0389)	(0.0690)	(0.0254)	(0.0465)
sg	0.3980*	0.0311	0.3251***	0.4007*	0.0329	0.3257***	0.4041*	0.0338	0.3267***
	(0.2105)	(0.1391)	(0.1111)	(0.2116)	(0.1396)	(0.1107)	(0.2103)	(0.1390)	(0.1091)
cfo	-0.3698***	-0.0306	-0.2654***	-0.3687***	-0.0289	-0.2662***	-0.3685***	-0.0288	-0.2661***
	(0.0992)	(0.0261)	(0.0553)	(0.0999)	(0.0271)	(0.0549)	(0.1001)	(0.0270)	(0.0550)
size	-0.1001	-0.0752	0.0125	-0.0964	-0.0687	0.0090	-0.0984	-0.0693	0.0085
	(0.0869)	(0.0557)	(0.0831)	(0.0880)	(0.0562)	(0.0822)	(0.0876)	(0.0566)	(0.0821)
age	0.3060	0.0601	0.2536	0.5256	0.3254	0.1736	0.5996	0.3459	0.1960
	(0.4001)	(0.1868)	(0.3444)	(0.5020)	(0.2146)	(0.3972)	(0.5297)	(0.2200)	(0.4271)
cash	-0.8116***	-0.1340	-0.4645*	-0.7891**	-0.1101	-0.4690*	-0.7949**	-0.1116	-0.4699*
	(0.3093)	(0.1920)	(0.2388)	(0.3104)	(0.1980)	(0.2401)	(0.3155)	(0.2005)	(0.2417)
lev	-1.0137***	-0.0775	-1.0531***	-1.0624***	-0.1371	-1.0345***	-1.0738***	-0.1404	-1.0381***
	(0.2767)	(0.1139)	(0.1582)	(0.2970)	(0.1196)	(0.1577)	(0.2980)	(0.1203)	(0.1560)
retain	-0.6359*	-0.5332**	0.1947*	-0.6358*	-0.5279**	0.1888*	-0.6369*	-0.5283**	0.1879*

	(0.3782)	(0.2564)	(0.1123)	(0.3742)	(0.2510)	(0.1110)	(0.3741)	(0.2511)	(0.1111)
Observations	2,317	2,317	2,317	2,317	2,317	2,317	2,317	2,317	2,317
firm FE	yes	yes	yes	yes	yes	yes	yes	yes	yes
clustered by	firm	firm	firm	firm	firm	firm	firm	firm	firm
Adj R^2	0.496	0.402	0.327	0.496	0.409	0.327	0.496	0.408	0.327

Table 3 Robustness tests

This table presents the result of robustness tests. Columns (1)-(3) report the results of the second stage of treatment effect model where I include inverse Mill's ratio (*mills*). Columns (4)-(9) report the results of regression using alternative matching procedures. In Columns (4)-(6), I identify the corresponding control sample using firm size (*size*), leverage (*lev*), and firm age (*age*) for each industry. In Columns (7)-(9), I identify the corresponding control sample using firm size (*size*), leverage (*lev*), firm age (*age*), cash holding (*cash*), and sales growth (*sg*), for each industry. In each specification, control variables include sales growth (*sg*), operating cash flow (*cfo*), natural logarithm of lagged total assets (*size*), natural logarithm of lagged firm age (*age*), and lagged cash holding (*cash*), lagged leverage (*lev*), lagged retained earnings (*retain*). I also control for the time-invariant firm fixed effects. Standard errors in parentheses are obtained by clustering at the firm level. *, **, *** indicate significance at the 10, 5, 1% levels, respectively, using a two-tailed test. All variables are defined in Table A1.

	Treatment Effect Model			Alternative Matching					
				industry +size +leverage +age			industry +size +leverage +age +cash +sales growth		
	fin_tot	*fin_ext*	*fin_loan*	*fin_tot*	*fin_ext*	*fin_loan*	*fin_tot*	*fin_ext*	*fin_loan*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
treat×post(+1,+2)	0.0758**	0.0659***	-0.0122	0.0496*	0.0327*	0.0111	0.0412*	0.0454***	-0.0141
	(0.0351)	(0.0200)	(0.0247)	(0.0278)	(0.0181)	(0.0225)	(0.0240)	(0.0145)	(0.0233)
treat×post(+3,+4)	0.0670*	0.0157	0.0342	0.0530*	0.0167	0.0335	-0.0140	0.0038	-0.0220
	(0.0345)	(0.0152)	(0.0289)	(0.0271)	(0.0144)	(0.0259)	(0.0286)	(0.0146)	(0.0269)
post(+1,+2)	-0.0857**	-0.0258*	-0.0580**	-0.0303	-0.0173	-0.0230	-0.0845***	-0.0216*	-0.0644**
	(0.0428)	(0.0141)	(0.0293)	(0.0260)	(0.0152)	(0.0178)	(0.0298)	(0.0121)	(0.0276)
post(+3,+4)	-0.1278**	-0.0518***	-0.0628	-0.0238	-0.0365*	-0.0069	-0.1134***	-0.0423**	-0.0716*
	(0.0589)	(0.0185)	(0.0387)	(0.0368)	(0.0216)	(0.0233)	(0.0413)	(0.0164)	(0.0368)
sg	0.4865	0.2713	0.0161	0.2748**	-0.0038	0.2496**	0.2412**	0.0760	0.1525*
	(0.4238)	(0.2099)	(0.1238)	(0.1303)	(0.1197)	(0.1125)	(0.1161)	(0.0684)	(0.0844)
cfo	-0.3593***	-0.0170	-0.2750***	-0.4040***	-0.0055	-0.3019***	-0.2207***	-0.0186*	-0.2086***
	(0.1084)	(0.0325)	(0.0587)	(0.1004)	(0.0502)	(0.0476)	(0.0561)	(0.0110)	(0.0578)
size	-0.0775	-0.0469	-0.0157	-0.0250	-0.1159*	0.1183	-0.0018	-0.0098	0.0089
	(0.0958)	(0.0616)	(0.0776)	(0.0655)	(0.0611)	(0.0866)	(0.0373)	(0.0198)	(0.0292)
age	0.6097	0.2195	0.2312	0.0029	0.2384	-0.2150	0.5041	0.3197*	0.2123
	(0.4702)	(0.1880)	(0.3789)	(0.2420)	(0.1615)	(0.1928)	(0.3630)	(0.1710)	(0.3577)
cash	-0.0306*	-0.0163	-0.0324**	-0.0446	0.0114	-0.0433	-0.0423**	-0.0113	-0.0518***
	(0.0178)	(0.0126)	(0.0132)	(0.0540)	(0.0274)	(0.0411)	(0.0185)	(0.0081)	(0.0182)
lev	-1.0559***	-0.1786	-1.0026***	-0.6250***	-0.0148	-0.8502***	-1.1307***	-0.1617***	-0.9305***
	(0.3227)	(0.1267)	(0.1545)	(0.1820)	(0.0792)	(0.1303)	(0.1330)	(0.0588)	(0.1134)
retain	-0.6375*	-0.5189**	0.1765	0.1567	-0.1002	0.2316*	0.0681	-0.0083	0.0873
	(0.3677)	(0.2415)	(0.1119)	(0.1463)	(0.1716)	(0.1300)	(0.1307)	(0.0548)	(0.1053)
mills	0.1759	0.4611	-0.5843**						
	(0.9841)	(0.4560)	(0.2689)						
Observations	2,317	2,317	2,317	2,131	2,131	2,131	2,136	2,136	2,136

firm FE	yes	yes	yes	yes	yes	yes	yes	yes	yes
clustered by	firm	firm	firm	firm	firm	firm	firm	firm	firm
Adj R^2	0.494	0.420	0.342	0.543	0.335	0.357	0.277	0.0605	0.286

Table4 Heterogeneity

This table presents the results of heterogeneous effects of the increase in financial reporting frequency. Panel A reports the results of financial constraints. In Columns (1) – (3) (Columns (4) - (6)), firm size (Hadlock-Pierce index) is the proxy of financial constraints. Panel B reports the results of the test of information friction and external finance demand. To test the effects of information friction, I include the interaction of *post×treat* and Amihud's (2002) stock illiquidity measure in Columns (1)-(3). For external finance demand test, I include external demand in Columns (4)-(6). In each specification, control variables include sales growth (*sg*), operating cash flow (*cfo*), natural logarithm of lagged total assets (*size*), natural logarithm of lagged firm age (*age*), and lagged cash holding (*cash*), lagged leverage (*lev*), lagged retained earnings (*retain*). I also control for the time-invariant firm fixed effects. Standard errors in parentheses are obtained by clustering at the firm level. *, **, *** indicate significance at the 10, 5, 1% levels, respectively, using a two-tailed test. All variables are defined in Table A1.

Panel A. Financial constraints

	Firm size			Hadlock-Pierce		
	fin_tot	*fin_ext*	*fin_loan*	*fin_tot*	*fin_ext*	*fin_loan*
	(1)	(2)	(3)	(4)	(5)	(6)
treat×post(+1,+2)	0.7170*	0.4999*	0.0656	0.8325***	0.3946**	0.0671
	(0.4334)	(0.2623)	(0.2068)	(0.2837)	(0.1560)	(0.2082)
treat×post(+3,+4)	0.3660	-0.1812	0.4467	-0.2282	-0.0062	-0.0363
	(0.3510)	(0.1462)	(0.2941)	(0.4105)	(0.1316)	(0.3037)
large×treat×post(+1,+2)	-0.0614	-0.0416*	-0.0075			
	(0.0394)	(0.0236)	(0.0189)			
large×treat×post(+3,+4)	-0.0282	0.0190	-0.0394			
	(0.0320)	(0.0135)	(0.0266)			
hp×treat×post(+1,+2)				0.1487***	0.0642**	0.0155
				(0.0518)	(0.0280)	(0.0396)
hp×treat×post(+3,+4)				-0.0585	-0.0053	-0.0136
				(0.0785)	(0.0248)	(0.0577)
post(+1,+2)	-0.0807*	-0.0248*	-0.0554*	-0.1658**	-0.0193	-0.1497***
	(0.0427)	(0.0141)	(0.0302)	(0.0843)	(0.0335)	(0.0560)
post(+3,+4)	-0.1198**	-0.0474**	-0.0627	-0.2500**	-0.0388	-0.2074**
	(0.0571)	(0.0188)	(0.0396)	(0.1252)	(0.0497)	(0.0836)
hp				-0.6843	0.0261	-0.7843**
				(0.6116)	(0.2427)	(0.3976)
sg	0.3851*	0.0289	0.3151***	0.3911*	0.0335	0.3111***
	(0.2172)	(0.1375)	(0.1064)	(0.2062)	(0.1346)	(0.1021)
cfo	-0.3624***	-0.0258	-0.2627***	-0.3609***	-0.0263	-0.2626***
	(0.1027)	(0.0287)	(0.0554)	(0.0979)	(0.0275)	(0.0557)
size	-0.0671	-0.0672	0.0249	0.0079	-0.0761	0.1258
	(0.0869)	(0.0571)	(0.0870)	(0.1083)	(0.0801)	(0.0993)
age	0.5788	0.2769*	0.1147	0.5382	0.2346	0.0156
	(0.4606)	(0.1644)	(0.3970)	(0.5360)	(0.1931)	(0.3958)
cash	-0.0291*	-0.0149	-0.0334***	-0.0325*	-0.0157	-0.0355***
	(0.0173)	(0.0122)	(0.0118)	(0.0175)	(0.0122)	(0.0122)
lev	-1.0399***	-0.1382	-1.0478***	-0.9709***	-0.1421	-0.9932***
	(0.2955)	(0.1204)	(0.1545)	(0.2977)	(0.1223)	(0.1477)
retain	-0.6261*	-0.5044**	0.1769*	-0.7294*	-0.5220**	0.0816
	(0.3614)	(0.2395)	(0.1046)	(0.3896)	(0.2613)	(0.1234)
Observations	2,317	2,317	2,317	2,317	2,317	2,317
firm FE	yes	yes	yes	yes	yes	yes
clustered by	firm	firm	firm	firm	firm	firm
Adj R^2	0.495	0.421	0.336	0.505	0.417	0.343

Panel B. Information cost and capital demand

	Illiquidity			External Dependence		
	fin_tot	*fin_ext*	*fin_loan*	*fin_tot*	*fin_ext*	*fin_loan*
	(1)	(2)	(3)	(4)	(5)	(6)
treat×post(+1,+2)	0.0693*	0.0607***	-0.0132	0.0346**	0.0144	-0.0335
	(0.0372)	(0.0215)	(0.0248)	(0.0150)	(0.0360)	(0.0313)
treat×post(+3,+4)	0.0726**	0.0222	0.0302	0.0166	0.1066***	0.0537
	(0.0332)	(0.0140)	(0.0287)	(0.0160)	(0.0410)	(0.0345)
illiq×treat×post(+1,+2)	0.0574***	0.0582***	-0.0078			
	(0.0082)	(0.0065)	(0.0071)			
illiq×treat×post(+3,+4)	-0.0152	-0.0132	0.0186			
	(0.0145)	(0.0101)	(0.0131)			
ext_depend×treat×post(+1,+2)				0.0637*	0.1189**	0.0354
				(0.0326)	(0.0567)	(0.0370)
ext_depend×treat×post(+3,+4)				0.0021	-0.0874**	-0.0486
				(0.0283)	(0.0382)	(0.0343)
post(+1,+2)	-0.0809*	-0.0204	-0.0577*	-0.0252*	-0.0839**	-0.0576*
	(0.0416)	(0.0131)	(0.0299)	(0.0138)	(0.0422)	(0.0297)
post(+3,+4)	-0.1198**	-0.0415**	-0.0654*	-0.0482***	-0.1238**	-0.0653*
	(0.0558)	(0.0171)	(0.0390)	(0.0184)	(0.0567)	(0.0390)
sg	0.3709*	0.0075	0.3299***	0.0271	0.3870*	0.3181***
	(0.2171)	(0.1390)	(0.1140)	(0.1388)	(0.2162)	(0.1114)
cfo	-0.3620***	-0.0261	-0.2622***	-0.0268	-0.3629***	-0.2619***
	(0.1019)	(0.0279)	(0.0560)	(0.0279)	(0.1004)	(0.0555)
size	-0.0882	-0.0711	0.0151	-0.0704	-0.0871	0.0124
	(0.0896)	(0.0567)	(0.0845)	(0.0569)	(0.0891)	(0.0857)
age	0.5912	0.2348	0.1240	0.2816*	0.6051	0.1362
	(0.4650)	(0.1457)	(0.3926)	(0.1572)	(0.4620)	(0.3921)
cash	-0.0307	-0.0152	-0.0306**	-0.0151	-0.0303*	-0.0341***
	(0.0203)	(0.0142)	(0.0151)	(0.0117)	(0.0176)	(0.0122)
lev	-1.0162***	-0.1208	-1.0593***	-0.1424	-1.0446***	-1.0450***
	(0.2931)	(0.1200)	(0.1600)	(0.1239)	(0.2973)	(0.1576)
retain	-0.6652*	-0.5527**	0.1873*	-0.5182**	-0.6300*	0.1891*
	(0.3759)	(0.2506)	(0.1114)	(0.2479)	(0.3688)	(0.1122)
Observations	2,317	2,317	2,317	2,317	2,317	2,317
firm FE	yes	yes	yes	yes	yes	yes
clustered by	firm	firm	firm	firm	firm	firm
Adj R^2	0.499	0.437	0.335	0.413	0.496	0.334

Table 5 Financial reporting frequency and corporate activities

This table presents the other aspects of the economic consequences of the increase in financial reporting frequency. Columns (1) and (2) use cash holding (*cash*) and net cash (*net_cash*) as the dependent variable to test the effects on corporate cash holding. While Column (3) tests the effects on corporate investment (*investment*), Column (4) examines the effects on payout (*payout*). In each specification, control variables include sales growth (*sg*), operating cash flow (*cfo*), natural logarithm of lagged total assets (*size*), natural logarithm of lagged firm age (*age*), and lagged cash holding (*cash*), lagged leverage (*lev*), lagged retained earnings (*retain*). I also control for the time-invariant firm fixed effects. Standard errors in parentheses are obtained by clustering at the firm level. *, **, *** indicate significance at the 10, 5, 1% levels, respectively, using a two-tailed test. All variables are defined in Table A1.

	cash	*net_cash*	*investment*	*payout*
	(1)	(2)	(3)	(4)
treat×post(+1,+2)	0.0427	0.0883	0.0296**	0.0235**
	(0.0578)	(0.0735)	(0.0140)	(0.0099)
treat×post(+3,+4)	0.0623	-0.0073	0.0230*	0.0192***
	(0.0597)	(0.0755)	(0.0134)	(0.0067)
post(+1,+2)	0.0041	0.1443	-0.0176	0.0033
	(0.0748)	(0.1006)	(0.0169)	(0.0054)
post(+3,+4)	0.0128	0.2366*	-0.0163	0.0042
	(0.1087)	(0.1423)	(0.0225)	(0.0083)
sg	-0.0311	-0.3962	0.0195	-0.0444**
	(0.2287)	(0.2811)	(0.0377)	(0.0173)
cfo	0.3536***	0.6319***	-0.0002	-0.0006
	(0.0946)	(0.1224)	(0.0168)	(0.0043)
size	0.0680	-0.1603	-0.0354	0.0382
	(0.1132)	(0.1331)	(0.0285)	(0.0281)
age	-0.1993	-1.9738	0.0266	-0.0444
	(1.0551)	(1.4427)	(0.1906)	(0.1003)
cash	0.6703***	0.5819***	0.0272***	0.0117
	(0.0612)	(0.0991)	(0.0102)	(0.0078)
lev	-0.1979	-2.5825***	-0.1664	-0.1506**
	(0.2795)	(0.3755)	(0.1265)	(0.0754)
retain	-0.3160	-0.5495	0.0596	0.0217
	(0.2491)	(0.3774)	(0.0703)	(0.0231)
Observations	2,317	2,317	2,317	2,317
firm FE	yes	yes	yes	yes
clustered by	firm	firm	firm	firm
Adj R^2	0.816	0.836	0.414	0.597

Appendix on
"Financial reporting frequency and external finance: Evidence from a quasi-natural experiment"

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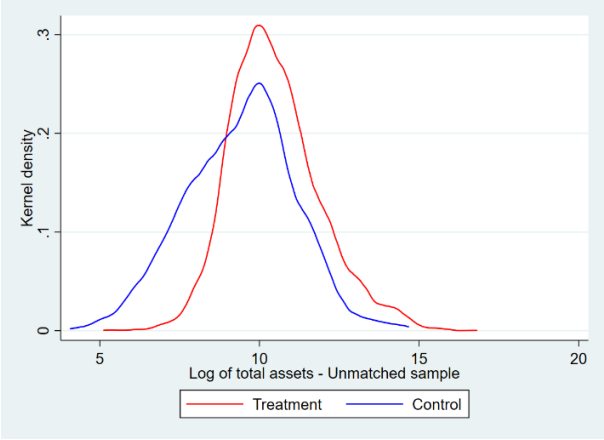
A1 Variable definitions

Table A1 describes the definitions of the variables used in this study.

A2 Size distribution before and after matching procedure

Figure 1 presents the firm size distribution of treatment and control groups.

Panel A. Unmatched Sample



Panel B. Matched Sample

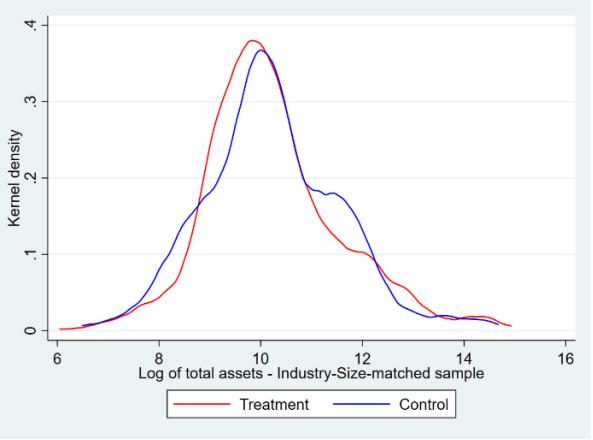


Figure A1 Firm size distribution in matched sample

This figure presents the size distribution of treatment and control firms in the before treatment periods. Panel A shows the size distribution of both groups in my full samples of NIKKEI FQ. Panel B shows the size distribution of each group in my size-industry matched sample. The graphs present, for each set of firms, Epanechnikov kernel densities of the natural logarithm of total assets in million Japanese yen. The unit of observation is a firm-year.

Table A1. Variable definitions

This table describes the definitions of the variables in this study.

Variables	Definitions
Financing	
fin_tot	Total financing estimated as the the sum of the cash inflow from loan, issues of bond, compatible bond, and stock scaled by the sum of lagged tangible and intangible assets.
fin_ext	External financing estimated as the sum of the cash inflow from issues of bond, compatible bond, and stock scaled by the sum of lagged tangible and intangible assets.
fin_loan	Bank loan financing estimated as the increase in short- and long-term debt scaled by the sum of lagged tangible and intangible assets.
Variable in interest	
treat	Treatment indicator taking one if the firm belongs to treatment group, zero otherwise.
post	Post treatment indicator taking one for periods after the treatment year, and 0 for periods prior to the treatment year.
Control Variables	
sg	Sales growth estimated the change in sales from the previous fiscal year scaled by the sales in the previous year.
cfo	Operating cash inflow scaled by the sum of lagged tangible and intangible assets.
size	The natural logarithm of lagged total assets.
age	The natural logarithm of firm age.
cash	The sum of cash and short-term security scaled by the sum of lagged tangible and intangible assets.
lev	The sum of short- and long-term debt scaled by the sum of lagged tangible and intangible assets.
retain	Retained earnings scaled by the sum of lagged tangible and intangible assets.
large	An indicator taking one if the firm belongs to the first quintile of firm size, zero otherwise.
hp	An indicator taking one if the firm belongs to the third quintile of Hadlock-Pierce index, zero otherwise.
illiq	Amihud Illiquidity index estimated as: $illiq = (1/d) \Sigma [\mid ret \mid / (vol \times price)]$ *ret* represents daily stock returns, *vol* represents daily trading volume, *price* represents the stock price, and d represents the number of the dates of fiscal year.
ext_depend	Rajan and Zingales (1997) external finance dependency estimated as: