Does financing influence the sensitivity of cash and investment to asset tangibility?

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Abstract Research shows that asset tangibility substantially impacts firms' cash levels and investment. Using the deregulation of equity issuance in the U.S. as an exogenous shock to access to equity markets, we investigate the influence of financing on the dependence of cash and investment on asset tangibility. We show that financing dampens the sensitivity of cash and investment to asset tangibility, and promotes investment and firm growth. Our results suggest that greater access to financing allows financially constrained firms to invest in productive projects that may otherwise not be taken up. This provides evidence that public firms even in well-developed financial markets such as the U.S. benefit from financial deregulation that removes barriers to external financing, shedding light on the role of financial markets in fostering growth.

1 Introduction

A large body of theoretical and empirical literature shows that access to external financing is important for corporations, particularly for small firms. The literature on financial constraints provide evidence that financing frictions may impact the operating decisions of firms (Butler and Cornaggia (2011); Chava and Roberts (2008); Whited (1992)). Prior studies (Liberti and Mian (2010); Bernanke and Gertler (1989); Kiyotaki and Moore (1997)) posit that contract incompleteness and limited enforceability reduce access to external finance, and that asset tangibility is fundamental to financial contracting and corporate financing capacity. This is because in default or bankruptcy states, the value that can be captured by creditors increases with asset tangibility. Therefore, by mitigating the extent of contractibility problems, asset tangibility increases the capability of firms to obtain external financing. Importantly, because investment generally relies on asset-based financing, tangible assets can increase investment when firms have imperfect access to credit.

Low tangible firms are typically exposed to costly external financing (Lei, Qiu, and Wan (2018); Falato, Kadyrzhanova, and Sim (2013); Lyandres and Palazzo (2016)). Because of the vulnerability of limited and expensive access to external finance, firms with low asset tangibility build up high cash balances to insure the availability of sufficient liquidity capable to weather adverse shocks. Low tangibility firms are financially constrained, and their investments and asset growth are more likely to be limited to available internal resources (Chava and Roberts (2008)). The tangibility of a firm's assets may impact its external financing capacity as well as its liquidity and investment strategy, and a negative asset tangibility sensitivity of cash could constrain firm growth if firms forgo investment to hold more cash.

Financial deregulation of public capital markets that improves access to external finance might remove binding financial constraints and moderate the dependence of cash and investment on asset tangibility, and promote firm growth. The theoretical underpinning of this line of inquiry is that capital market development expands the accessibility of alternative financing sources, and improves firms' access to lower cost external financing (Khurana, Martin, and Pereira (2006)).

Despite the far-reaching implications of asset tangibility on corporate cash holdings and investments, the impact of improved access to equity financing on the sensitivity of cash and

investment to asset tangibility, particularly for smaller public firms has received little attention in the empirical finance literature. While a number of studies examine whether access to bank financing affect firm growth and investments (for example Krishnan, Nandy, and Puri (2014); Kerr and Nanda (2009)), to the best of our knowledge, no study has directly explored the link between increased access to equity financing and the dependence of corporate cash holdings on asset tangibility. In this paper, we ask whether and how differential access to capital markets affects the dependence of cash and investment on asset tangibility.

A challenging hurdle facing empirical research in this area is the identification of an exogenous shock to a firm's access to equity markets to recognize differentials in the cost of external financing. Also, stock market development and corporate financial outcomes or firm growth could be endogenously determined, therefore, identifying the direction of causality is a major challenge. Little exists in the way of clearly exogenous variation for possible exploitation. Therefore, a conventional approach in the literature would examine a corporate financial or growth variable and a financial development proxy such as ratio of stock market traded value to Gross Domestic Product. However, such proxy could contain a market expectation of future growth, which could result in a spurious correlation between stock market development and the financial or growth variable (Levine and Zervos (1998)). Overcoming such a challenge requires a natural experiment setting where one can consider an exogenous shift in the availability of external financing. To bridge this gap, we provide evidence from a natural experiment created by the SEC 2008 financial deregulation that removed barriers to equity issuance and resulted in an exogenous and substantial decrease in the issuance cost (Gustafson and Iliev (2017)) for small listed firms. Consistent with prior literature (Gustafson and Iliev (2017)), we analyze the same set of firms before and after the exogenous shock to equity market access so as to avoid many of the challenges associated with endogenous priors. If the improved access to capital markets removes binding financial constraints on firms, we expect the sensitivity of cash and investment to asset tangibility to be dampened by the SEC equity issuance deregulation.

Prior to 2008, exchange-listed firms with public float or equity market capitalization of less than $75 million were restricted from using shelf-registration to conduct accelerated SEOs. This restriction resulted in a different equity issuance environment for smaller and larger firms, and constituted a binding financial constraint that prevented about 25% of exchange-listed compa-

nies from raising follow-on equity capital using accelerated SEOs (Gustafson and Iliev (2017)). In 2008, the SEC adopted amendments to the eligibility requirements of shelf-registration (Form S-3). The 2008 deregulation, for the first time, allowed securities-exchange-listed firms with public float or equity market capitalization of less than $75 million to conduct accelerated SEOs using shelf-registration. The aim of the amended public float requirement to shelf registration was to improve access to external finance and facilitate capital-raising efforts in the public equity markets by small listed firms. The SEC's decision to deregulate equity issuance using shelf registration plausibly provides an exogenous framework that allows us to study how the exogenous shock differentially impacted the real outcomes of financially constrained and unconstrained firms. The amendment of the public float requirement led to greater and improved access to equity financing for small listed firms.

To carry out the empirical analysis, we follow Gustafson and Iliev (2017) and use the rule threshold of $75 million and restrict the sample to firms with reported public floats between $10 million and $150 million, and we employ the difference-in-difference estimator to examine the effect of the deregulation of equity issuance on the sensitivity of cash and investment to asset tangibility.[1] The advantage of using this public float restriction is that firms below and above the $75 million threshold differ in terms of their access to shelf registration for accelerated SEOs but are unlikely to differ substantially in terms of other characteristics. In particular, firms with public float of less than $75 million were ineligible for shelf registration, hence, financially constrained relative to firms with public float above the threshold. Therefore, employing this approach provides an assurance that the results are not driven by other potentially unobservable differences between the treated and control firms.

The results of this paper deliver a number of interesting findings. Consistent with the view that financing impacts corporate financial policies, we find that improved access to public capital markets lowers the asset tangibility sensitivity of cash. This suggests that as financial deregulation broadens the sources of corporate financing for constrained firms, it effectively reduces the sensitivity of cash to asset tangibility and moderates the need to hold cash among firms with low tangibility. While the methodology we employ provides a strong assurance that the baseline results are not simply driven by size differences or other potentially unobservable differences between the treated and control firms, we examine further whether public float size

[1] As robustness, we use a tighter band around the $75 million threshold.

cutoffs other than the $75 million have similar effects. We create two placebo groups, the lower placebo and upper placebo with cutoffs of $40 million and $120 million respectively. If the baseline results are due to size differences, then we expect these placebo cutoffs to have similar impact. The main results disappear in the upper and lower placebo tests. The results do not show differences in impact of the deregulation on the sensitivity of cash to asset tangibility. The non-results discount the possibility that the baseline results are due to differential reaction of the treated and control firms.

An important implication of the findings is that by lessening the impact of tangible assets on cash holdings, financial deregulation could permit low tangibility firms to hold less cash and undertake more investment opportunities. In line with this prediction, we find evidence that access to public capital markets has real effect on the ability to make investments. Specifically, we find that the financial deregulation dampened the positive impact of asset tangibility on investment. The implication of this is that, following the deregulation, small firms have improved access to additional financing source, hence, reserve less cash, and are able to increase their investments. This results support the idea that improved access to external financing may increase constrained firms' access to additional profitable and productive projects that they may otherwise not be able to pursue, suggesting that the availability of financing is very much important for the success of small firms.

While the deregulation of equity issuance improved access to external finance, which can be valuable to the size of corporate investments, it does not automatically translate into good investment decisions. A natural follow-up question is whether the improved access to cheaper equity financing following the equity issuance deregulation is dissipated by the treated firms taking on unproductive or less productive projects or whether this increases the ability of firms to undertake additional profitable projects that they were unable to take on prior to the equity issuance deregulation. We extend the analysis further to examine the effect of the equity issuance deregulation on the quality of investment decisions as proxied by investment efficiency. This analysis is important because more is not necessarily better in the case of corporate investments. With this approach, rather than looking at the size of firm investments, we focus our attention directly on the quality of investment decisions as gauged by firms' investment efficiency gains. The measure of investment efficiency captures the difference between

expected and actual investment levels. Therefore, gains in investment efficiency cannot merely be the result of an increase in the size of corporate investments or scale of operations, but rather the result of increased access to additional profitable projects that allows a firm to become more efficient. In this situation, we expect the increased access to equity financing to lead to the highest increase in investment efficiency for those firms that were initially financially constrained due to the limitation on the use of shelf-registration. We find that investment efficiency for the treated firms increased following the financial deregulation. This suggests that the financial deregulation by facilitating access to external finance, permitted small firms to finance prudent and productive investments that otherwise might not be pursued. Finally, we examine the effect of the deregulation on the asset side of the firms' balance sheet to shed light on the implication of the deregulation for firm growth. We find that the treated firms increase their growth of fixed assets, suggesting that a deregulation that improves access to external finance promotes faster firm growth. This provides evidence that public firms in a developed financial market like the US benefit from a financial deregulation that removes barriers to external financing.

This paper delivers important findings and contributions. First, it brings evidence from a natural experiment to the literature on the role of tangible assets in determining corporate financial and investment policies. As far as we are aware, it is the first study that examines the causal effect of financing on the sensitivity of cash to asset tangibility at the firm level, with the objective to identify the causal impact of financial development on corporate investment policy. Specifically, it is related to the recent emerging literature on the role of tangibility on financial and investment policies of firms (See Chaney, Sraer, and Thesmar (2012); Gan (2007)). Second, to the best of our knowledge, no previous study has investigated the influence of improved access to equity capital on the sensitivity of cash and investment to asset tangibility before and after an exogenous and substantial shock to external financing. This paper helps fill this gap. This paper is closest in spirit to Lei, Qiu, and Wan (2018) as they conduct a cross-country study of the impact of financial development on the cash-asset tangibility sensitivity. However, we provide a firm-level evidence that the deregulation of capital markets reduces firms' financing constraints, and allows for improved access to external finance for the funding of profitable investments, which enhances firm growth. While Lei, Qiu, and Wan (2018) conventionally uses a macro level financial development proxy such as private credit to GDP, we use a natural

experiment framework to precisely capture the magnitude of the causal effect of financing on the cash-asset tangibility sensitivity at the firm-level, and employ a testing procedure that resolves the problem of endogeneity between financial development and financial variables such as investment and growth. Financial development proxy such as private credit to GDP, and corporate financial outcomes could be endogenously determined (Levine and Zervos (1998)). The economic forces that promote financial development could also affect the interplay between cash holdings and asset tangibility. Third, this paper is related to the literature on financing constraints and investment decisions (e.g., Love (2003)).

Also, we document that financial deregulation by reducing the sensitivity of cash to asset tangibility promotes investment efficiency by ensuring efficient allocation of resources, which enables firms to undertake profitable projects they would otherwise forgo. This is very vital from a policy perspective if the objective is to promote the growth of small listed firms. Overall, the findings of this paper show that even in a highly developed market such as the US, access to external financing is an important component of corporate behaviour. We provide evidence that even in a developed market like the US, greater access to equity financing is important for corporate cash and investment policies. This provides micro-level evidence that sheds new light on the role of financial markets in fostering economic growth.

The remainder of the paper is structured as follows. Section 2 provides institutional background information in relation to the financial deregulation. Section 3 describes the sample construction. Section 4 and Section 5 discuss the empirical approach and results, respectively. Section 6 presents robustness checks and Section 7 concludes the paper.

2 Institutional detail: deregulation of equity issuance in the US

Accelerated SEOs have become an increasingly common and popular method of raising seasoned public equity. Previous studies (Gao and Ritter (2010) and Bortolotti, Megginson, and Smart (2008)) document that accelerated deals are faster and cheaper than the traditional fully marketed offerings, hence, their popularity. Accelerated SEO proceeds accounted for more than half the total value of SEOs in the US in 2004 (Bortolotti, Megginson, and Smart (2008)). In the US, accelerated SEOs are usually conducted through shelf registrations. The SEC, in 1982, introduced shelf registration, which permits firms to pre-file estimated offerings that they

reasonably anticipate issuing in the future. The shelf registered offerings can be subsequently issued in full or in part. According to the SEC, the ability to pre-file expected offerings using Form S-3 (shelf registration) confers significant benefits on eligible firms. SEOs issued off the shelf allow firms to avoid regulatory delays and interruptions, and minimize the costs associated with the SEO process.[2] By having control over the timing of issuing the shelf-registered securities, firms are able to raise capital on more favourable terms. Consequently, the ability to issue securities off the shelf as needed provides firms with a significant financing alternative to other funding methods.[3] As at 2003, more than two-thirds of firms eligible to use Form S-3 had issued SEOs off the shelf (Kumar and Shome (2008)).

However, prior to the 2008 deregulation, which amended the eligibility requirement for using shelf registration, public firms conducted off the shelf equity offerings only if their public float was $75 million or more. This restriction resulted in different equity issuance environment for smaller and larger firms. It effectively prevented about 25% of exchange listed companies (mainly small firms) from raising follow-on equity capital using accelerated SEOs (Gustafson and Iliev (2017)). The final text of the 2008 amendment to the eligibility requirement for Form S-3 (shelf registration) emphasizes how the restriction prevented a large number of listed firms from conducting accelerated SEOs. The final SEC text states that "These amendments are intended to allow a large number of public companies to benefit from greater flexibility and efficiency in accessing the public securities markets afforded by Form S-3."

By amending the $75 million public float eligibility requirement, the SEC, argues that smaller companies will have greater financing flexibility, efficiency, and an enhanced access to capital in the equity markets, with less cost and burden. Because smaller firms have fewer financing options relative to their larger counterparts, removing public float limitations to shelf registration should facilitate their capital-raising efforts in the public equity markets. Consequently, Gustafson and Iliev (2017) find that, post-deregulation; the treated firms significantly increased their public equity capital issuance using shelf registration, and importantly, the issuance costs for off the shelf accelerated SEOs significantly declined.

[2]See the SEC release NO. 33-8878
[3]See the SEC release NO. 33-8878

3 Sample construction

To construct the sample, we begin with exchange listed firms with public float between $10 million and $150 million covering the period 2002 and 2013. The public float data was made available by Gustafson and Iliev (2017).[4] We restrict the public float data to between $10 million and $150 million because of the 2008 deregulation which permitted firms with public float of less than $75 million to use shelf registrations to raise equity capital. Also, given that the requirement for public companies to report their public float in 10-K filings came into effect in 2002, we restrict the sample period to begin from 2002. Because firms with public float between $70 million and $80 million can change treatment status during the year, we follow Gustafson and Iliev (2017) and exclude such observations from the dataset. This ensures treated firms have public float between $10 million and $70 million, and control firms have public float between $80 million and $150 million. We then merge the public float data with the relevant annual firm-level accounting data from the Compustat database.

We follow previous literature (Almeida, Campello, and Weisbach (2004), Opler, Pinkowitz, Stulz, and Williamson (1999), and Hoberg, Phillips, and Prabhala (2014)) and exclude firms in the financial (SIC codes 6000 – 6999) and utilities (SIC codes 4900 – 4950) industries. We exclude shell companies and firms that are not registered on national stock exchanges because the deregulation is not applicable to them. We also exclude firm-year observations that have missing and negative data for total assets. We further drop observations with negative cash. While we account for general trends in the empirical setting, the onset of the global financial crisis in 2008 presented a major economic downturn and negative shock to access to external financing. To ensure the analysis of the paper is not driven by this systemic event, we follow Gustafson and Iliev (2017) and account for the effect of the financial crisis by excluding firm-year observations for which more than six months fall within the financial crisis as defined by the National Bureau of Economic Research.[5] The final sample consists of 7,213 firm year observations.

Table 2 reports descriptive statistics for the main firm characteristics split by firm treatment status in the pre and post shelf registration rule period. All data filters described earlier such

[4] A detailed description of the process of extracting the public float data can be found in their paper.

[5] Following Gustafson and Iliev (2017), observations with fiscal year-end from June 2008 to December 2009 are excluded as they fall within the NBER financial crisis definition of December 2007 to June 2009.

as excluding firms with negative or missing assets and cash, excluding financial crisis period, and all continuous variables winsorized at the 1% and 99% in both tails are applied to the descriptive statistics. As can be seen in Table 2, the treated firms are smaller in terms of public float and size relative to the control firms, but they are much comparable in terms of other firm characteristics. This suggests that the untreated firms serve as suitable control group to investigate the effect on the equity issuance deregulation on the dependence of cash and investment on asset tangibility.

4 Empirical strategy

This section provides a description of our regression specification. We use the difference-in-differences approach to formally explore the influence of the 2008 equity issuance deregulation on the sensitivities of cash, and investment to asset tangibility. With this empirical strategy, we exploit the fact that the treated and untreated firms faced different regulatory requirements before the deregulation, but both are in the same regulatory environment following the amendment to the eligibility requirement. This difference-in-difference strategy allows for a better isolation of the independent role of financial deregulation on corporate financial policies. In the spirit of Gustafson and Iliev (2017), we specify the following model.

$$\begin{aligned} Y_{i,t} =& \alpha + \beta_1 \textit{Asset Tangibility}_{i,t} + \beta_2 \textit{Asset Tangibility}_{i,t} \times \textit{Treated(0/1)}_{i,t} \times \textit{Post(0/1)}_t \\ &+ \beta_3 \textit{Treated(0/1)}_{i,t} \times \textit{Post(0/1)}_t + \beta_4 \textit{Treated(0/1)}_{i,t} + \gamma X_{i,t} + \delta_t + \rho_j + \varepsilon_{i,t}, \end{aligned} \tag{1}$$

where i, j, and t index firm, industry and year respectively. $Y_{i,t}$ represents the dependent variables, which is either *Cash* or *Investment* depending on the test being conducted. *Cash* is the ratio of cash and marketable securities (CHE) to total book assets (AT) and *Investment* is the ratio of capital expenditure (CAPX) to total book assets (AT). $\textit{Asset Tangibility}_{i,t}$ is the ratio of gross property, plant, and equipment (PPEGT) to total book assets (AT). $\textit{Treated(0/1)}_{i,t}$ is a dummy variable set to one for firms with public float of less than \$75 million, otherwise zero. $\textit{Post(0/1)}_t$ switches to one for periods after 2008, indicative of the years after the deregulation. $X_{i,t}$ is a set of firm-level control variables. δ_t is year fixed effects, and it captures shocks that might affect the outcome variables. ρ_j controls for industry fixed effects. Standard errors are

clustered at the firm level to correct for serial correlation. Because the effect of a separate $Post(0/1)_t$ term is subsumed by the year fixed effects (δ_t), we exclude it from the specification.

β_1 measures the direct effect of tangibility on cash and investment. Because firms with high level of tangibility have greater access to debt financing as they can collateralize their assets, they have less incentive to hold cash, hence the expectation is that *Asset Tangibility* should have a negative marginal effect on *Cash*. We are most interested in the coefficient estimate β_2 of the triple interaction term $Asset\ Tangibility_{i,t} \times Treated(0/1)_{i,t} \times Post(0/1)_t$. A positive β_2 estimate would imply that financing in the form of stock issuance deregulation dampens the negative sensitivity of *Cash* to *Asset Tangibility*. By reducing the effect of asset tangibility on cash, the deregulation should promote investment by low tangibility firms.

Also, to examine the effect of the financial deregulation on investment efficiency, we estimate the following model.

$$InvEff_{i,t} = \alpha + \beta_1 Treated(0/1)_{i,t} \times Post(0/1)_t + \beta_2 Treated(0/1)_{i,t} + \gamma X_{i,t} + \delta_t + \rho_j + \varepsilon_{i,t}, \quad (2)$$

where $InvEff_{i,t}$ represents investment efficiency, and all other variables remain the same as defined in Eq.(1).

Conceptually, investment efficiency implies firms undertaking all positive net present value projects. Biddle, Hilary, and Verdi (2009) estimates a model of investment in terms of growth opportunities. Investment efficiency exists when the residuals from the investment model equals to zero, suggesting there is no deviation from the expected level of investment. Positive deviations from the expected level of investment imply that firms are overinvesting while negative deviations or residuals imply firms do not undertake all positive net present value projects. To examine how the financial deregulation affected firm investment efficiency, we follow Biddle, Hilary, and Verdi (2009) and Gomariz and Ballesta (2014), and estimate a model that predicts firm investment level based on growth opportunities using sales growth and alternatively Tobin's Q, or both. Deviations from the model capture investment inefficiency.

$$Investment_{i,t} = \alpha + \beta_1 X_{i,t} + \varepsilon_{i,t}, \quad (3)$$

where $X_{i,t}$ is either *SalesGrowth*, *Tobin's Q*, or both.[6] We estimate Eq.(3) cross-sectionally for each industry-year based on Fama and French (1997) industry classification. Deviations as reflected in the residuals, capture the deviations from the expected investment level. The residuals proxy for investment inefficiency. Again, a positive residual implies that a firm is investing at a rate higher than the expected level based on sales growth or Tobin's Q, representing overinvestment. However, a negative residual means that a firm's real investment is less than the expected level, indicating a case of underinvestment. To obtain investment efficiency, we multiply the absolute value of the deviations (residuals) by -1. Therefore, a higher value represents a higher investment efficiency.

5 Empirical analysis

5.1 Financing, asset tangibility, and cash

Table 3 presents the estimation results of Eq.(1). Columns 1 and 2 report the baseline estimation results. In the baseline estimation, we restrict the sample to firms with public float between $10 million and $150 million with the aim of balancing the need for statistical power with the assumption that the treated and control firms are similar. In Columns 3 and 4, we test whether the baseline results hold to a tighter band of public float between $25 million and $125 million. This tighter band selection should inherently reduce statistical power to obtain conservative statistical inferences. In order to examine the impact of the increased access to financing on the dependence of cash on asset tangibility within a short horizon around the public float rule change, in Columns 5 and 6, we restrict the sample for the cash-tangibility sensitivity regression to the time period within the five years of the equity issuance deregulation.[7]

In Columns 1, 3 and 5, we measure the direct sensitivity of cash to asset tangibility. Across the columns, the coefficient estimate of *Asset Tangibility* is negative and statistically significant, suggesting that high asset tangibility leads to lower cash holdings. Firms with high asset tangibility have greater access to financing as they can collateralize their assets, hence, have lower need to hold high cash balances. In Columns 2, 4 and 6, β_2, the coefficient of the triple interaction $Asset\ Tangibility_{i,t} \times Treated(0/1)_{i,t} \times Post(0/1)_t$, which is the interaction

[6] *SalesGrowth* is the change in sales from period $t-1$ to t

[7] Here, the sample period is from 2005 to 2012 but excludes the financial crisis period of 2008 and 2009 as described in the earlier section. All the data filters are still included in this shorter sample period

of interest is positive and statistically significant across the columns. This implies that the negative relation between *Asset Tangibility* and *Cash* is dampened by financing. The financial deregulation by removing a binding financial constraint on treated firms (small firms), moderates the asset tangibility sensitivity of cash.

In Table 4, we perform a placebo test to ensure that the results in Table 3 are not due to size differences between the treated and control firms. We examine whether public float size cutoffs other than the $75 million have similar effects. If the baseline results are due to size differences between the treated and untreated firms, then the alternative size cutoffs would have a similar effect. We create two placebo groups, the lower placebo and upper placebo. The lower placebo consists of firms with public float from $10 million to $70 million with a cutoff of $40 million, so *Treated(0/1)* is now set to one for a firm with a public float of less than $40 million, otherwise zero. In the upper placebo, firms have public float from $90 million to $150 million with a cutoff of $120 million. Again, *Treated(0/1)* is now set to one for a firm with a public float of less than $120 million, otherwise zero. The results as presented in Table 4 are different from the baseline results in Table 3. The coefficients of the triple interaction of interest *Asset Tangibility* $\times$ *Treated(0/1)* $\times$ *Post(0/1)* become insignificant for both the lower and upper placebo groups. This discounts the possibility that the baseline results are due to differential reaction of the treated and control firms.

5.1.1 Information asymmetry and tech intensiveness

The evidence so far suggest that the deregulation dampened the impact of asset tangibility on cash balances. In this section, we examine in detail the channels through which the deregulation influences the dependence of cash on asset tangibility.

First, we examine whether the deregulation is particularly beneficial to firms with high levels of information asymmetry. In an imperfect market, firms with high levels of information asymmetry face frictions in obtaining external capital (Armstrong, Core, Taylor, and Verrecchia (2011), and Easley and Maureen (2004)). They face high financial constraints as they are unable to undertake profitable projects in the absence of adequate financing. However, since the equity issuance deregulation lead to an exogenous increase in the availability of financing, we anticipate firms with high information asymmetry to benefit more from the deregulation. To examine the

differential impact of the deregulation on the level of firm information asymmetry, we sort the sample of firms into low and high information asymmetry firms based on firm age. We measure firm age as the number years since a firm first appeared in Compustat. For each year, we rank the firms using the firm age over the sample period and categorize firms in the top (bottom) 4 deciles of the distribution as the low (high) information asymmetry group. As indicated earlier, we expect the deregulation to be more important for firms with high information asymmetry. In this case the deregulation should have a higher impact on the sensitivity of cash to asset tangibility for the high information asymmetry group than for the low information asymmetry group.

Next, we test whether the improved access to stock market financing is particularly important for high tech intensive firms. Here, the idea is that the intangibility nature of R&D limits the ability of firms to use debt finance. The equity market imposes no collateral requirement and equity financing does not increase the probability of financial distress. Therefore, a deregulation that removes barriers to equity issuance and improves access to equity financing should be much more important for high-tech intensive firms. Again, we expect the deregulation to have a stronger impact on the sensitivity of cash to asset tangibility for firms with high tech intensiveness. We follow Hsu, Tian, and Xu (2014) and measure a firm's tech intensiveness as the annual gross growth in R&D expenditure. For each year, we rank the firms and categorize those with tech intensiveness in the top (bottom) 4 deciles of the distribution as the high (low) tech intensiveness group.

Table 5 presents the results. Consistent with our expectations, the deregulation had a stronger dampening impact on the cash-tangibility sensitivity for firms with high information asymmetry and those with high-tech intensiveness. Across Columns 1-4, the coefficient estimate of *Asset Tangibility* is negative and highly statistically significant. However, the coefficient estimate of the triple interaction *Asset Tangibility* $\times$ *Treated(0/1)* $\times$ *Post(0/1)* is positive and significant for young and high-tech intensiveness group. This suggests that young and high-tech intensive firms benefit more from a deregulation that removes barriers to equity issuance.

5.1.2 External equity financing

The deregulation could moderate the cash-tangibility sensitivity by allowing low tangible firms to finance investment activities through the use of external equity financing, which effectively reduces the need for them to hold or build up cash. Therefore, in this section we examine the effect of the deregulation on external equity financing. We follow Dierker, Lee, and Seo (2019) and measure external equity financing as the ratio of the difference between the sale of common and preferred stocks (SSTK) and the purchase of common and preferred stocks (PRSTKC) to total assets (AT) at the beginning of the year.

Table 6 presents the results of the effect of the deregulation on external equity financing. Across both Columns 1 and 2, we find that the coefficients associated with *Treated(0/1)× Post(0/1)*, are positive and statistically significant, suggesting that the deregulation permitted low tangible firms to increase their external equity financing activities.

5.2 Financing, asset tangibility, and investment

So far, the findings show that deregulation allows low-tangibility firms to hold less cash. By dampening the impact of asset tangibility on cash balances, the deregulation allows low-tangibility firms to reserve less cash, and could potentially enable them undertake more investment opportunities when they do arise. We investigate this implication by examining the impact of the deregulation on the asset tangibility sensitivity of investment. Table 7 presents the estimation results of Eq.(1) but with investment as the dependent variable.

In Column 1, we examine the direct effect of the deregulation on investment. The coefficient estimate of *Treated(0/1)× Post(0/1)* (β_3) is positive and statistically significant, which indicates that investment for the treated firms relative to the untreated firms, increased following the deregulation. Small firms responded to the improved access to external equity financing by significantly increasing investment spending. This is consistent with the findings in Gustafson and Iliev (2017), that the improved access to shelf registration and the accompanying reduction in issuance costs leads to more investment. In Column 2, we examine the direct effect of asset tangibility on investment. The coefficient estimate of *Asset Tangibility* is positive and highly statistically significant. This indicates that the investment policy of a firm is related to its level of tangibility. The positive sensitivity of investment to asset tangibility is consistent

with the findings in Chaney, Sraer, and Thesmar (2012) that investment increase by \$0.06 with each \$1 increase in collateral value. In Column 3, we examine the baseline estimate of Eq.(1) to assess the role of the deregulation. We find that β_2, the coefficient of the triple interaction $Asset\ Tangibility_{i,t} \times Treated(0/1)_{i,t} \times Post(0/1)_t$, is negative and statistically significant, which indicates that financial development in the form of equity issuance deregulation reduces the impact of asset tangibility on investment. The empirical finding of the treated firms post deregulation, reserving less cash, and having more capital investments is consistent with the intuition offered by Almeida, Campello, and Weisbach (2004) that financially constrained firms have a stronger propensity to save cash out of cash flows. Following the equity issuance deregulation, the treated firms have better or improved access to external credit, and hence have less incentive to accumulate cash. Therefore, by reserving less cash, the treated firms are able to make more capital investments.

5.3 Financing and the quality of investment decisions

The previous section examines the effect of the equity issuance deregulation on the size of investment. However, more may not necessarily be better in the case of investment. So in this section, we examine the effect of the equity issuance deregulation on the quality of investment decisions as gauged by efficiency gains of the treated firms relative to the control sample. A detailed description of the estimation of the investment efficiency measure is described in Section 4.

The results are presented in Table 8. The dependent variable in all columns is investment efficiency. The investment deviations from the investment model of Eq.(3) are based on sales growth in Column 1, Tobin's Q in Column 2, and both sales growth and Tobin's Q in Column 3. The measure of investment efficiency captures the difference between expected and actual investment levels. Therefore, gains in investment efficiency cannot merely be the result of an increase in the size of corporate investments. Across all columns, we find that the coefficients associated with the variable of interest, *Treated(0/1)× Post(0/1)*, are all positive and statistically significant, suggesting that the deregulation by facilitating access to external finance, permitted small firms to finance prudent and productive investments that otherwise might not have been pursued.

5.4 Financing and firm performance

The previous section shows that investment efficiency increases for the treated firms following the deregulation. The implication is that firms now have the ability to undertake additional profitable projects that they were unable to take on prior to the deregulation. In other words, firms could now finance positive NPV projects and this should have some real effects on firm performance. Therefore, we examine the effect of the deregulation on firm performance in this section.

Table 9 presents the results of the effect of the deregulation on firm performance. In Columns 1 and 2, the dependent variables are *Return on Assets* and *Return on Sales*, respectively. Across both Columns 1 and 2, we find that the coefficients associated with *Treated(0/1)× Post(0/1)*, are positive and statistically significant, suggesting that the deregulation permitted firms to finance positive NPV projects and improved firm performance.

5.5 Financing and firm asset growth

The findings so far show that financial deregulation, permits low tangibility firms to hold less cash and invest more. The deregulation by improving access to external finance, moderates the asset tangibility sensitivity of cash, and enables firms to make more investment. We extend the analysis further to examine the direct financing channel by which the deregulation increased corporate investment. We investigate this by looking at the asset side of the firms' balance sheet to shed light on the implications of the deregulation for firm growth. If the increase in investment is due to increased asset growth, we expect an increase in the growth of both fixed asset and R&D following the deregulation.

In Table 10, we document how fixed assets and R&D changed following the deregulation. In order, Columns 1-3 report regression results for growth in total fixed assets, growth in net fixed assets, and growth in R&D. Across specifications 1-3, the coefficients associated with the variable of interest, *Treated(0/1)× Post(0/1)*, are all positive and statistically significant, suggesting growth in the proportion of fixed assets and R&D following the deregulation. This is consistent with the findings in Tang (2009), who finds that credit rating refinement upgrades improves credit market access and promotes faster asset growth. Overall, the findings suggest

that equity issuance deregulation improves firms' access to external financing, which in turn enables them to increase their investments by providing funds for more asset investment.

6 Robustness tests

In this section, we conduct additional analyses to alleviate potential endogeneity concern and examine the robustness of our finding regarding the moderating role of financing on the investment-tangibility sensitivity.

6.1 Robustness: An instrumental variable analysis

We address the issue of endogeneity of tangibility in this section. We conduct an instrumental variable analysis to mitigate the concern that asset tangibility could be endogenous in determining cash holdings. Specifically, we re-estimate the sensitivity of cash to asset tangibility regression with the IV-2SLS approach. To qualify as a valid instrument, a variable needs to be strongly correlated with the instrumented regressors (the validity requirement) but uncorrelated with the error term (the exclusion restriction). We follow Campello and Giambona (2013) and Lei, Qiu, and Wan (2018) and construct two instrumental variables.

The first instrument, *IndustryResale*, proxies the liquidity of the market for second-hand machinery and equipment within the industry where the firm operates. In an industry for a given year, *IndustryResale* is calculated as the ratio of the median of firm-level sales of PP&E (SPPE) to that of total PP&E (PPEGT) and capital expenditures (CAPX). The higher the ratio, the more active the supply and demand conditions of the second-hand market are. In a liquid secondary market, a firm can acquire used equipment and integrate it into its production process at a lower cost; meanwhile, the firm incurs a smaller cost of carrying those assets on its balance sheets. Therefore, a firm's asset tangibility should be related to the liquidity of machinery and equipment within the industry.

The second instrument, denoted as *IndustryLabor*, is defined as the industry-year median ratio of the number of employees scaled by total assets. *IndustryLabor* is used by Lei, Qiu, and Wan (2018) to instrument firm tangibility. *IndustryLabor* measures the typical technology level in an industry, and thus is related to the use of tangible assets in corporate production.

We confirm the suitability of our instruments by various identification tests reported in Table 11. In Column 1, we estimate the first stage regression where the dependent variable is *Asset Tangibility*. We find that our instruments, *IndustryResale* and *IndustryLabor*, satisfy the validity requirement since they are positive and statistically significant at the 1% level in explaining *Asset Tangibility*. With two instruments and only one endogenous regressor, we conduct an over-identification test to examine whether the instruments satisfy the exclusion restriction. In Column 2, the Hansen J statistic for the over-identification test is reported and the p-value is over 0.1. The Hansen over-identification test fails to reject the hypothesis that our instruments are exogenous.

In Column 2 of Table 11, we estimate the second-stage regression where the dependent variable is *Cash*, and *Asset Tangibility* is replaced by the instrumented values from the first-stage regression. The result presented in Column 2 shows that the coefficient associated with *Asset Tangibility* is negative and statistically significant at the 1% level. The IV-2SLS approach supports the baseline negative sensitivity of cash to asset tangibility.

6.2 Robustness: Financing and investment efficiency

Chen, Hribar, and Melessa (2018) evaluate the two-step procedure for examining the determinants of the abnormal, discretionary, or unexplained components of various variables. They show that when the first-step regressors are not included in the second-step regression, the two-step procedure could potentially generate biased estimates of the second-step regressors. As a robustness check, we apply the methodology proposed by Chen, Hribar, and Melessa (2018) to deal with the potential bias in the two-stage estimation of investment efficiency. Specifically, we include all the covariates from the first-stage estimation of the investment model in Eq.(3) in our second-stage investment efficiency estimation.

The results are presented in Table 12. The results are qualitatively similar to our baseline findings. Across all columns, we find that the coefficients associated with the variable of interest, *Treated(0/1)× Post(0/1)*, are all positive and statistically significant.

6.3 Robustness: Matching approach

As explained earlier, the advantage of our sample construction and empirical approach is that firms below and above the $75 million threshold only differ in terms of their access to shelf registration for accelerated SEOs but are unlikely to differ substantially in terms of other firm characteristics. In other words, the treated and control firms are comparable with one another and only differ in their eligibility to use shelf registration. This ensures the untreated firms serve as suitable control group.

However, to address the concern that the treated firms are inherently different from the untreated firms, we implement the entropy balancing method of Hainmueller and Xu (2013). By using this matching procedure, we ensure that the treated firms are equivalent to the control firms, which alleviates any concerns that differences in firm characteristics are influencing our results. We match firms on three moments (i.e., mean, variance, and skewness) of all the control variables used in the baseline regression. The results for the entropy-balanced sample, reported in Table 13, confirm the baseline results.

6.4 Robustness: Financing, asset tangibility, and investment

We employ an alternative measure of investment to assess the robustness of our results on the moderating role of financing on the investment-tangibility sensitivity. Our initial estimation did not include investment in intangible assets such as R&D. However, intangibles could be more relevant to financially constrained young firms. We therefore re-estimate the results in Table 7 by redefining investment to capture both capital expenditure and R&D.

The results are presented in Table 14. The dependent variable in all columns is investment, which is measured as the ratio of capital expenditure and R&D to beginning of period total assets. In Column 1, we examine the direct effect of the deregulation on investment. The coefficient estimate of *Treated(0/1)*× *Post(0/1)* is positive and statistically significant. In Column 2, we examine the direct effect of asset tangibility on investment. The coefficient estimate of *Asset Tangibility* is positive and statistically significant. In Column 3, the coefficient of the triple interaction $Asset\ Tangibility_{i,t} \times Treated(0/1)_{i,t} \times Post(0/1)_{t}$, is negative and statistically significant, which is consistent with our results reported earlier.

7 Conclusion

This paper examines the impact of financial development on the sensitivity of cash and investment to asset tangibility. We use a natural experiment created by the financial deregulation of seasoned equity issuance in the US to investigate the influence of financial development on the dependence of cash and investment on asset tangibility. We show that financial deregulation dampens the sensitivity of cash to asset tangibility, and promotes investment and firm growth. This provides evidence that public firms in well developed financial markets such as the US benefit from a financial deregulation that removes barriers to external equity financing, shedding light on the role of financial markets in fostering growth

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Table 1: Variable definitions

This table provides the definition of the key variables used. Accounting data are from Compustat.

Variable	Definition
Treated(0/1)	One for a firm with a public float of less than $75 million, otherwise zero
Post(0/1)	One for periods after the amendment of the public float requirement in 2008, otherwise zero
Investment	Ratio of capital expenditure (CAPX) to beginning of period total assets (AT)
Ln(Public Float)	Natural logarithm of public float
Firm Size	Natural logarithm of total book assets
Market-to-book	Ratio of total book assets (AT) less the book value of common equity (CEQ) plus the total market value of equity (CSHO $\times$ $PRCC_C$) all divided by the total book assets (AT)
Asset Tangibility	Ratio of gross property, plant, and equipment (PPEGT) to total book assets (AT)
R&D Expenditure	Ratio of research and development expense (XRD) to total book assets (AT)
Cash	Cash and marketable securities (CHE) scaled by total book assets (AT)
Cash Flow	Earnings after interest, dividends and taxes, but before depreciation (OIBDP) less interest (XINT), income taxes (TXT), and dividends (DVC), all divided by book assets (AT)
Book Leverage	Ratio of total book debt (DLC+DLTT) to total book assets (AT)
Dividend Paying Firms (0/1)	One in the year a firm pays dividend and zero otherwise; set to zero if missing
Firm Age	Natural Logarithm of the number of years a firm has been listed in the merged CRSP/Compustat database
Return on Assets	Ratio of earnings before interest and taxes (EBIT) to total book assets (AT)
Return on Sales	Ratio of earnings before interest and taxes (EBIT) to sales (SALE)

Table 2: Summary statistics: comparison of key characteristics

This table presents the main firm characteristics split by firm treatment status in the pre and post shelf registration rule period. All sample filters described in Section 3 are applied in this table. All continuous variables are winsorized at the 1% level. Detailed description of the variables are in Table 1.

	Pre-deregulation (2002-2008)				Post-deregulation (2008-2012)			
	Treated		Nontreated		Treated		Nontreated	
	Mean	S.D	Mean	S.D	Mean	S.D	Mean	S.D
(a) Size variables								
Ln(Public Float)	34.10	17.15	112.35	20.17	34.42	16.84	112.8	20.69
Firm Size	3.88	1.13	6.22	2.10	4.11	1.18	6.68	2.07
(b) Dependent variables								
Cash	0.26	0.29	0.25	0.29	0.27	0.3	0.24	0.27
Investment	0.045	0.07	0.06	0.08	0.041	0.07	0.06	0.08
(c) Other controls								
Asset Tangibility	0.51	0.4	0.69	0.39	0.51	0.45	0.61	0.42
Market-to-book	1.97	1.75	2.24	1.7	1.68	1.52	2.09	1.65
Cash Flow	-0.09	0.30	0.01	0.21	-0.08	0.30	0.02	0.2
Dividend Paying Firms (0/1)	0.11	0.32	0.31	0.46	0.15	0.36	0.37	0.48
Book Leverage	0.18	0.22	0.20	0.21	0.16	0.21	0.21	0.21

Table 3: Financing and cash-tangibility sensitivity

This table reports estimation results for the effect of deregulation on the sensitivity of cash to asset tangibility. The dependent variable, *Cash*, is the ratio of cash and marketable securities (CHE) to beginning period total assets (AT). *Treated(0/1)* is one for a firm with a public float of less than $75 million, otherwise zero. *Post(0/1)* is one for periods after 2008, otherwise zero. *Asset Tangibility* is the ratio of gross property, plant, and equipment (PPEGT) to total book assets (AT). Columns 1 and 2 report baseline estimation results. Columns 3 and 4 reports results using a tighter public float of $25 million to $125 million. Columns 5 and 6 reports estimation results using a shorter sample period of 2005-2012. The variable of interest *Asset Tangibility* × *Treated(0/1)* × *Post(0/1)* tests for the impact of equity issuance deregulation on cash-tangibility sensitivity. All continuous variables are winsorized at the 1% level. Standard errors clustered by firm are reported in parentheses with less than 1%, 5%, and 10% levels of statistical significance denoted by ***, **, and *, respectively.

	Dependent Variable – *Cash*					
	Baseline		Tighter Public Float		Shorter Sample Period	
	(1)	(2)	(3)	(4)	(5)	(6)
Asset Tangibility	-0.1607***	-0.1679***	-0.1722***	-0.1804***	-0.1575***	-0.1736***
	(0.0109)	(0.0118)	(0.0133)	(0.0142)	(0.0127)	(0.0143)
Asset Tangibility × *Treated(0/1)* × *Post(0/1)*		0.0367**		0.0375*		0.0431**
		(0.0177)		(0.0203)		(0.0180)
Treated(0/1)× *Post(0/1)*		0.0022		-0.0376		-0.0276
		(0.0201)		(0.0238)		(0.0211)
Treated(0/1)		-0.0050		0.0123		-0.0082
		(0.0110)		(0.0148)		(0.0157)
Ln(Public Float)	-0.0005	-0.0008	0.0283***	0.0342**	0.0208**	0.0151
	(0.0059)	(0.0078)	(0.0098)	(0.0148)	(0.0084)	(0.0109)
Firm Size	0.0107**	0.0106**	0.0030	0.0030	-0.0018	-0.0018
	(0.0049)	(0.0049)	(0.0063)	(0.0063)	(0.0072)	(0.0072)
Market-to-book	0.0242***	0.0241***	0.0330***	0.0329***	0.0282***	0.0280***
	(0.0034)	(0.0034)	(0.0041)	(0.0041)	(0.0049)	(0.0049)
Cash Flow	0.0085	0.0083	-0.0837***	-0.0829***	-0.0813***	-0.0816***
	(0.0529)	(0.0530)	(0.0222)	(0.0223)	(0.0221)	(0.0221)
Dividend Paying Firms (0/1)	-0.0081	-0.0074	-0.0283***	-0.0279***	-0.0191*	-0.0189*
	(0.0542)	(0.0543)	(0.0103)	(0.0104)	(0.0103)	(0.0103)
Book Leverage	-0.3050***	-0.3033***	-0.3428***	-0.3418***	-0.3537***	-0.3533***
	(0.0184)	(0.0184)	(0.0226)	(0.0227)	(0.0230)	(0.0231)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	7,195	7,195	4,892	4,892	4,404	4,404
R^2	0.4699	0.4703	0.4308	0.4314	0.4134	0.4143

Table 4: Placebo: lower and upper public float cutoffs

This table reports placebo estimation results for the effect of deregulation on the sensitivity of cash to asset tangibility. Column 1 represents the lower placebo of public float between $10 million to $70 million with a cutoff of $40 million. Column 2 represents the upper placebo of public float between $90 million to $150 million with a cutoff of $120 million. In Columns 1 and 2, *Treated(0/1)* is one for a firm with a public float of less than $40 million and $120 million respectively, otherwise zero. *Post(0/1)* is one for periods after 2008, otherwise zero. The dependent variable, *Cash*, is the ratio of cash and marketable securities (CHE) to beginning period total assets (AT). The variable of interest *Asset Tangibility* × *Treated(0/1)* × *Post(0/1)* tests for the impact of equity issuance deregulation on cash-tangibility sensitivity. All continuous variables are winsorized at the 1% level. Standard errors clustered by firm are reported in parentheses with less than 1%, 5%, and 10% levels of statistical significance denoted by ***, **, and *, respectively.

	Dependent Variable – *Cash*	
	(1)	(2)
	Lower Placebo	Upper Placebo
Asset Tangibility	-0.1572***	-0.1824***
	(0.0136)	(0.0224)
Asset Tangibility × *Treated(0/1)* × *Post(0/1)*	0.0274	0.0150
	(0.0226)	(0.0373)
Treated(0/1)× *Post(0/1)*	-0.0029	0.0805**
	(0.0254)	(0.0398)
Treated(0/1)	-0.0265*	-0.0200
	(0.0147)	(0.0313)
Ln(Public Float)	-0.0154	-0.0157
	(0.0130)	(0.0949)
Firm Size	0.0152**	-0.0042
	(0.0059)	(0.0101)
Market-to-book	0.0263***	0.0245***
	(0.0043)	(0.0074)
Cash Flow	0.0640	0.0633
	(0.0619)	(0.1041)
Dividend Paying Firms (0/1)	-0.0081	0.0930
	(0.0635)	(0.1022)
Book Leverage	-0.3106***	-0.3029***
	(0.0235)	(0.0338)
Year Fixed Effects	Yes	Yes
Industry Fixed Effects	Yes	Yes
Observations	3,961	3,234
R^2	0.4161	0.5551

Table 5: Information asymmetry and tech intensiveness

This table reports estimation results for the effect of deregulation on the sensitivity of cash to asset tangibility conditional upon firm opaqueness and tech intensiveness. The dependent variable, *Cash*, is the ratio of cash and marketable securities (CHE) to beginning period total assets (AT). *Treated(0/1)* is one for a firm with a public float of less than $75 million, otherwise zero. *Post(0/1)* is one for periods after 2008, otherwise zero. *Asset Tangibility* is the ratio of gross property, plant, and equipment (PPEGT) to total book assets (AT). *Firm Age* is the natural log of the number of years a firm has been listed in the Compustat. *Tech Intensiveness* is the annual gross growth in R&D expenditure. See Table 1 for all other variable definitions. All continuous variables are winsorized at the 1% level. Standard errors clustered by firm are reported in parentheses with less than 1%, 5%, and 10% levels of statistical significance denoted by ***, **, and *, respectively.

	Dependent Variable – *Cash*			
	Firm Age		Tech Intensiveness	
	Young	Old	Low Tech	High Tech
Asset Tangibility	-0.2023***	-0.1451***	-0.1429***	-0.2582***
	(0.0180)	(0.0165)	(0.0121)	(0.0210)
Asset Tangibility × *Treated(0/1)* × *Post(0/1)*	0.0938***	-0.0063	0.0215	0.0753*
	(0.0302)	(0.0260)	(0.0181)	(0.0421)
Treated(0/1)× *Post(0/1)*	-0.0589*	-0.0004	-0.0420*	-0.0090
	(0.0310)	(0.0296)	(0.0219)	(0.0341)
Treated(0/1)	0.0081	-0.0172	0.0193	-0.0252
	(0.0181)	(0.0168)	(0.0137)	(0.0200)
Ln(Public Float)	0.0186	0.0019	0.0119	0.0047
	(0.0135)	(0.0113)	(0.0094)	(0.0137)
Firm Size	0.0089	0.0007	-0.0049	0.0275***
	(0.0079)	(0.0084)	(0.0058)	(0.0081)
Market-to-book	0.0299***	0.0388***	0.0360***	0.0297***
	(0.0047)	(0.0071)	(0.0052)	(0.0046)
Cash Flow	-0.0656**	-0.0825**	-0.0333	-0.1185***
	(0.0272)	(0.0372)	(0.0228)	(0.0251)
Dividend Paying Firms (0/1)	-0.0695***	0.0015	-0.0075	-0.0588***
	(0.0172)	(0.0116)	(0.0100)	(0.0168)
Book Leverage	-0.3448***	-0.3168***	-0.2918***	-0.4030***
	(0.0271)	(0.0304)	(0.0219)	(0.0285)
Year Fixed Effects	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes
Observations	3,316	3,185	3,412	3,150
R^2	0.4139	0.3916	0.4189	0.4034

Table 6: External equity financing

This table reports estimation results for the effect of the deregulation on external equity financing. The dependent variable, external equity financing, is estimated as the ratio of the difference between the sale of common and preferred stocks (SSTK) and the purchase of common and preferred stocks (PRSTKC) to total assets (AT) at the beginning of the year. *Treated(0/1)* is one for a firm with a public float of less than $75 million, otherwise zero. *Post(0/1)* is one for periods after 2008, otherwise zero. All continuous variables are winsorized at the 1% level. Standard errors clustered by firm are reported in parentheses with less than 1%, 5%, and 10% levels of statistical significance denoted by ***, **, and *, respectively.

	Dependent Variable – External Equity Financing	
	(1)	(2)
Treated(0/1)× Post(0/1)	0.0177**	0.0197**
	(0.0021)	(0.0022)
Treated(0/1)	0.0014	0.0017
	(0.0160)	(0.0160)
Ln(Public Float)	0.0147	0.0032
	(0.0110)	(0.0111)
Firm Size	0.0136*	0.0197***
	(0.0071)	(0.0076)
Market-to-book	0.0391***	0.0363***
	(0.0065)	(0.0067)
Cash Flow	-0.3720***	-0.3071***
	(0.0327)	(0.0342)
Dividend Paying Firms (0/1)	-0.0648***	-0.0636***
	(0.0067)	(0.0067)
Book Leverage	-0.1277***	-0.1432***
	(0.0261)	(0.0275)
Year Fixed Effects	Yes	Yes
Industry Fixed Effects	No	Yes
Observations	6,799	6,799
R^2	0.2338	0.2671

Table 7: Financing and investment-tangibility sensitivity

This table reports estimation results for the effect of equity issuance deregulation on the sensitivity of investment to asset tangibility. The dependent variable, *Investment*, is defined as the ratio of capital expenditure to beginning of period total assets. *Treated(0/1)* is one for a firm with a public float of less than $75 million, otherwise zero. *Post(0/1)* is one for periods after 2008, otherwise zero. *Asset Tangibility* is the ratio of gross property, plant, and equipment (PPEGT) to total book assets (AT). In Column 1, the variable of interest, *Treated(0/1)× Post(0/1)*, tests for the effect of the deregulation on investment. Column 2 reports regression estimates of the direct effect of tangibility on investment. In Column 3, *Asset Tangibility* × *Treated(0/1)* × *Post(0/1)* tests for the impact of equity issuance deregulation on investment-tangibility sensitivity. All continuous variables are winsorized at the 1% level. Standard errors clustered by firm are reported in parentheses with less than 1%, 5%, and 10% levels of statistical significance denoted by ***, **, and *, respectively.

	Dependent Variable – *Investment*		
	(1)	(2)	(3)
Asset Tangibility		0.0396***	0.0444***
		(0.0030)	(0.0032)
Asset Tangibility × *Treated(0/1)* × *Post(0/1)*			-0.0208***
			(0.0066)
Treated(0/1)× Post(0/1)	0.0091**		0.0213***
	(0.0037)		(0.0043)
Treated(0/1)	-0.0006		-0.0004
	(0.0029)		(0.0028)
Ln(Public Float)	0.0084***	0.0084***	0.0097***
	(0.0017)	(0.0014)	(0.0017)
Firm Size	-0.0055***	-0.0046***	-0.0046***
	(0.0013)	(0.0012)	(0.0012)
Market-to-book	0.0018**	0.0022***	0.0022***
	(0.0007)	(0.0007)	(0.0007)
Cash Flow	0.0422***	0.0440***	0.0451***
	(0.0107)	(0.0108)	(0.0106)
Dividend Paying Firms (0/1)	-0.0021	-0.0085***	-0.0087***
	(0.0114)	(0.0113)	(0.0112)
Book Leverage	0.0186***	0.0091*	0.0089*
	(0.0051)	(0.0049)	(0.0048)
Year Fixed Effects	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes
Observations	7,195	7,195	7,195
R^2	0.2605	0.2922	0.2954

Table 8: Financing and investment efficiency

This table reports estimation results for the effect of equity issuance deregulation on investment efficiency. The dependent variable in all columns is investment efficiency. The level of investment from the investment model of Eq.(3) are based on sales growth in Column 1, Tobin's Q in Column 2, and both sales growth and Tobin's Q in Column 3. *Treated(0/1)* is one for a firm with a public float of less than $75 million, otherwise zero. *Post(0/1)* is one for periods after 2008, otherwise zero. All continuous variables are winsorized at the 1% level. Standard errors clustered by firm are reported in parentheses with less than 1%, 5%, and 10% levels of statistical significance denoted by ***, **, and *, respectively.

	Dependent Variable – Investment Efficiency		
	SalesGrowth	*Tobin's Q*	*SalesGrowth* and *Tobin's Q*
Treated(0/1)× Post(0/1)	0.0187**	0.0210***	0.0230***
	(0.0077)	(0.0074)	(0.0074)
Treated(0/1)	-0.0114**	-0.0099	-0.0075
	(0.0054)	(0.0051)	(0.0051)
Ln(Public Float)	-0.0046	-0.0085**	-0.0085**
	(0.0038)	(0.0037)	(0.0037)
Firm Size	0.0037	0.0077***	0.0077***
	(0.0024)	(0.0023)	(0.0023)
Market-to-book	-0.0058***	0.0011	0.0011
	(0.0019)	(0.0017)	(0.0017)
Cash Flow	0.1504***	0.1385***	0.1385***
	(0.0112)	(0.0115)	(0.0115)
Dividend Paying Firms (0/1)	-0.0020	-0.0019	-0.0019
	(0.0037)	(0.0035)	(0.0035)
Book Leverage	-0.0004	0.0041	0.0041
	(0.0120)	(0.0106)	(0.0106)
Year Fixed Effects	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes
Observations	6,866	6,866	6,866
R^2	0.3712	0.3291	0.329

Table 9: Financing and firm performance

This table reports estimation results for the effect of the deregulation on firm performance. The dependent variables are firm performance measures. In Column 1, firm performance is measured by *Return on Assets*. In Column 2, firm performance is measured by *Return on Sales*. *Treated(0/1)* is one for a firm with a public float of less than $75 million, otherwise zero. *Post(0/1)* is one for periods after 2008, otherwise zero. All continuous variables are winsorized at the 1% level. Standard errors clustered by firm are reported in parentheses with less than 1%, 5%, and 10% levels of statistical significance denoted by ***, **, and *, respectively.

	Dependent Variable – Firm Performance	
	Return on Assets	*Return on Sales*
	(1)	(2)
Treated(0/1)× Post(0/1)	0.0105**	0.0053**
	(0.0049)	(0.0016)
Treated(0/1)	-0.0026	-0.0008
	(0.0032)	(0.0026)
Ln(Public Float)	-0.0001	0.0009
	(0.0023)	(0.0018)
Firm Size	0.0022	-0.0022**
	(0.0015)	(0.0011)
Market-to-book	0.0012	0.0012
	(0.0010)	(0.0008)
Cash Flow	0.9866***	0.9647***
	(0.0086)	(0.0077)
Dividend Paying Firms (0/1)	0.0643***	0.0616***
	(0.0051)	(0.0046)
Book Leverage	0.0455***	0.0706***
	(0.0065)	(0.0049)
Year Fixed Effects	Yes	Yes
Industry Fixed Effects	Yes	Yes
Observations	7,195	7,195
R^2	0.4901	0.5994

Table 10: Financing and asset growth

This table reports estimation results for the effect of the stock issuance deregulation on asset growth. The dependent variable in Column 1 is total fixed asset growth, net fixed asset growth in Column 2 and R&D growth in Column 3. *Treated(0/1)* is one for a firm with a public float of less than $75 million, otherwise zero. *Post(0/1)* is one for periods after 2008, otherwise zero. All continuous variables are winsorized at the 1% level. Standard errors clustered by firm are reported in parentheses with less than 1%, 5%, and 10% levels of statistical significance denoted by ***, **, and *, respectively.

	Fixed Assets Growth	Net Fixed Assets Growth	R&D Growth
	(1)	(2)	(3)
Treated(0/1)× Post(0/1)	0.0172***	0.0140***	0.0083**
	(0.0064)	(0.0052)	(0.0018)
Treated(0/1)	0.0048	0.0046	0.0022
	(0.0049)	(0.0037)	(0.0081)
Ln(Public Float)	0.0061*	0.0042*	0.0028
	(0.0033)	(0.0024)	(0.0048)
Firm Size	0.0047**	0.0042**	0.0085*
	(0.0023)	(0.0018)	(0.0051)
Market-to-book	0.0028**	0.0024***	0.0069***
	(0.0012)	(0.0009)	(0.0021)
Cash Flow	0.0614***	0.0294*	-0.0063
	(0.0227)	(0.0166)	(0.0089)
Dividend Paying Firms (0/1)	0.0029	0.0048	-0.0046
	(0.0230)	(0.0165)	(0.0055)
Book Leverage	0.0171*	0.0043	-0.0265**
	(0.0090)	(0.0071)	(0.0124)
Year Fixed Effects	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes
Observations	7,185	7,185	7,185
R^2	0.2616	0.2463	0.213

Table 11: Robustness check: the instrumental variables 2SLS regressions

In this table, we re-estimate the sensitivity of cash to asset tangibility with the instrumental variable 2SLS method. Our instrumental variables are *IndustryResale* and *IndustryLabor*. In an industry for a given year, *IndustryResale* is calculated as the ratio of the median of firm-level sales of PP&E (SPPE) to that of total PP&E (PPEGT) and capital expenditures (CAPX). *IndustryLabor* is measured as the industry-year median ratio of the number of employees scaled by total assets. In Column 1, we provide estimation results of the first-stage of the 2SLS regression. In Column 2, we provide estimation results of the second-stage of the 2SLS regression. All continuous variables are winsorized at the 1% level. Standard errors clustered by firm are reported in parentheses with less than 1%, 5%, and 10% levels of statistical significance denoted by ***, **, and *, respectively.

	First Stage 2sls	second stage 2sls
	tan	cash
	(1)	(2)
IndustryResale	71.9102***	
	(11.9028)	
IndustryLabor	13.7998***	
	(1.9047)	
Asset Tangibility		-0.4122***
		(0.055)
Ln(Public Float)	-0.0192*	0.0259***
	(0.0106)	(0.0069)
Firm Size	0.0234**	-0.0084
	(0.0092)	(0.0058)
Market-to-book	-0.0089**	0.0372***
	(0.0044)	(0.0036)
Cash Flow	0.1095***	-0.1334***
	(0.3002)	(0.02)
Dividend Paying Firms (0/1)	0.1666***	-0.0101
	(0.0252)	(0.0155)
Book Leverage	0.4087***	-0.2449***
	(0.0399)	(0.0345)
First-stage F test statistics	47.67	
Over-identification p-vlaue		0.6355
Year Fixed Effects	Yes	Yes
Industry Fixed Effects	Yes	Yes
Observations	7,195	7,195
R^2	0.1448	0.2236

Table 12: Robustness check: financing and investment efficiency

This table presents the results of robustness test in which we apply the methodology proposed by Chen, Hribar, and Melessa (2018) to deal with the potential bias in the two-stage estimation of investment efficiency. Specifically, we include all the covariates from the first-stage estimation of the investment model in Eq.(3) in our second-stage investment efficiency estimation. The level of investment from the investment model of Eq.(3) are based on sales growth in Column 1, Tobin's Q in Column 2, and both sales growth and Tobin's Q in Column 3. *Treated(0/1)* is one for a firm with a public float of less than $75 million, otherwise zero. *Post(0/1)* is one for periods after 2008, otherwise zero. All continuous variables are winsorized at the 1% level. Standard errors clustered by firm are reported in parentheses with less than 1%, 5%, and 10% levels of statistical significance denoted by ***, **, and *, respectively.

	Dependent Variable – Investment Efficiency		
	SalesGrowth	*Tobin's Q*	*SalesGrowth* and *Tobin's Q*
Treated(0/1)× Post(0/1)	0.0185**	0.0204***	0.0210***
	(0.0076)	(0.0076)	(0.0074)
Treated(0/1)	-0.0114**	-0.0098*	-0.0078
	(0.0054)	(0.0053)	(0.0052)
Ln(Public Float)	-0.0105***	-0.0099***	-0.0081**
	(0.0038)	(0.0038)	(0.0037)
Firm Size	0.0097***	0.0084***	0.0076***
	(0.0023)	(0.0024)	(0.0024)
Cash Flow	0.1562***	0.1464***	0.1392***
	(0.0115)	(0.0115)	(0.0116)
Dividend Paying Firms (0/1)	-0.0029	-0.0029	-0.0026
	(0.0036)	(0.0037)	(0.0035)
Book Leverage	-0.0098	0.0049	0.0039
	(0.0119)	(0.0103)	(0.0107)
SalesGrowth	-0.0044		-0.0091***
	(0.0032)		(0.0033)
Tobin's Q		0.0014	0.0015
		(0.0017)	(0.0017)
Year Fixed Effects	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes
Observations	6,866	6,866	6,866
R^2	0.3683	0.3384	0.3318

Table 13: Robustness: Entropy balancing approach

This table reports estimation results for the effect of equity issuance deregulation on the sensitivities of cash and investment to asset tangibility using the entropy balanced sample. We match firms on three moments (i.e., mean, variance, and skewness) of all the control variables used in the baseline regression. The dependent variable in Columns 1 and 2 is *Cash*. In Columns 3 and 4, the dependent variable is *Investment*. *Treated(0/1)* is one for a firm with a public float of less than $75 million, otherwise zero. *Post(0/1)* is one for periods after 2008, otherwise zero. All continuous variables are winsorized at the 1% level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

	(1)	(2)	(3)	(4)
	Cash		Investment	
Asset Tangibility	-0.1551***	-0.1611***	0.0382***	0.0434***
	(0.0076)	(0.0087)	(0.0026)	(0.0029)
Asset Tangibility × *Treated(0/1)* × *Post(0/1)*		0.0218***		-0.0190***
		(0.0065)		(0.0055)
Treated(0/1)× *Post(0/1)*		-0.0274		0.0185***
		(0.0192)		(0.0039)
Treated(0/1)		0.0027		-0.0022
		(0.0112)		(0.0027)
Ln(Public Float)	0.0104*	0.0096	0.0086***	0.0088***
	(0.0055)	(0.0069)	(0.0012)	(0.0016)
Firm Size	0.0122***	0.0122***	-0.0033***	-0.0032***
	(0.0044)	(0.0044)	(0.0011)	(0.0011)
Market-to-book	0.0327***	0.0326***	0.0020***	0.0021***
	(0.0033)	(0.0033)	(0.0006)	(0.0006)
Cash Flow	-0.0778***	-0.0776***	0.0267***	0.0266***
	(0.0149)	(0.0149)	(0.0035)	(0.0035)
Dividend Paying Firms (0/1)	-0.0233***	-0.0231***	-0.0074***	-0.0076***
	(0.0114)	(0.0064)	(0.0020)	(0.0020)
Book Leverage	-0.3507***	-0.3499***	0.0102**	0.0095**
	(0.0164)	(0.0164)	(0.0048)	(0.0048)
Year Fixed Effects	Yes	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes	Yes
Observations	7,195	7,195	7,195	7195
R^2	0.3850	0.3852	0.2874	0.2900

Table 14: Robustness check: financing and investment-tangibility sensitivity

In this table, we re-estimate the effect of financing on the investment-tangibility sensitivity. The dependent variable, *Investment*, is re-defined to capture both capital expenditure and R&D and is measured as the ratio of capital expenditure and R&D to beginning of period total assets. *Treated(0/1)* is one for a firm with a public float of less than $75 million, otherwise zero. *Post(0/1)* is one for periods after 2008, otherwise zero. *Asset Tangibility* is the ratio of gross property, plant, and equipment (PPEGT) to total book assets (AT). In Column 1, the variable of interest, *Treated(0/1)× Post(0/1)*, tests for the effect of the deregulation on investment. Column 2 reports regression estimates of the direct effect of tangibility on investment. In Column 3, *Asset Tangibility × Treated(0/1) × Post(0/1)* tests for the impact of equity issuance deregulation on investment-tangibility sensitivity. All continuous variables are winsorized at the 1% level. Standard errors clustered by firm are reported in parentheses with less than 1%, 5%, and 10% levels of statistical significance denoted by ***, **, and *, respectively.

	Dependent Variable – *Investment*		
	(1)	(2)	(3)
Asset Tangibility		0.0664***	0.0731***
		(0.0059)	(0.0066)
Asset Tangibility × Treated(0/1) × Post(0/1)			-0.0302***
			(0.0092)
Treated(0/1)× Post(0/1)	0.0085***		0.0096
	(0.0017)		(0.0080)
Treated(0/1)	0.0044		0.0044
	(0.0050)		(0.0049)
Ln(Public Float)	0.0225***	0.0227***	0.0242***
	(0.0035)	(0.0026)	(0.0034)
Firm Size	-0.0122***	-0.0103***	-0.0102***
	(0.0022)	(0.0021)	(0.0021)
Market-to-book	0.0079***	0.0085***	0.0085***
	(0.0016)	(0.0015)	(0.0015)
Cash Flow	-0.2486***	-0.2500***	-0.2502***
	(0.0110)	(0.0108)	(0.0108)
Dividend Paying Firms (0/1)	-0.0153***	-0.0254***	-0.0258***
	(0.0040)	(0.0038)	(0.0038)
Book Leverage	-0.0147	-0.0324***	-0.0336***
	(0.0093)	(0.0090)	(0.0090)
Year Fixed Effects	Yes	Yes	Yes
Industry Fixed Effects	Yes	Yes	Yes
Observations	7,195	7,195	7,195
R^2	0.5610	0.5798	0.5810