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The impact of corporate social responsibility on financial constraints: Does the life cycle stage of a firm matter?

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Abstract

Based on a sample of China's Shanghai and Shenzhen A-share public firms during 2010-2016, we examine the role of a firm's life cycle stage on the relationship between corporate social responsibility (CSR) and financial constraints. After classifying firms into the initial, growth, mature, and declining stages of the life cycle, we find that for firms in the growth, mature, and declining phases of the life cycle the CSR engagement is negatively correlated with financial constraints. However, the effect of CSR relieving financial constraints is not related to firms in the initial stage of the life cycle. The results suggest that firms are not homogeneously related to the impact of CSR on financial constraints. Hence, investors can identify the firm's life cycle and take it into consideration when making decisions to minimize their investment risk. Our findings are robust using various CSR and financial constraint measurements. This study can also help regulators make more reasonable and reliable social responsibility disclosure policies appropriate for firms in different life cycle stages.

Key words: Corporate Social Responsibility; Information Disclosure; Financial Constraints; Life Cycle
JEL: G18, G32, G38

The Impact of Corporate Social Responsibility on Financial Constraints: Does the Life Cycle Stage of a Firm Matter?

1. Introduction

With rapid economic development, there is an increasing awareness of social and environmental problems. Ho & Williams (2003) believe that the effectiveness of capital markets depends on how information is shared among the participants. Better management of the relationships with stakeholders is an effective way for a firm to improve operation efficiency. According to Rankings (RKS), a private company specializing in tracking the corporate social responsibility (CSR) reports of Chinese listed firms, an increasing number of firms have joined the ranks of disclosing a social responsibility report since 2006, after the first official regulation "Chinese Listed Company Social Responsibility Guidelines" was released. Although many firms respond actively, CSR-disclosing firms represent only a small fraction of the population of publicly listed Chinese firms. Disclosure of a social responsibility report is still a relatively casual and spontaneous behavior in China.

In an emerging market, due to information asymmetry and agency problems, the cost of external financing is generally higher than that of internal sources, thus resulting in firms facing binding financial constraints. Most of the prior studies conclude that CSR disclosure can ease the financial constraints (e.g., El Ghoul et al., 2011). These studies implicitly assume that firms are homogeneous in terms of their stage within the industry life cycle. Considering the dynamic development and heterogeneity of firms, most prior literature ignore an important fact that firms reasonably have a capability boundary to undertake CSR. Firms be in a certain life cycle phase could exhibit unique CSR capability and objective. We find that as firms progress from the initial

phase to the growth phase, and further to the mature phase, the mean CSR score increases, whereas there is a sharp reduction in the declining stage (as shown in Figure 1). Thus, firms are not homogeneous in the context of their respective positions in the life cycle. However, few studies consider the impact of life cycle when they investigate the economic effect of firms' social responsibility.

We argue that firms' life cycle could moderate the relationship between CSR and financial constraints, mainly for the following three reasons. First, CSR disclosure could reduce information asymmetry (e.g., El Ghoul et al., 2011), and limit the likelihood of manager's short-term opportunistic behavior and ease agency conflict, so that it could reduce the firm's financing costs. However, firms will experience different degree of information asymmetry and agency conflicts in different life cycle stages. Second, firms' excellent CSR performance could help them establish a good corporate image and enhance corporate reputation (Fombrun and Shanley, 1990), which could further improve the relationship between the firm and the banks and regulators (Lin et al., 2015). Thus, the firm could get fund more easily or finance with a lower cost (Goss and Roberts, 2011). However, reputation has not always been the main factor influencing bank lending. When companies first set up, banks pay more attention to their core business as well as product quality and whether they have stable sources of sales orders. Therefore, for firms in different life cycle phases, there are distinctions for the effect that CSR ease financing constraints through establishing a good reputation to improve the relationship with government and banks. Third, according to stakeholder theory, firms that participant in CSR activities can better align management with shareholder interests, obtain trust and cooperation

from the stakeholders (Jones, 1995), leading to lower financial constraints. However, stakeholders have different CSR expectations for firms in various life cycle stages. Stakeholders are rational and the anticipation for firms' CSR engagement need to be built upon the premise of firms' continuous operation and it also should be moderate. Thus, firms' life cycle could moderate the relationship between CSR and the financial constraints.

In addition to the moderating role of life cycle stage, we build our research upon the Chinese capital market. China is an important counterexample to the findings in the law, institutions, finance, and growth literature; as depicted by Allen, Qian, & Qian (2005), "Neither its legal nor financial system is well developed, yet it has one of the fastest growing economies." The importance and necessity of non-financial information disclosure is reflected more obviously in emerging markets such as China. Moreover, a stream of related research documents demonstrate that financial constraints due to costly external financing are more pronounced in underdeveloped financial markets (Khurana, Martin, & Pereira, 2006). Because the financing problem has been a primary issue in the development of firm for a long time, our findings can provide empirical evidence for the specific effect of CSR disclosure on financing and shed light on the influence of the life cycle stage of a firm on the relationship between CSR and financial constraints.

Our analysis include on all firms publicly listed in the Chinese Shanghai Stock Exchange (SSE) and Shenzhen Stock Exchange (SZSE). Based on firm-year level data over the period 2010-2016, we find that for firms in the growth, mature and declining stages of the life cycle, the higher the CSR engagement, the lower the financial constraints they face. However, for firms in

the initial stage, the impact of CSR on financial constraints is insignificant. Our findings are robust using alternative measures of CSR and financial constraints. Additionally, by using the cross-lagged model to address reverse causality, we find that CSR relieving financial constraints still hold true, but only in our growth, mature, and declining stage samples.

Our findings advance the literature in several ways. First, prior literature about the economic consequences of CSR mainly takes the perspective of the cost of capital and analyst forecasts (Dhaliwal et al., 2011). In our research, we combine the firm life cycle theory with our research conducted with a unique perspective: the effect of CSR on financial constraints. Second, we document that firms are not necessarily homogeneous in terms of the life cycle theory. After partitioning all of the firm-year observations into initial, growth, mature, and declining phases, we find that the effect of CSR engagement on relieving financial constraints depends largely on the life cycle stages. Third, much of the prior literature investigates mature capital markets, whereas the Chinese state-dominated financial system performs very differently. Due to the local government interference and misallocation of capital (Boyreau-Debray & Wei, 2005), corporate financing is influenced by many factors, such as the position of the firm in the life cycle. This research is carried out based on Chinese capital market, which increases the novelty to a great extent.

2. Literature Review

2.1 Motivation of firms' CSR

It is widely believed that CSR disclosure is a form of ethical practice by a firm. Prior research on CSR provides a theoretical background of integrating the ethical expectations of a

business into a rational economic and legal framework (Kim, Park, & Wier, 2012). Managers driven by ethical concerns produce high-quality financial reports; hence, CSR firms are less likely to engage in aggressive earnings management, which shows the governance effect of CSR.

The economic motivation of CSR believes that firms' social responsible activities could help firm establish an affirmative image and enhance corporate reputation (Fombrun and Shanley, 1990), as well as reducing information asymmetry and relieving financing cost (El Ghoul et al., 2011). From this point of view, a body of literature find that better corporate social performance could lead to enhanced investment efficiency and superior financial performance (McWilliams and Siegel, 2001). Besides, better CSR performance could also promote the relationship between the firm and the government (Parish, 2006). Political connection, as an important source of social capital, could further help the firm easily get access to the government resource, such as state-owned bank loans (Su and He, 2010). Thus, many firms fulfill social responsibility for the sake of better reputation and lower financing cost, which may directly increase firm value in the long run.

However, the belief that CSR plays as positive a role is not always true. Firms' social responsible activities may be due to strategic motivation. CSR has experienced a conceptual shift through the past 80 years (Lee, 2008). On the one hand, from the view of agency theory, firms may undertake CSR due to the manager's individual private benefit (such as personal prestige, power, status or rewards) at the cost of shareholder wealth (Friedman, 1970), which diversifying investments and leading to short-termism and the herd effect. This misallocation of resources destroys shareholder value and weakens the competitiveness of the firm. On the other hand,

managers may manipulate CSR information intentionally to whitewash their immoral behavior in order to portray a good reputation (Hou et al., 2018), misleading the evaluation and supervision of stakeholders, and reduce the negative influence of immoral behavior such as earnings management. El Ghoul et al. (2011) report that firms in the tobacco and nuclear power industries widely engage in CSR activities. Du (2015) find that firms' act philanthropically to divert public attention from their environmentally unfriendly behavior. As a result, CSR disclosure is just a shelter that interferes with the judgment of the information users, leading to greater risk to the firm. Overall, it is not clear whether CSR has a positive impact on a firm.

2.2 The relationship between CSR and FC

Prior research on the relationship between CSR and financial constraints mostly conclude that CSR significantly relieves firms' financial constraints(Dhaliwal et al., 2011; El Ghoul et al., 2011; Chan, Chou, & Lo, 2017). For example, Goss and Roberts (2011) find that companies perform better social responsibility can achieve lower bank call rate and longer loan term. Chan et al. (2017) using the KZ index and Altman's Z-score as the measurement of FC, and conclude that firm's engagement in CSR is negatively linked with financial constraint.

However, there is also a contradictory view. Disclosure of social responsibility may place the firm at a competitive disadvantage in the economic competition. Since the engagement of social responsible activities, such as charitable donations and sewage control, may cost a huge amount of cash assets, which occupy the resources that could have been allocated to other investment projects. So that the engagement of CSR will lead to the damage of firm value (Friedman, 1970). The investors may also ask for additional risk premium, which further

increase the cost of equity capital. Besides, Anderson and Frankle (1980) find that excessively disclosure of social information could also have a certain negative impact on the whole capital market.

Above mixed findings arise our thinking that what factors led to the different research results. Prior studies find that some key issues could moderate the relationship between CSR and financing costs, such as ownership structure, geographic CSR engagement (Husted et al., 2016). We argue that except for external institutional environment, firm-level heterogeneity could also influence the relationship between CSR and FC.

2.3 The role of firms' life cycle

According to the life cycle theory (Adizes, 2004), problems faced by firms will mostly be influenced by different stages in the life cycle to which the firm belongs. Recent empirical studies in accounting and finance have investigated the impact of the firm life cycle on corporate investment, financing, dividend decisions (Berger and Udell, 1998; Hasan & Habib, 2017), as well as firms' financial performance (Irvine, Park, & Yildizhan, 2015). Firms are more likely to undertake relatively larger, growth-oriented investments in the initial stage while in the mature stage their investments are more likely to be geared toward the maintenance of assets in place (Richardson, 2006). Regarding to financing sources, small and young firms generally resort to private equity and debt markets, whereas large and mature firms mainly rely on public markets (Berger & Udell, 1998). Firms' financial structure changes over their life cycle. Besides, Dutta & Nezlobin (2017) conclude that the growth trajectory of a firm plays an important role in determining the equilibrium between information disclosure and risk.

The financial effect of firms' CSR is a dynamic process. The firms show various understanding and capability of social responsibility in different life cycle phases. Thus, firms' CSR practice needs to be adapted to its overall corporate strategy in each specific lifecycle stage. Therefore, the financial effect of CSR reveals dynamic characteristics, and we believe that firms' life cycle is an unnoticed factor that affect the relationship between CSR and FC.

3. Theory and Hypotheses

3.1 Theoretical analysis

Prior studies investigate the relationship between CSR and FC mostly elaborate from the stakeholder theory. It is generally recognized that external stakeholders, such as customers, government, and investors tend to respond favorably to firms' CSR activities, leading to firms to get external financing much more easily. However, the endogenous factors, such as firms' life cycle, could also affect the mechanism that how CSR affect financial constraints. In a parallel body of literature, the life cycle of a firm makes a difference in various corporate financial policies (Anthony & Ramesh, 1992; Arikan & Stulz, 2016). Therefore, based on institutional theory, absorptive capacity theory, resource slack theory, stakeholder theory, and information asymmetry theory, we argue that the financial effect of CSR varies in the process of firms' dynamic evolution.

The unique Chinese institutional environment influences the strategy choices of Chinese firms. Chinese traditional culture advocates virtue and morality, which is reflected as CSR. Firms' CSR behavior will be greatly influenced by institutional culture. Firms with better CSR performance are considered as just, and will attract more attention from the public. Investors are

also attracted to invest in these kind of firms. Thus, in the context of Chinese specific institutional background, the meaning of CSR is distinct. Both firms and their stakeholders focus more on CSR. Besides, Chinese government is playing an essential role in capital market. Since the government and state-owned banks consist one of the main external sources of firms' funding, maintaining the close relationship with government will show numerous advantages in firms' long-term development.

Absorptive capacity theory and resource slack theory suggest that a firm's financial activities, such as CSR investment, depends largely on firms' absorptive capacity and resource slack level. The absorptive capacity refers to a firm's ability to recognize the value of new information, assimilate it, and apply it to commercial ends, while the resource slack level represents the degree of scarcity of firms' resources. The degree of a firm benefit from CSR investment is constrained by its absorptive capacity and complementary resources (Zahra and George, 2002). However, firms' absorptive capacity and resource abundant level showing differences in firms' dynamic evolutionary process. The ability of firms to obtain resources and the resource richness of firm enhances along with the growth of firms, as well as the gradually established social and political contact. Besides, stakeholder theory suggest that the firm should attach enough importance to diverse stakeholders, and taking their requirement into consideration when making business decisions. However, stakeholders will also have various CSR objectives towards firms' dynamic evolution. A firm's CSR strategy should be in accordance with its growth phases. Therefore, firms show various CSR capabilities and objectives in their process of growth.

Corporate social responsibility exert its financial effect mainly through the following two mechanisms. One important way is to alleviate the information asymmetry and agency problems of the firm. Information asymmetry in capital markets is the main factor leading to credit mismatch (Jaffee & Russell, 1976). Most determinants of firms' financial constraints have their roots on information asymmetry (Giombini Teobaldelli, & Schneider, 2018). The financial and non-financial information released by firms is an effective way to reduce information asymmetry, which also helps outsiders better judge the firm’s risk, sustainability, and future profitability. CSR disclosure can be considered as a corporate strategy that plays the role of a signal (Shapira, 2012). Turban and Greening (1997) find that better CSR firms could deliver signals to the potential candidates, in order to attract and retain outstanding employees, and further enhance the company's competitive advantage. Another mechanism is that superior CSR practice can help firms to create an affirmative social image by enhancing corporate reputation and alleviating the impact of negative news, thus reducing business risk (Husted, 2005) and making the firm better prepared to cope with a crisis (Lins, Servaes, & Tamayo, 2017). A good reputation helps firms attract investment, lower financial costs, and further improve the long-term financial performance.

In summary, firms’ CSR capability and goals, as well as stakeholders’ CSR expectations, differ greatly among the life cycle phases of their growth trajectory. In the meantime, the implementation mechanism of CSR’s financial effect will also be influenced by firms’ dynamic evolution process. Therefore, we argue that the economic consequences of corporate social responsibility changes with the growth of firms.

3.2 Hypotheses development

Firms in various life cycle stages have different cognition of social responsibility, and will also adopt different CSR strategies. Prior literature find that there are mainly three ways that CSR could relieve firms' financial constraints, however we suggest that the relieving effect will not be significant among initial firms. The detailed reasons are as follows.

First of all, firms in the initial stage often lack sufficient funding, thus mainly depends on internal financing, private investment and venture capital (Adizes, 2004). Survival is their primary goal, and the management should not place much emphasis on CSR investment. The stakeholders' expectation on initial firms' CSR will also be extinct. Firms in this first stage fulfilling too much CSR will increase their capital burden because the reward of CSR will not be seen in the short term. It is also a burden on the firm's cash holdings and operation. Thus, blindly engage into CSR investment is misplacing the firms' focus and will lead to the damage to firms' long-term financial performance.

Second, CSR disclosure could relieve information asymmetry, and reduce the likelihood of manager's opportunism and ease agency conflicts. So that the positive effect of CSR disclosure is reflected in lower financing costs, and weaker financial constraints. However, the degree of information asymmetry and agency conflicts showing differences among various life cycle stages. Miller and Friesen (1984) proposed that initial firms have a simple informal structure, often controlled by the owner, and they experience rare agency problems. Based on this situation, the governance effect of CSR will not be fully shown among initial firms.

Third, another mechanism for CSR to exert positive financial effect is through the

establishment of firm's reputation. An affirmative corporate social image and reputation could improve the relationship between the firm and the government and banks (Lin et al., 2015), especially state-owned banks, so that firms could get fund more easily or finance with a lower cost (Goss and Roberts, 2011). However, reputation has not always been the main factor influencing bank lending, the state of firms' life cycle is also a key issue. When firms first set up, banks pay more attention to their core business, as well as product quality and whether have stable sources of sales orders. Therefore, initial firms will get little financing benefit from the good reputation and closely relationship with government or banks resulted from firms' excellent CSR performance.

Besides, given the various capital market impediments in China, the data from Chinese capital market reveals that firms in the initial phase of the life cycle usually undertake little CSR and at the same time face relatively severe financial constraints. Hence, on whether disclosing a CSR report contributes to financial constraints, our first testable hypothesis is as follows:

H1: In the initial stage of the life cycle, firms fulfilling CSR have little influence on financial constraints.

Firms in the growth stage of the life cycle have already passed through the tough start-up phase and are developing into a relatively stable business mode, but they still need to seek greater innovation. On one hand, both the capability and goals of firms' CSR and the stakeholders' expectation are changed accordingly. Since growth firms already have abundant cash assets that could be invested in CSR projects, and also have the ability to better allocate resources, firms should set up CSR strategies in accordance with their financial strategies. Better

CSR performance could help firms attract more investment from stakeholders, thus relieving financial constraints.

On the other hand, in the second stage, the firm's management is standardized gradually, and the firm has a greater desire for business expansion and financing demand. At the same time, there will be agency problems. CSR could ease agency conflicts through the enhanced information transparency and the less likelihood of manager's opportunism, thus the governance effect of CSR on agency problem is fully manifested in the growing stage.

Besides, firms in this phase fulfill CSR mainly to comply with the rules and regulations, while some others that are not mandated to disclose CSR reports do so mainly for the purpose of constructing a good reputation. The role of reputation is to provide a type of implicit incentive for participants who care for the long-term profit in order to ensure their commitment. Reputation, therefore, can be a substitute for explicit contracts (Kreps & Wilson, 1982). In conclusion, growing firms actively undertake CSR, which is conducive to improving reputations and acquiring more external financing, hence lowering the degree of financial constraints. This leads to our second hypothesis:

H2: In the growth stage of the life cycle, CSR firms have lower financial constraints.

Firms in the mature stage of the life cycle have already well-developed. Their establishment in the market suggests that seeking financing is no longer a problem. On one hand, firms in this stage have already achieved the financial basis to fulfill CSR, and they actively participate in CSR activities. According to stakeholder theory, by improving working conditions, increasing wages, and increasing job security, firms can obtain, retain, and motivate talented staff,

especially senior managers. This can also fully inspire their enthusiasm in their work and enhance efficiency and the improvement of management.

On the other hand, mature firms though well-developed, they still face severe agency problems. By actively engage into CSR activities, firms in the mature phase could enhance information transparency, reduce the possibility of management opportunistic behavior to obtain self-interest, thus alleviate the agency conflicts. The governance effect of CSR is fully reflected in mature firms.

Besides, mature firms set up a good corporate image and competitive advantages in the marketplace through various social responsible cognitions, such as paying more attention to fair prices, higher quality products, services, and product safety. Thus, because of the superior CSR performance, they also improve the relationship with the government and banks. Thus, the firm can obtain external sources of finance at a lower cost (Dhaliwal et al., 2011; El Ghoul et al., 2011).This leads to our third hypothesis:

H3: In the mature stage of the life cycle, CSR firms incur lower financial constraints.

In the declining stage, due to severe competition, the market demand is gradually shrinking, and the sales growth is small or even negative. Firms should pay more attention to its survival in the long term. Since Chinese capital market has the protection mechanism for investors, namely the Special Treatment (ST) Mechanism[1], firms in very bad situations have already exited the market or delisted from the exchanges, the declining firms are more likely in

[1] To guarantee the profits of the investors, China's Shanghai and Shenzhen Stock Exchanges have a safety-security mechanism such that firms that are in financial distress are treated specially (the daily rise and drop of each ST stock should be below 5%). This is indicated by adding an ST sign before the stock code. Discussion of the ST samples is beyond the scope of this paper.

their early declining stage. Hence, these firms do not deteriorate badly. In this stage, firms actively undertake CSR to leverage reputational capital to hope for weathering potential future poor performance. Therefore, firms continue to have incentives to engage in CSR. The importance of firms acquiring reputation capital through social responsibility is particularly important for declining firms. This reputation capital allows the firm to face less stringent financial constraints. Our fourth testable hypothesis is:

H4: In the declining stage of life cycle, CSR firms have lower financial constraints.

4. Data and research methods

4.1 Data

We obtain our CSR data from the Hexun website (www.hexun.com), the first vertical financial portal website in China. Hexun is a subsidiary organization of Lianban, the former China Securities Market Research and Design Center. Hexun's CSR evaluation system based on firms' CSR report and annual financial report, conducting a comprehensive rating towards firms' responsibility to shareholders, employees, suppliers, customers and consumer rights, environmental and social responsibility. It is one of the major measurement for Chinese listed company's social responsibility.

The financial data of Chinese firms listed in the Shanghai and Shenzhen Stock Exchanges are obtained from China Stock Market and Accounting Research (CSMAR) from 2010-2016. Our sample period begins in 2010 because China's capital market began to attach great importance to the fulfillment of CSR since 2008, the CSRC (China Securities Regulatory Commission) request part of listed companies mandatorily disclosure of social responsibility

information. However, there are seldom voluntary disclosure of CSR report in 2009, the first year after the rule released. From 2010 on, social responsibility disclosure of Chinese listed companies starting to be normalize. Besides, we exclude the firms in financial industries and special treatment (ST) firms, and finally get 11865 unbalanced firm-year observations from 2155 firms in 7 years, for which the number of observations in each life cycle stage is 1739, 3783, 4215, and 2128, respectively. All of the continuous variables are winsorized at the 1% and 99% levels.

4.2 Research methods

4.2.1 Based model

We use pooled cross-sectional data to examine the four hypotheses by using the following logit model:

$$FC_{i,t} = \alpha_0 + \alpha_1 CSR_{i,t} + \sum \beta_j \, CONTROL_{i,t} + Year\ effect + Industry\ effect + \in_{i,t} \quad (1)$$

where *CSR* is the reported corporate social responsibility score and *FC* is the financial constraint of a firm. By following the model proposed by Whited & Wu (2006), we calculated *WW* as follows:

$$WW_{i,t} = -0.091 * CASHFLOW_{i,t} - 0.062 * DIVPOS_{i,t} + 0.021 * TLTD_{i,t} - 0.044 * SIZE_{i,t} + 0.102 * ISG_{i,t} - 0.035 * SG_{i,t} \quad (2)$$

where *CASHFLOW* is the net cash flow from operations; *DIVPOS* is a dummy variable equaling 1 if firm *i* pays out a cash dividend in year *t* and 0 otherwise; *TLTD* is the ratio of long-term debt to the book value of the total assets; *SIZE* is the natural log of the total assets; *ISG* is the average industry sales growth calculated based on two-digit industry codes, and *SG* is the firms' sales

growth. We calculate the WW value for each firm-year observation. In each fiscal year, we rank firms according to the WW index. Firms in the top quartile of the annual distribution of the WW score are considered financially constrained firms, and we assigned the financial constraint (*FC*) variable to 1 and otherwise zero. Several studies, such as Bao, Chan, & Zhang (2012), use a similar approach of using the WW index to capture the impact of financial constraints.

For the control variables in Eq. (1), we include state-ownership status (*STATE*), firm size (*SIZE*), investment opportunity (*TOBINQ*), leverage (*LEV*), dividends payout ratio (*PAYOUT*), change of dividend (*DIVPSCHG*), sustainable growth rate (*SUSTRT*), and increase in current liabilities (*STD*). The full definitions are presented in Appendix 1. We also account for industry and year fixed effect.

To examine the impact of a firm's life cycle, we partition the full sample into four sub-samples according to our classification of a firm's respective life cycle stage. We follow Dickinson (2011) in using a combination of cash flow patterns reflecting the interaction among the firm's resource allocation, operational ability, and corporate strategy. According to the features of cash flow in the different life cycle stages of a firm, Dickinson combines the three types of cash flow information characteristics (positive or negative) and uses them as the basis to define life cycles. This method evaluates a firm more objectively and is considered a better approach to classify the life cycle of a firm. For example, for a firm in the initial stage of its life cycle, it has negative operating and investment cashflows and a positive financing cashflow, reflecting the firm's aggressiveness in operation, investment of fixed assets, and funding needs for expansion. It has been widely used in academic research in recent years (such as Faff, Kwok,

Podolski, & Wong, 2016). Appendix 2 shows the detailed method for coding the corporate life cycle. We use the panel data logit model to run our baseline regression using Eq. (1). If *H1* (*H2* to *H4*) is valid, α_1 in Eq. (1) is not (is) significant for the respective sub-samples based on a firm's life cycle.

4.2.2 Endogeneity and robustness checks

A general challenge for the literature is the potentially endogenous nature of the relationship between CSR and financial constraints due to factors such as reverse causality. Some studies find that firms facing fewer financial constraints can have abundant financial resources to engage in more CSR activities (Cheng, Ioannou, & Serafeim, 2013). To mitigate the potential endogeneity between *FC* and *CSR*, we use a cross-lagged effescts model. As Finkel (1995) stated, the cross-lagged model has wide applicability in panel analysis. Thus, in our additional test, we incorporate the *CSR* in year t-1 and *FC* in year t-1 as the independent variables. By using this cross-lagged effects model (Finkel, 1995), we further investigate how the previous *CSR* influenced the current period *FC*. Thus, we set up the following models:

$$FC_{i,t} = \delta_0 + \delta_1 CSR_{i,t-1} + \delta_2 FC_{i,t-1} + \sum \emptyset_j \, CONTROL_{i,t-1} + \omega_{i,t} \quad (3)$$

If *H1* (*H2* to *H4*) is valid, δ_1 in Eq. (3) is not (is) significant for the respective sub-samples based on a firm's life cycle.

For the robustness tests, we use an alternative measure for *CSR*: whether a firm discloses its CSR report. We obtain the data from RKS (Rankings). RKS is an authoritative third-party CSR ranking system for Chinese companies (Quan, Wu, & Yin, 2015). By using the CSR disclosure data from RKS, we further examined whether disclosing a social responsibility report

helps lower financial constraints. However, due to the imperfectness of the CSR regulations in the Chinese capital market, firms that disclose CSR reports are only a small part of the full samples. A firm that discloses a CSR report may have radically good financial and operational performance and could easily gain access to external funding at a lower cost. To avoid the self-selection bias in research design, we adopt the Heckman two-stage method in our robustness analysis.

Given that there are numerous measures of financial constraints, to ensure the robustness of our research conclusion, we further do a series of robustness checks towards various measurements for financial constraints. Although there are many measures of financial constraints, no optimal one is admitted in the prior literature. Besides WW index, dividend payout, KZ index (Kaplan and Zingales, 1997), and investment-cash flow sensitivity (Fazzari, Hubbard, & Petersen, 1988) are also widely used in the mainstream authoritative literature, and these methods are also widely used in most recent studies (Such as Boubaker, Saffar, & Sassi, 2018). Thus to better gauge the impact of CSR on firms' financial constraints, we use above three alternative measures to do the robustness checks.

5. Results and discussions

5.1 Graphical evidence and summary statistics

Figure 1 presents the trend of CSR engagement among firms in the four life cycle stages. We calculate the mean CSR score for all firm-year observations within each life cycle stage, and draw the line graph. We find that firms exhibit different CSR capabilities toward different life cycle phases. Figure 1 shows an inverted U-shape relationship between life cycle and CSR

engagement. More specifically, we find that as firms progressed from the initial phase to the growth phase, and further to the mature phase, the mean CSR score increased, whereas there is a sharp reduction in the declining stage. This is coincide well with the firms' business demand and financial health. Our result is consistent with that of Hasan & Habib (2017).

[Insert Figures 1 and 2 about here]

Figure 2 shows the trend of financial constraints among the four life cycle stages. We calculate the mean financial constraints for all firm-year observations within each life cycle stage. Figure 2 presents an approximate U-shape relationship between the life cycle and financial constraints of the firms. Growth firms face the lowest financial constraints while the declining firms face the highest financial constraints.

[Insert Table 1 about here]

Panel A of Table 1 shows the full sample summary statistics. The first three columns show the sample size, the mean value and standard deviation of each variable. The last three columns are the minimum, median, and maximum, respectively. The average *FC* is 0.25 per our definition. After removing the scale effect, the average *CSR* is 26.96% for the 11,865 observations with a standard deviation of 17.92%. The standard deviation of *CSR* is relatively high, which suggests a large cross-sectional variation in the CSR engagement of firms ranging from -1.7 to 73.32[2]. In addition to *CSR*, the standard deviations of *SIZE* and *TOBINQ* are also relatively high. This reflects the great difference in firm size and the growth opportunities of the

[2] Note that based on the evaluation criteria of Hexun, a firm could get a negative score if its CSR concerns' points are larger than the CSR strengths' points.

firms among the observations.

Since Wang et al. (2017) document that there is a heterogeneity in borrowing constraints between SOEs and non-SOEs, we compare the characteristics of these two groups of firms which is shown in Panel B of Table 1. The t-test results reveal significant differences in financial constraints, CSR engagement, firm size, growth opportunity, leverage, dividend payout ratio, change in dividend per share and short-term debt between the two groups. As stated earlier, the institutional background and purpose of operation differ greatly between SOEs and non-SOEs, which mainly led to the variance in financial constraints, CSR engagement, growth opportunity, short-term debt, and items related to dividend. Only the difference in sustainability rate between the two groups is not significant.

[Insert Table 2 about here]

Table 2 presents the correlation coefficients of the variables. The correlation coefficient of *FC* and *CSR* is negative and significant, suggesting that CSR engagement could relieve financial constraints. The relationship between *STATE* and *CSR* is significantly positive, indicating that SOEs have a better CSR performance than non-SOEs. All of the correlation coefficients among the variables in the model are less than 0.7, showing that there is no severe multicollinearity problem.

5.2 Base results

We present the findings of Eq. (1) in Table 3. Panel A reports the baseline results while Panel B compares the differences among the four life cycle stages. The first two columns of Panel A are the full sample OLS regression results. The first column does not control for industry

or year fixed effects, while the second column controlled both. The results show that the overall relationship between the firms' CSR engagement and financial constraints is significantly negative, which is consistent with the prior literature (such as Chan, Chou, & Lo, 2017). The last four columns of Table 3 Panel A show that, for the firms in the growth, mature, and declining stages, the coefficient of *CSR* is significantly negative. It shows that on average the higher the CSR performance, the fewer the financial constraints faced by the firm. However, the coefficient of *CSR* in the initial stage of the life cycle is not significant, suggesting that if firms in the initial phase fulfill CSR, the CSR activities have little influence on financial constraints. Regarding the control variables, *SIZE*, *SUSTRT*, and *STD* are all negative and significant at the 1% level, indicating that big firms, firms with better sustainability, and firms with more short-term debt will face fewer financial constraints. *LEV* is only significant in the initial and growth stage groups, suggesting that leverage is more important to the initial and growth stage firms in obtaining external financing. The overall results are consistent with intuition.

Given the different results due to the different industrial life cycles of a firm in Panel A of Table 3, we statistically examined whether the impact of *CSR* on *FC* is statistically significant across different life cycle stages. We conduct several Chow tests by introducing the product term of *LIFE* and all independent variables, where *LIFE* is a dummy variable equal to 1 if the firm belongs to the second life cycle stage in each comparison pair and zero otherwise. For example, when we compare the initial stage versus the growth stage, *LIFE* = 1 for the firms in the growth stage and *LIFE* = 0 for the firms in the initial stage.

Panel B shows the results of the Chow tests. The coefficients of *LIFE*CSR* are

consistently negative and significant at the 1% or 10% levels in columns (1) to (3), suggesting that the coefficients of *CSR* in the initial stage is statistically significantly smaller than those of the other three regression equations. In other words, firms in the initial stage of life cycle, on average, have a significantly lower CSR impact on financial constraints versus firms in all other stages of life cycles. Thus, the life cycle of a firm matters for the impact of CSR on financial constraints. Our findings support *H1* to *H4*.

[Insert Table 3 about here]

5.3 Endogeneity mitigation and robustness checks

We present the results for Eq. (3) in Table 4. The coefficients of CSR_{t-1} remain negative and significant in columns (2) to (4), indicating that the previous year's CSR engagement significantly relieve the current year's financial constraints, supporting H2 to H4. In contrast, the same coefficient is not significant in column (1), suggesting that for a firm in the initial stage of life cycle the impact of CSR on financial constraint is minimal. The findings in Table 4 are consistent with our baseline results in Table 3, and the negative impact of CSR activities on the financial constraints during the growth, maturity, and declining stages of the life cycle are not due to endogeneity.

[Insert Table 4 about here]

Prior studies have shown that firms with superior CSR performance are more likely to publicly disclose their CSR activities by issuing sustainability reports (Dhaliwal et al., 2011). Cheng, Ioannou, & Serafeim (2013) suggest that CSR reporting could increase transparency with regard to the social and environmental impact of firms and their governance structure and lead to

better internal control systems that further improve the compliance with regulations and the reliability of the reporting. CSR reporting could also reduce information asymmetry, resulting in fewer financial constraints. From this point of view, we use the CSR report disclosure as an alternative proxy for CSR engagement and reexamine the influence of CSR report disclosure on the financial constraints of firms.

In accordance with Quan, Wu, & Yin (2015), we used the RKS data to measure whether a firm discloses CSR report.[3] If firm *i* discloses its CSR report in year *t*, then the variable *CSR_DISCLOSURE* equals 1 and zero otherwise. Table 5 presents the results on the impact of CSR disclosure on the financial constraints of firms.

[Insert Table 5 about here]

The results in Table 5 are qualitatively similar to the baseline results in Table 3. The coefficients of *CSR_DISCLOSURE* are negative and significant at the 10% level in columns (2) and (3). Hence, the firms in the growth and mature stages that chose to disclose a CSR report significantly lessen their financial constraints.

Given that the RKS database is a scoring system based on the CSR report released by listed firms, the data have selectivity bias. “Good” firms, which are more likely to release a CSR report, also face fewer financial constraints. Thus, we perform the Heckman two-stage test to further examine whether sample selection bias influences our results. The first step is to run a Probit regression based on the selection equation. The dependent variable of the selection

[3] RKS is one of the authoritative third party rating agencies in China, which making evaluations towards public firms’ social responsibility report. The website of RKS is www.rksratings.com.

equation is *CSR_DISCLOSURE,* and the independent variables were chosen on account of the factors that could influence the CSR report disclosure decision by firms. Referencing prior literature (Tan, 2017), we choose *STATE*, *LEV*, *STD*, *ROA*, *BTOM*, *NWC*, *CF*, *GROWTH*, *TOP1*, and *MONISIZE* as the independent variables. The variable definitions are presented in Appendix 1. The first step of the Probit regression calculate the Inverse Mills Ratio (*IMR*). Then, we add *IMR* as an additional control variable into the second step of the Logit regression. We also run the Logit regression for the panel data in the second step, where FC_t is the dependent variable, and reexamine the firms in the four life cycle stages.

Table 6 presents the Heckman two-step test results. Panel A shows that there is indeed a self-selection bias. Panel B shows that after correction for the self-selection bias, the coefficients of *CSR_DISCLOSURE* are negative and significant at the 10% level for the firms in the growth and mature stages of the life cycle. The results are consistent with Table 5, and they support the notion that a firm's industrial life cycle moderates the impact of CSR on financial constraints.

[Insert Table 6 about here]

We also use alternative measures for financial constraints to verify the robustness of our conclusion. We substitute the WW index with cash dividend payout, KZ index, and Investment-Cash Flow Sensitivity respectively. Table 7 shows the robustness results that using various measures for financial constraints. Panel A shows the results that using cash dividend payout and KZ index as the measurement for firms' financial constraints. The first dependent variable *DIV* is calculated as cash dividend divided by total assets, while the second dependent variable *KZ* is calculated following Kaplan and Zingales (1997) and Lamont et al., (2001). We

test the influence of CSR on financial constraints for the full sample and four life cycle phases' subsamples for each dependent variable (as shown in column (1) to (5) and column (6) to (10) respectively). Panel B exhibits the effect of CSR on investment-cash flow sensitivity towards various life cycle phases. The coefficient of the product term *CSR*CF* represents the effect of CSR on firms' financial constraints.

[Insert Table 7 about here]

The results in Panel A shows that no matter dependent variable is *DIV* or *KZ*, the coefficients of *CSR* reveal the same pattern with our base results. The coefficient of *CSR* is significantly negative in full sample, and in growth, mature, and declining stages of the life cycle, while not for firms in the initial stage. In Table 7 Panel B, the product terms are significantly negative for the full sample, as well as the growth, mature, and declining samples, while not significant for initial firms. This empirical result showing that firms are not homogeneous, and the CSR's relieving effect on firms' financial constraints also various towards different life cycle stages. The coefficient of *CF* is significantly positive in all five columns, suggesting the increase in firms' internal fund could increase firm investment, which verifies that the sensitivity of investment-cash flow could reflect the situation of firms' financial constraints.

6. Conclusion

This paper examines the moderate role of a firm's industrial life cycle on the impact of CSR engagement on financial constraints. While the literature suggests that a firm's CSR engagement can relieve its financial constraints, it implicitly assumes that firms are homogeneous in the context of industrial life cycle. According to the life cycle theory, firms

exhibit different investment, financing, and dividend payout preference in their growth trajectory. Firms also faced with different social responsibility goals at each distinct development stage, and they show various capabilities of fulfilling social responsibility. Thus, we hypothesized that the impacts of CSR on financial constraints are different across different life cycles. Specifically, we conjecture that for firms in the growth, mature, and declining stages, the higher their CSR scores, the lower the financial constraints they faced. In contrast, for firms in the initial stage, CSR engagement has no significant impact on financial constraints.

Using a sample of Chinese A-share listed firms during the period of 2010 to 2016, our findings are consistent with our hypotheses. The findings remain intact after using a lagged effect model, an alternative sample of firms choosing to disclose their CSR report, and various financial constraints measurements.

Previously, the few studies investigating the effect of CSR disclosure on financing mostly conclude that CSR disclosure could lessen financial constraints. While counter to the initial expectations, our results suggest a reverse correlation between CSR disclosure and financial constraints. The economic significance of our research is reflected in the following aspects. First, our research is helpful for firms to identify their specific life cycle phases, and make idiosyncratic CSR strategies, which is conductive for firms better achieving economic goals. Second, we focus on the life cycle theory of firms, together with the industry's economic cycle, drawing a more comprehensive conclusion to implement the collaborative development between firms and society.

Our findings allow us to predict the possible beneficial impact of Chinese regulators and

policymakers. We can draw some policy implications based on our results: (1) the China Securities Regulatory Commission (CSRC) should formulate appropriate social responsibility guidance for initial firms. Because better CSR performance for initial firms has little impact on their financial constraints, we should not subject all firms to unified standards and requirements. The start-up phase is crucial to the firms' long-term development; hence, an appropriate corporate strategy could help the firm pass through the tough stage successfully. Our results can help Chinese regulators make more reasonable and reliable social responsibility disclosure policies, which can be more pertinent measures to firms in different life cycle phases. (2) Firms should not fulfill social responsibility objectives blindly. The management should develop an appropriate social responsibility strategy based on the characteristics of the firm. Especially for the initial firms, developing a core business and maintaining its long-term stability is the primary goal. At this time, the firm should not spread the funds too thinly on excessive CSR investment.

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Table 1. Summary statistics

Table 1 Panel A presents the descriptive statistics of the full sample. The first three columns for each group show the sample size, the mean value and standard deviation of each variable. The last three columns for each group are the minimum value, median value and maximum value. Table 1 Panel B shows the summary statistics and the significance of the mean difference between SOEs and non-SOEs. Definitions of the variables are presented in Appendix 1. ***, **, and * indicate 1%, 5%, and 10% significant, respectively.

Panel A: Full Sample Descriptive Statistics

variables	N	mean	std	min	median	max
FC	11865	0.250	0.430	0	0	1
CSR	11865	26.96	17.92	-1.700	21.76	73.32
STATE	11865	0.470	0.500	0	0	1
SIZE	11865	22.17	1.260	19.52	22.01	26
TOBINQ	11865	2.090	1.910	0.200	1.530	11.29
LEV	11865	0.460	0.210	0.0600	0.460	0.940
PAYOUT	11865	0.250	0.310	0	0.190	1.900
DIVPSCHG	11865	0	0.100	-0.400	0	0.400
SUSTRT	11865	0.0500	0.100	-0.420	0.0500	0.380
STD	11865	0.0700	0.160	-0.290	0.0400	0.840

Panel B: Descriptive Statistics of the Subsample

	(1) SOEs (N = 5554)					(2) Non-SOEs (N = 6251)					Difference between	t-statistics
Variable	mean	std	min	median	max	mean	std	min	median	max	means: (1)-(2)	
FC	0.1682	0.0050	0	0	1	0.3229	0.0059	0	0	1	-0.1547***	19.7437
CSR	29.5403	0.2640	-1.700	22.62	73.32	24.6591	0.1990	-1.700	21.18	73.32	4.8812***	14.9509
SIZE	22.5706	0.0179	19.52	22.40	26	21.8061	0.0134	19.52	21.72	26	0.7645***	34.5718
TOBINQ	1.6105	0.0206	0.200	1.150	11.29	2.5118	0.0265	0.200	1.880	11.29	-0.9013***	-26.3896
LEV	0.5217	0.0027	0.0600	0.530	0.940	0.4142	0.0026	0.0600	0.400	0.940	0.1075***	28.5247
PAYOUT	0.2270	0.0037	0	0.180	1.900	0.2754	0.0041	0	0.200	1.900	-0.0484***	-8.6376
DIVPSCHG	0.0024	0.0012	-0.400	0	0.400	-0.0115	0.0014	-0.400	0	0.400	0.0139***	7.5477
SUSTRT	0.0535	0.0014	-0.420	0.0500	0.380	0.0547	0.0012	-0.420	0.0500	0.380	-0.0012	-0.6740
STD	0.0594	0.0020	-0.290	0.0400	0.840	0.0716	0.0021	-0.290	0.0400	0.840	-0.0122***	-4.1981

Table 2. Correlation Analysis

Table 2 presents the correlation coefficients of the variables. The Spearman correlations are above the diagonal while the Pearson correlations are below the diagonal. Definitions of the variables are presented in Appendix 1. ***, **, and * indicate 1%, 5%, and 10% significant, respectively.

	FC	*CSR*	*STATE*	*SIZE*	*TOBINQ*	*LEV*	*PAYOUT*	*DIVPSCHG*	*SUSTRT*	*STD*
FC		-0.2659***	-0.1784***	-0.6834***	0.4562***	-0.2660***	-0.1331***	-0.0598***	-0.1993***	-0.1853***
CSR	-0.2499***		0.0957***	0.3282***	-0.0825***	-0.0584***	0.2943***	0.0976***	0.4730***	0.0656***
STATE	-0.1784***	0.1360***		0.2919***	-0.2978***	0.2557***	-0.0689***	0.0804***	0.0072	-0.0334***
SIZE	-0.6137***	0.3458***	0.3025***		-0.6312***	0.4473***	0.1009***	0.0709***	0.1517***	0.1690***
TOBINQ	0.4359***	-0.1197***	-0.2355***	-0.5228***		-0.5977***	0.0152***	-0.0309***	0.0937***	-0.1268***
LEV	-0.2555***	-0.0049	0.2533***	0.4219***	-0.4091***		-0.2678***	0.0475***	0.0034	0.2572***
PAYOUT	-0.0559***	0.1166***	-0.0791***	0.0390***	-0.0363***	-0.2098***		0.2417***	-0.0320***	-0.0117
DIVPSCHG	-0.0488***	0.0511***	0.0691***	0.0654***	-0.0181**	0.0523***	0.2074***		0.0739***	0.0030
SUSTRT	-0.1732***	0.3313***	-0.0062	0.1212***	0.0759***	-0.0819***	-0.0726***	0.0179*		0.1463***
STD	-0.1639***	0.0352***	-0.0385***	0.1462***	-0.0921***	0.2344***	-0.0426***	0.0171*	0.1296***	

Table 3. Baseline Regression Results

Table 3 Panel A presents the results of the Logit regression for the panel data, and it shows the effect of CSR on the financial constraints of the firms. The first two columns are the full sample results, and the last four columns are for subsamples in the four life cycle phases. Table 3 Panel B presents the Chow tests results which examine the differences in the effect of CSR on financial constraints among the different life cycles. We conducted six pairs of Chow tests by introducing the conduct term of *LIFE* with all independent variables. *LIFE* is a dummy variable equal to 1 if the firm belongs to the second life cycle stage in each comparison pair and zero otherwise. For example, when we compare the initial stage vs. the growth stage, *LIFE* = 1 for the firms in the growth stage and *LIFE* = 0 for the firms in the initial stage. Standard errors in parentheses. Definitions of the variables are presented in Appendix 1. ***, **, and * indicate 1%, 5%, and 10% significant, respectively.

Panel A: The effect of CSR on firms' financial constraints

	Dependent variable = FC_t					
	Full sample	Full sample	Initial stage	Growth stage	Mature stage	Declining stage
	(1)	(2)	(3)	(4)	(5)	(6)
CSR_t	-0.014***	-0.012***	0.006	-0.014*	-0.016***	-0.013*
	(0.003)	(0.003)	(0.007)	(0.008)	(0.006)	(0.007)
$STATE_t$	-0.040	0.080	-0.080	0.254	0.051	0.256
	(0.079)	(0.092)	(0.210)	(0.221)	(0.186)	(0.192)
$SIZE_t$	-3.838***	-5.872***	-4.869***	-8.310***	-6.958***	-5.770***
	(0.090)	(0.147)	(0.309)	(0.450)	(0.322)	(0.320)
$TOBINQ_t$	0.235***	-0.063**	0.096	0.076	-0.164***	-0.165**
	(0.023)	(0.031)	(0.080)	(0.072)	(0.054)	(0.075)
LEV_t	0.285	0.555**	1.400**	2.128***	-0.406	-0.454
	(0.220)	(0.251)	(0.609)	(0.669)	(0.473)	(0.491)
$PAYOUT_t$	-0.319***	-0.302**	-0.121	0.077	-0.295	-0.039
	(0.121)	(0.136)	(0.312)	(0.341)	(0.250)	(0.285)
$DIVPSCHG_t$	-0.475	-1.117**	-2.183*	-1.886*	-0.499	-1.628
	(0.383)	(0.446)	(1.211)	(1.037)	(0.734)	(1.050)
$SUSTRT_t$	-5.573***	-4.937***	-3.198***	-6.304***	-4.974***	-3.761***
	(0.432)	(0.491)	(1.002)	(1.386)	(0.969)	(0.925)
STD_t	-2.071***	-1.662***	-1.420**	-4.315***	-3.746***	-0.915
	(0.286)	(0.309)	(0.583)	(0.749)	(0.854)	(0.648)
INDUSTRY	Not Control	Control	Control	Control	Control	Control
YEAR	Not Control	Control	Control	Control	Control	Control
INTERCEPT	81.538***	123.307***	102.660***	172.902***	145.319***	122.622***
	(1.924)	(3.112)	(6.584)	(9.400)	(6.754)	(6.816)
N	11865	11865	1739	3781	4205	2114
Wald test χ^2 statistics and p-value in parentheses	2073.78 (0.0000)	1758.94 (0.0000)	291.10 (0.0000)	366.25 (0.0000)	498.74 (0.0000)	380.96 (0.0000)

Panel B: Chow test results examining the statistical significance of the coefficient difference among life cycles.

	Dependent variable = FC_t					
	Initial vs. Growth	Initial vs. Mature	Initial vs. Declining	Growth vs. Mature	Growth vs. Declining	Mature vs. Declining
$LIFE*CSR_t$	-0.020*	-0.022**	-0.018*	-0.002	0.001	0.003
	(0.011)	(0.009)	(0.010)	(0.010)	(0.011)	(0.009)
$LIFE*STATE_t$	0.324	0.122	0.310	-0.193	0.002	0.198
	(0.305)	(0.273)	(0.284)	(0.284)	(0.293)	(0.260)
$LIFE*SIZE_t$	-3.434***	-2.046***	-0.907**	1.432***	2.541***	1.120**
	(0.546)	(0.433)	(0.444)	(0.550)	(0.553)	(0.441)
$LIFE*TOBINQ_t$	-0.021	-0.260***	-0.254**	-0.255***	-0.241**	0.001
	(0.108)	(0.096)	(0.110)	(0.089)	(0.104)	(0.092)
$LIFE*LEV_t$	0.692	-1.720**	-1.743**	-2.443***	-2.582***	-0.071
	(0.904)	(0.759)	(0.781)	(0.812)	(0.830)	(0.668)
$LIFE*PAYOUT_t$	0.204	-0.205	0.088	-0.326	-0.114	0.303
	(0.463)	(0.397)	(0.423)	(0.421)	(0.445)	(0.377)
$LIFE*DIVPSCHG_t$	0.299	1.574	0.552	1.289	0.259	-1.025
	(1.594)	(1.420)	(1.602)	(1.276)	(1.476)	(1.286)
$LIFE*SUSTRT_t$	-3.002*	-1.880	-0.519	1.527	2.554	1.319
	(1.709)	(1.382)	(1.363)	(1.689)	(1.667)	(1.327)
$LIFE*STD_t$	-2.857***	-2.451**	0.472	0.268	3.396***	2.924***
	(0.948)	(1.036)	(0.871)	(1.135)	(0.990)	(1.074)
$LIFE$	70.101***	41.864***	19.988**	-29.120**	-50.313***	-21.433**
	(11.474)	(9.163)	(9.466)	(11.501)	(11.619)	(9.331)
CSR_t	0.006	0.006	0.006	-0.014*	-0.014*	-0.016***
	(0.007)	(0.007)	(0.007)	(0.008)	(0.008)	(0.006)
$STATE_t$	-0.079	-0.067	-0.052	0.242	0.254	0.059
	(0.210)	(0.210)	(0.210)	(0.227)	(0.221)	(0.175)
$SIZE_t$	-4.868***	-4.865***	-4.861***	-8.366***	-8.311***	-6.895***
	(0.309)	(0.309)	(0.308)	(0.462)	(0.451)	(0.304)
$TOBINQ_t$	0.096	0.093	0.089	0.094	0.077	-0.166***
	(0.080)	(0.080)	(0.080)	(0.072)	(0.072)	(0.052)
LEV_t	1.396**	1.353**	1.294**	2.115***	2.128***	-0.381
	(0.609)	(0.608)	(0.607)	(0.679)	(0.669)	(0.454)
$PAYOUT_t$	-0.121	-0.124	-0.127	0.054	0.075	-0.341
	(0.312)	(0.312)	(0.312)	(0.344)	(0.341)	(0.246)
$DIVPSCHG_t$	-2.183*	-2.181*	-2.178*	-1.898*	-1.887*	-0.605
	(1.211)	(1.211)	(1.211)	(1.038)	(1.037)	(0.741)
$SUSTRT_t$	-3.199***	-3.216***	-3.239***	-6.531***	-6.315***	-5.079***
	(1.002)	(1.002)	(1.001)	(1.402)	(1.387)	(0.952)
STD_t	-1.419**	-1.408**	-1.393**	-4.125***	-4.311***	-3.834***

	(0.583)	(0.582)	(0.581)	(0.743)	(0.749)	(0.856)
Intercept	102.656***	102.621***	102.576***	173.992***	172.932***	144.146***
	(6.583)	(6.579)	(6.573)	(9.639)	(9.409)	(6.366)
N	5520	5944	3853	7986	5895	6319
Wald test χ^2 statistics and p-value in parentheses	657.11 (0.0000)	845.83 (0.0000)	674.95 (0.0000)	855.03 (0.0000)	751.12 (0.0000)	934.42 (0.0000)

Table 4. Cross-lagged model to mitigate the endogeneity relationship between CSR and financial constraints

Table 4 presents the results of the cross-lagged model, which was employed to mitigate the potential endogeneity relationship between CSR and financial constraints. Standard errors in parentheses. Definitions of the variables are presented in Appendix 1. ***, **, and * indicate 1%, 5%, and 10% significant, respectively.

	Dependent variable = FC_t			
	Initial stage	Growth stage	Mature stage	Declining stage
	(1)	(2)	(3)	(4)
CSR_{t-1}	-0.002	-0.021***	-0.012**	-0.011*
	(0.007)	(0.007)	(0.005)	(0.006)
FC_{t-1}	0.860***	1.681***	1.745***	1.964***
	(0.226)	(0.193)	(0.160)	(0.209)
$STATE_{t-1}$	0.012	0.393**	-0.088	0.087
	(0.212)	(0.179)	(0.163)	(0.175)
$SIZE_{t-1}$	-2.780***	-2.659***	-2.951***	-2.273***
	(0.247)	(0.206)	(0.188)	(0.189)
$TOBINQ_{t-1}$	-0.086	-0.032	0.011	-0.010
	(0.065)	(0.044)	(0.046)	(0.061)
LEV_{t-1}	0.952	-1.089**	-0.059	0.387
	(0.597)	(0.520)	(0.459)	(0.460)
$PAYOUT_{t-1}$	-0.165	-0.271	-0.159	-0.132
	(0.354)	(0.273)	(0.254)	(0.275)
$DIVPSCHG_{t-1}$	-1.473	1.568*	-0.823	1.673
	(1.118)	(0.905)	(0.656)	(1.029)
$SUSTR_{t-1}$	0.441	-0.182	0.000	-0.134
	(0.306)	(0.162)	(0.050)	(0.192)
STD_{t-1}	-3.273***	-0.462	-1.538**	-1.012*
	(0.737)	(0.627)	(0.680)	(0.614)
_CONS	58.603***	55.502***	61.929***	48.039***
	(5.290)	(4.412)	(4.030)	(4.083)
N	1299	2970	3299	1709
Wald test χ^2 statistics	257.76	526.74	623.59	505.84
and p-value in	(0.0000)	(0.0000)	(0.0000)	(0.0000)
parentheses				

Table 5 Robustness Analysis

Table 5 presents a robustness test based on an alternative method that measures the CSR engagement of the firms in terms of CSR disclosure. We replaced the CSR performance score with a dummy variable, *CSR_DISCLOSURE*. *CSR_DISCLOSURE* has a value of 1 if the firm discloses it CSR activities and zero otherwise. Standard errors in parentheses. Definitions of the variables are presented in Appendix 1. ***, **, and * indicate 1%, 5%, and 10% significant, respectively.

	Dependent variable = FC_t			
	Initial stage	Growth stage	Mature stage	Declining stage
	(1)	(2)	(3)	(4)
$CSR\_DISCLOSURE_t$	0.016	-0.448*	-0.311*	-0.094
	(0.257)	(0.253)	(0.188)	(0.217)
$STATE_t$	-0.212	-0.086	-0.171	0.147
	(0.189)	(0.178)	(0.149)	(0.161)
$SIZE_t$	-3.398***	-4.672***	-4.164***	-3.493***
	(0.209)	(0.222)	(0.176)	(0.180)
$TOBINQ_t$	0.271***	0.417***	0.190***	0.265***
	(0.062)	(0.050)	(0.039)	(0.055)
LEV_t	1.122**	1.191**	-0.318	-0.178
	(0.536)	(0.550)	(0.388)	(0.413)
$PAYOUT_t$	-0.173	-0.019	-0.499**	-0.180
	(0.287)	(0.275)	(0.210)	(0.242)
$DIVPSCHG_t$	-1.827*	-0.741	-0.032	-0.665
	(1.075)	(0.843)	(0.598)	(0.882)
$SUSTRT_t$	-3.258***	-8.195***	-6.819***	-4.716***
	(0.819)	(1.047)	(0.800)	(0.757)
STD_t	-1.737***	-3.457***	-4.007***	-1.303**
	(0.532)	(0.646)	(0.720)	(0.588)
INDUSTRY	Control	Control	Control	Control
YEAR	Control	Control	Control	Control
_CONS	71.946***	98.143***	88.291***	74.421***
	(4.474)	(4.693)	(3.738)	(3.881)
N	1739	3783	4215	2128
Wald test χ^2 statistics	317.40	494.06	616.75	454.64
and p-value in	(0.0000)	(0.0000)	(0.0000)	(0.0000)
parentheses				

Table 6. Heckman Two-step Analysis

Table 6 presents the results of the Heckman two-step analysis. Panel A shows the results of the first step of the Probit regression of the selection equation. The dependent variable of the selection equation is *CSR_DISCLOSURE*$_t$. Panel B presents the results of the second step of the Logit regression. Standard errors in parentheses. Definitions of the variables are presented in Appendix 1. ***, **, and * indicate 1%, 5%, and 10% significant, respectively.

Panel A: The results of the first step of the Probit regression of the selection equation

Dependent variable = *CSR_DISCLOSURE*$_t$	
STATE$_t$	0.475***
	(0.028)
LEV$_t$	0.258***
	(0.084)
STD$_t$	-0.432***
	(0.088)
ROA$_t$	2.783***
	(0.294)
BTOM$_t$	0.226***
	(0.017)
NWC$_t$	0.048***
	(0.007)
CF$_t$	0.758***
	(0.158)
GROWTH$_t$	0.076
	(0.076)
TOP1$_t$	0.004***
	(0.001)
MONISIZE$_t$	0.318***
	(0.098)
Intercept	-1.638***
	(0.092)
N	11864
χ^2 statistics	1147.36
	(p-value = 0.000)
Pseudo R^2	0.0818
Log likelihood	-6439.3623

Panel B: The results of the second step of the Logit regression

Dependent variable = FC_t				
	Initial stage	Growth stage	Mature stage	Declining stage
	(1)	(2)	(3)	(4)
$CSR\_DISCLOSURE_t$	-0.023	-0.518*	-0.380*	-0.171
	(0.290)	(0.313)	(0.225)	(0.252)
IMR	3.284***	4.662***	3.846***	5.708***
	(0.840)	(0.917)	(0.688)	(0.779)
$STATE_t$	1.030***	1.842***	1.310***	2.246***
	(0.357)	(0.386)	(0.294)	(0.339)
$SIZE_t$	-4.658***	-8.272***	-6.576***	-5.537***
	(0.312)	(0.463)	(0.319)	(0.331)
$TOBINQ_t$	0.072	0.064	-0.114**	-0.188**
	(0.082)	(0.074)	(0.056)	(0.080)
LEV_t	1.754***	2.108***	-0.291	-0.061
	(0.630)	(0.669)	(0.475)	(0.522)
$PAYOUT_t$	0.075	0.227	-0.137	0.197
	(0.317)	(0.345)	(0.256)	(0.295)
$DIVPSCHG_t$	-2.223*	-1.867*	-0.482	-1.254
	(1.229)	(1.071)	(0.752)	(1.087)
$SUSTRT_t$	-0.877	-2.293	-2.099*	0.136
	(1.147)	(1.645)	(1.162)	(1.087)
STD_t	-2.786***	-5.806***	-4.573***	-2.529***
	(0.694)	(0.831)	(0.882)	(0.727)
INDUSTRY	Control	Control	Control	Control
YEAR	Control	Control	Control	Control
Intercept	93.036***	164.850***	131.065***	108.172***
	(6.865)	(9.637)	(6.855)	(7.047)
N	1739	3780	4205	2114
Wald test χ^2	283.40	348.24	508.15	362.79
statistics and p-value	(0.0000)	(0.0000)	(0.0000)	(0.0000)
in parentheses				

Table 7. Various Financial Constraints Measurement

Table 7 presents the robustness checks results for the various financial constraints measurements. Panel A shows the results of the financial constraints measured as cash dividend payout and KZ index. The dependent variable of first five columns is *DIV*, which is calculated as cash dividend divided by lagged total assets. The dependent variable of last five columns is *KZ*, we calculate KZ index following Kaplan and Zingales (1997) and Lamont et al.(2001). Panel B presents the results of investment-cash flow sensitivity proxy for financial constraints. Following Fazzari et al. (1988), the coefficient of *CF* represents firm's financial constraints. Standard errors in parentheses. Definitions of the variables are presented in Appendix 1. ***, **, and * indicate 1%, 5%, and 10% significant, respectively.

Panel A: The results of financial constraints measured as cash dividend payout and KZ index.

	Dependent variable = DIV_t					Dependent variable = KZ_t				
	Full sample (1)	Initial stage (2)	Growth stage (3)	Mature stage (4)	Declining stage (5)	Full sample (6)	Initial stage (7)	Growth stage (8)	Mature stage (9)	Declining stage (10)
CSR_t	-0.009***	-0.005	-0.010***	-0.009***	-0.021***	-0.009***	-0.004	-0.011***	-0.009***	-0.010*
	(0.002)	(0.007)	(0.003)	(0.003)	(0.005)	(0.002)	(0.006)	(0.003)	(0.003)	(0.005)
$STATE_t$	0.265***	0.764***	0.444***	0.142	0.357*	0.164*	0.665***	0.257*	0.147	0.133
	(0.086)	(0.245)	(0.136)	(0.131)	(0.189)	(0.090)	(0.224)	(0.137)	(0.133)	(0.189)
$SIZE_t$	-0.142***	-0.039	-0.036	-0.314***	-0.041	-0.007	0.215	0.090	-0.129*	0.034
	(0.047)	(0.158)	(0.072)	(0.073)	(0.121)	(0.048)	(0.147)	(0.073)	(0.073)	(0.120)
$TOBINQ_t$	-0.144	-0.145	-0.303*	-0.072	-0.080	0.822***	1.274***	0.868***	0.735***	0.940***
	(0.101)	(0.330)	(0.177)	(0.164)	(0.244)	(0.101)	(0.332)	(0.178)	(0.160)	(0.253)
LEV_t	6.787***	6.064***	6.667***	8.755***	5.952***	8.326***	6.224***	8.957***	8.946***	7.311***
	(0.271)	(0.833)	(0.452)	(0.451)	(0.610)	(0.290)	(0.775)	(0.491)	(0.462)	(0.639)
$PAYOUT_t$	-3.157***	-2.670***	-3.679***	-4.183***	-3.236***	-2.219***	-1.618***	-2.622***	-3.048***	-2.595***
	(0.143)	(0.351)	(0.264)	(0.282)	(0.346)	(0.125)	(0.319)	(0.226)	(0.249)	(0.325)
$DIVPSCHG_t$	-3.080***	-5.234***	-3.986***	-2.294***	-3.352***	-2.385***	-5.527***	-3.044***	-1.580***	-2.481***
	(0.259)	(1.068)	(0.504)	(0.442)	(0.756)	(0.247)	(1.048)	(0.473)	(0.411)	(0.781)
$SUSTRT_t$	-13.680***	-11.143***	-14.250***	-18.875***	-14.217***	-9.733***	-8.197***	-10.501***	-13.528***	-11.831***
	(0.672)	(1.998)	(1.180)	(1.308)	(1.598)	(0.608)	(1.885)	(1.087)	(1.144)	(1.545)

STD_t	-0.062	-1.307**	0.223	-1.346***	-0.733	-1.525***	-1.818***	-1.741***	-2.561***	-1.637***
	(0.205)	(0.573)	(0.348)	(0.492)	(0.537)	(0.193)	(0.518)	(0.334)	(0.471)	(0.523)
INDUSTRY	Control	Control	Control	Control	Control	Control	Control	Control	Control	Control
YEAR	Control	Control	Control	Control	Control	Control	Control	Control	Control	Control
INTERCEPT	2.661**	0.230	0.887	6.496***	0.870	-2.191**	-7.203**	-4.368***	1.056	-2.448
	(1.037)	(3.445)	(1.601)	(1.584)	(2.633)	(1.067)	(3.232)	(1.635)	(1.590)	(2.623)
N	7671	931	2598	2995	1121	7665	943	2598	2994	1126
Wald test $\chi 2$	1337.20	167.91	525.47	596.24	231.13	1365.86	180.84	555.64	581.46	241.13
statistics	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
and p-value in parentheses										

Panel B: The results of financial constraints measured as investment-cash flow sensitivity.

	Dependent variable = INV_t				
	Full sample	Initial stage	Growth stage	Mature stage	Declining stage
	(1)	(2)	(3)	(4)	(5)
*CSR*CF*	-0.001*	0.004	-0.004*	-0.002*	-0.002**
	(0.001)	(0.004)	(0.002)	(0.001)	(0.001)
CF	0.152***	0.166*	0.409***	0.154***	0.044*
	(0.021)	(0.095)	(0.079)	(0.032)	(0.027)
TOBINQ	-0.000	-0.002	0.001	-0.000	-0.002***
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
CSR	-0.000	-0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
STATE	-0.019***	-0.020***	-0.024***	-0.009***	-0.002
	(0.002)	(0.005)	(0.004)	(0.002)	(0.002)
SIZE	0.006***	0.004	0.003	0.001	0.005***
	(0.001)	(0.003)	(0.002)	(0.001)	(0.002)
LEV	-0.040***	-0.085***	-0.041***	-0.035***	-0.054***
	(0.005)	(0.015)	(0.013)	(0.006)	(0.005)
ROA	0.050***	0.034	0.175***	0.111***	-0.051**
	(0.019)	(0.054)	(0.047)	(0.022)	(0.020)
BTOM	-0.003**	-0.004	0.003	-0.002	-0.005**
	(0.001)	(0.003)	(0.003)	(0.002)	(0.002)
STD	0.193***	0.117***	0.229***	0.123***	0.052***
	(0.005)	(0.012)	(0.011)	(0.008)	(0.007)
NWC	0.001***	0.000	-0.001	0.001**	0.002***
	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)
INDUSTRY	Control	Control	Control	Control	Control
YEAR	Control	Control	Control	Control	Control
INTERCEPT	-0.032	0.080	0.061	0.041	-0.065*
	(0.024)	(0.071)	(0.050)	(0.026)	(0.034)
N	9244	1388	2943	3289	1624
R2_a	0.223	0.192	0.249	0.200	0.200
F	F(34, 9209) = 79.05	F(32, 1355) = 11.31	F(31, 2911) = 32.50	F(34, 3254) = 25.17	F(34, 1589) = 12.90

Figure 1. The line graph of the mean CSR score and life cycle

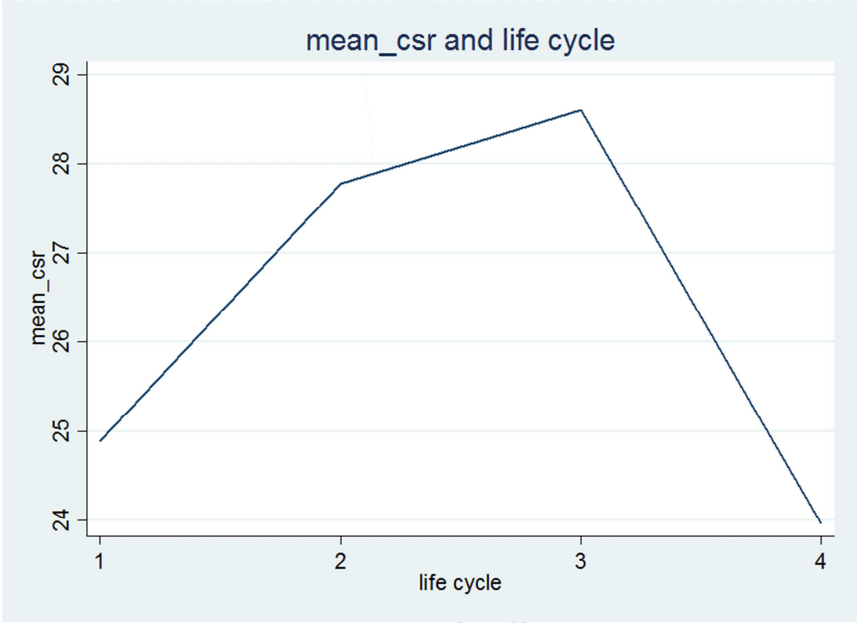
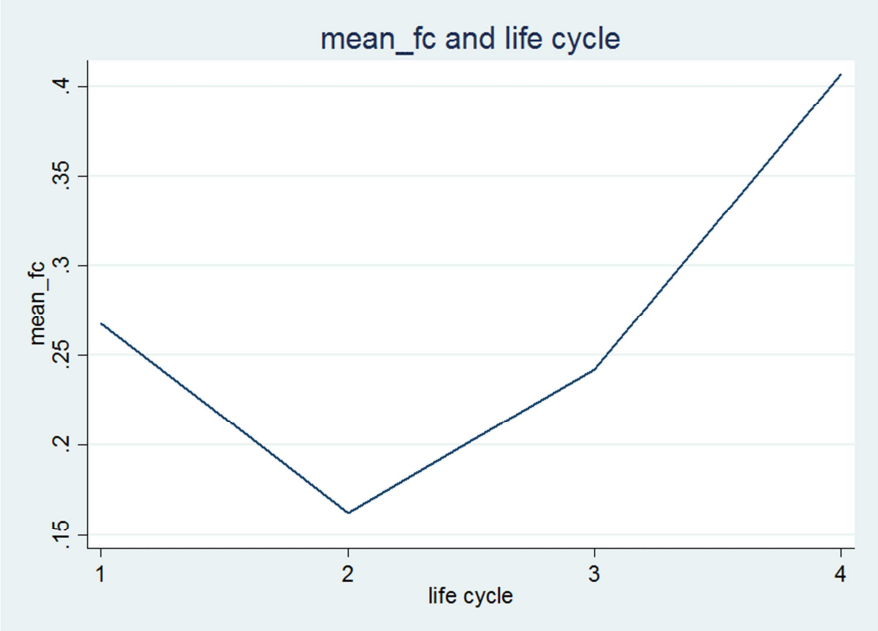


Figure 2. The line graph of the mean financial constraints and lifecycle



Appendix 1 Definitions of the variables

Variable	Symbols	Description
Dependent Variable	*FC*	In each fiscal year we ranked firms according to the WW index. Firms in the top quartile of the annual distribution were considered financially constrained firms and FC =1 or 0 otherwise.
Independent Variables	*CSR*	CSR data comes from the Hexun website
	CSR_DISCLOSURE	A dummy variable equal to 1 if firm i discloses a social responsibility report in year t and 0 otherwise.
	LIFE	A dummy variable equal to 0 if the firm belongs to the former life cycle stage in each comparison pair and 1 otherwise.
	STATE	State-owned enterprises, state=1; otherwise state=0
Control Variables	*SIZE*	The natural logarithm of the total assets
	TOBINQ	Total market value divided by the net asset
	LEV	Total debt/Total Assets
	PAYOUT	Dividend payout ratio
	DIVPSCHG	Change in dividend per share
	SUSTRT	Sustainable growth rate. Return on equity*ratio of retained earnings/(1 – return on equity * ratio of retained earnings)
	STD	Increase in current liabilities divided by total assets
	ROA	Net Income/Total Asset
	BTOM	Book-to-market ratio
	NWC	Change in net working capital divided by total assets
	CF	Net cash flow from operation divided by total assets
	GROWTH	Net profit/Total Profit
	TOP1	Share ratio of the largest shareholder
	MONISIZE	The number of supervisors divided by the number of directors

Appendix 2. Cashflow patterns and firm life cycle using the Dickinson (2011) method

Cash Flow Type	Initial	Growth	Mature	Declining		
Operating	-	+	+	+	-	-
Investing	-	-	-	+	+	-
Financing	+	+	-	+/-	+/-	-