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# Article

# Corporate social responsibility and trade credit during periods of monetary contraction

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# Corporate social responsibility and trade credit during periods of monetary contraction

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#### ABSTRACT

This paper studies whether firms' corporate social responsibility (CSR) affects their access to trade credit in response to monetary contraction shocks. Based on US firm-level data from 1995Q1 to 2014Q1, we find that after monetary contraction shocks, firms with higher levels of CSR receive more trade credit than firms with lower levels of CSR. Moreover, the beneficial impact of CSR is stronger for firms in regions with higher social trust and in more competitive industries. The interpretation of the observed phenomena is that the high-CSR firms are regarded as more trustworthy.

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#### **KEYWORDS**

Corporate social responsibility; trust; monetary contraction; trade credit

# 1. Introduction

Corporate social responsibility (CSR) refers to companies' responsibility for society in the context of sustainable development. Over the past few decades, US companies have taken CSR into careful consideration in the process of decision-making. Based on the Report on US Sustainable, Responsible and Impact Investing Trends (US Social Investing Forum, 2018), US sustainable and responsible investment has increased from USD 639 billion to USD 12 trillion over 1995-2018, at a compound annual growth rate of 13.6 percent. Existing studies show that CSR helps mitigate concerns about information asymmetries and enhance trust between parties, thus lowering transaction costs (e.g., Arrow, 1974; Flammer, 2018; Jones, 1995; Ring & Van de Ven, 1992). This in turn probably affects the transmission of macroeconomic shocks. However, to date, little empirical evidence has been provided to document the relationship between CSR and macroeconomic shocks.

This paper investigates how CSR affects monetary policy transmissions via the trade credit channel. Trade credit, facilitating the purchase of goods and service with delayed payment, is a type of informal credit. It is an important financing option, second only to bank credit. The Survey of Small Business Finance conducted by the Federal Reserve Board (1987, 1993, 1998, 2003) reports that 60 percent of small business uses trade credit in the United States. The Bank for the International Settlement (2014) reports that twothirds of global trade takes place on trade credit around the world. Trade credit accounts

All authors contributed equally to this work.

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for 35 percent of firms' total current liabilities in our sample of 2,290 firms from 1995Q1 to 2014Q1. This is indeed a large fraction of debt financing.

We use the monetary policy index developed by Nakamura and Steinsson (2018) as our principal measure of monetary policy shock. Firm-level CSR is proxied by a combination of information about firms' environmental and social performance. We use firms' accounts payable as the measure of trade credit received from suppliers. In the analyses, we scale accounts payable by the book value of total assets at the beginning of the corresponding period. A set of firm-level control variables, including firm size, Tobin's Q, long-term debt, operation scales, scale changes, inventory stocks, and retained earnings, are contained in our econometric regression model. These variables are divided by total assets at the beginning of the period.

We find that firms with higher levels of CSR have better access to trade credit in response to monetary contraction shocks than similar firms with lower levels of CSR. To better understand the economic magnitude, we consider a hypothetical "average-CSR" firm whose CSR equals the sample mean and a hypothetical "high-CSR" firm whose CSR is one standard deviation higher than the average. Our results show that a one-standard-deviation monetary contraction shock is associated with an increase in accounts payable of 0.085 percent of total assets for the average firm and an increase of 0.118 percent for the high-CSR firm. Thus, the high-CSR firm experiences a 39 percent (= (0.118 - 0.085)/0.085) larger expansion in the use of trade credit than the average firm in response to a one-standard-deviation monetary contraction shock.

Trade credit, however, usually involves general equilibrium effects. The positive impact of monetary contraction shocks on trade credit can be due to either suppliers' willingness to extend more trade credit or customers' higher demand for trade credit. To assume away this problem, prior financial literature (e.g., Petersen & Rajan, 1997) generally presupposes that firms will accept any credit offered. Thus, the amount of trade credit firms can use depends completely on their suppliers' willingness. This current paper relaxes this presupposition and follows a similar strategy with Love, Preve, and Sarria-Allende (2007). The strategy depends on firms' liquidity needs with exogenous monetary contraction shocks. Firms with higher liquidity needs are likely to take any credit offered, especially during periods of monetary contraction, as credit is a scare resource for those firms. Thus, it is inferred that high-liquidity-needs firms can benefit more from greater CSR. To test our predictions, we divide the sample into two subsamples based on firms' industry-level liquidity needs. The estimation results show that high-liquidity-needs firms with higher levels of CSR obtain more trade credit than similar firms with lower levels of CSR during periods of monetary contraction. Specifically, among firms with relatively high liquidity needs, the high-CSR firm obtains 47 percent more trade credit than the average firm after a one-standard-deviation monetary contraction shock. As with firms with relatively low liquidity needs, the relationship between CSR and trade credit under monetary contractions is insignificant. Our results still hold if we control for the industry-specific time-fixed effects or exclude the interaction of monetary policy with profitability, corporate governance, product quality, and brand capital.

Our interpretation of high-CSR firms' advantage in access to trade credit under monetary contractions is that those firms are more trustworthy. We exploit variations in regional social trust and industry-level market competitiveness to provide evidence for this interpretation. First, we find that CSR facilitates firms' access to trade credit more under monetary contractions if such firms are located in high-trust regions. This finding is consistent with Putnam's (2000) argument that an agent's social capital is more valuable in regions with higher overall social capital. Second, in dividing our sample into two subsamples based on the degree of market competitiveness, we find that in industries where companies face higher degrees of competition, CSR activities are more likely to pay off and help companies obtain more trade credit during monetary contraction periods. This finding is in line with Flammer's (2018) argument that a credit signal of trustworthiness is especially valuable in industries with a higher degree of market competitiveness.

# 2. Theories and hypotheses

# 2.1. Corporate social responsibility, trade credit and monetary contractions

Contractionary or expansionary monetary policy shocks have substantial effects on macroeconomic conditions and business activities. For instance, the literature has reported that monetary policy shocks lead to significant changes in industrial production (Auer, Bernardini, & Cecioni, 2021), unemployment (Miranda-Agrippino & Ricco, 2021), inflation (Inoue & Rossi, 2021), exchange rate (Yang & Zhang, 2021), and agents' expectations (Nakamura & Steinsson, 2018). According to the estimate by Miranda-Agrippino and Ricco (2021), a shock of 100-basis-point increase in the 1-year treasury rate would cause industrial production to decline by over 1% for months.

Credit markets are also greatly impacted by the monetary policy. Following Meltzer's (1960) contribution, a large body of literature has discussed the relationship between monetary policy and trade credit. For example, Choi and Kim (2005) use US data and find that a monetary contraction shock is associated with an increase in trade credit received. Mateut, Bougheas, and Mizen (2006) use UK data and show that firms using less bank credit experience a larger increase in the ratio of trade credit to bank credit during periods of monetary recession. In sum, existing studies show that firms use more trade credit in response to monetary contraction shocks.

Trade credit allows customers to purchase goods and services without immediate payment. In contrast with other types of credit, such as bank loans, trade credit is not collateralized by physical capital or guaranteed by third parties or financial institutions. Information asymmetries between suppliers and customers will incur a hold-up problem. Trust between suppliers and customers can mitigate information asymmetries because the two parties are likely to disclose information more openly and honestly (Dyer & Chu, 2003). Thus, trust facilitates the use of trade credit. As Guiso, Sapienza, and Zingales (2004) note, whether suppliers offer trade credit to their customers depends not only on the legal enforceability of the contract but also on the extent to which the suppliers believe their customers are trustworthy. Wu, Firth, and Rui (2014) use firm-level data from China and find that firms in regions with higher levels of social trust receive more trade credit. Levine, Lin, and Xie (2018) show that liquidity-dependent firms in countries with higher levels of social trust receive more trade credit during banking crises than similar firms in countries with lower levels of social trust. CSR is a critical determinant in the bundle of trust. First, CSR is likely to be a form of self-regulation under which firms will promise to maintain ethical standards in their activities and take responsibility for their actions. Being socially responsible may circumscribe firms' short-term opportunistic behaviors (Benabou & Tirole, 2010) and thus force firms to behave as "good citizens" and non-opportunistic business partners (Flammer, 2018). In this vein, high CSR reduces firms' opportunistic behaviors such as corruption (Luo, 2006) and corporate fraud (Harjoto, 2017), which enhances firms' trustworthiness. Second, high-CSR firms have more incentives to disclose their CSR strategies (Dhaliwal, Li, Tsang, & Yang, 2011) and tend to offer assurance of such reports by third parties to increase the credibility of such reports (Simnett, Vanstraelen, & Chua, 2009). As a result, high CSR can increase the transparency of firms' engagement in social activities and promote the reliability of the CSR report, which mitigates information asymmetries (Cheng, Ioannou, & Serafeim, 2014) and increases firms' trustworthiness.

The close relationship between CSR and trust is also acknowledged by public organizations, corporate managers and scholars. First, the World Business Council for Sustainable Development (2000) defines CSR as "the commitment of a business to contribute to sustainable economic development, working with employees, their families, the local community and society at large to improve the quality of life". This definition involves civic engagement, shared beliefs, and disposition toward cooperation, which maps directly into the theoretical foundations of social capital. Next, corporate managers believe that they could build firms' social capital and trust via their engagement in CSR activities. For example, business surveys conducted by PricewaterhouseCoopers (2013, 2014) find that CEOs have plans to engage more in CSR activities to restore their trust with stakeholders after the 2008 financial crisis. Finally, from the academic perspective, Lins, Servaes, and Tamayo (2017) find that CSR can help firms build social capital and trust to offset the impact of the negative shock to an overall level of trust in corporations and markets.

Based on the arguments above, firms intend to use more trade credit in response to monetary contraction shocks. High-CSR firms can receive more trade credit since they are more trustworthy. This leads to the following hypothesis:

# **Hypothesis 1a (H1a)** *Firms with higher levels of CSR can use more trade credit in response to monetary contraction shocks than firms with lower levels of CSR.*

As noted before, trade credit usually involves general equilibrium effects. To identify the supply effects on trade credit, we relax the general presupposition that firms will accept any trade credit offered. We presuppose that firms with high levels of liquidity needs will take any trade credit offered, especially during tight credit periods, because credit is a scarce resource for those firms. Under this new presupposition, CSR can help high-liquidity-needs firms more in terms of obtaining trade credit. This leads to the following hypothesis:

**Hypothesis 1b (H1b)** *High-liquidity-needs firms with higher levels of CSR can use more trade credit in response to monetary contraction shocks than similar firms with lower levels of CSR.* 

# 2.2. Regional social trust

Our main argument is that high-CSR firms can obtain more trade credit from their suppliers because they are thought to be more trustworthy. CSR affects the use of trade credit under monetary contractions via the channel of trust. We exploit regional variation in social trust to support our argument. Putnam (2000) argues that the value of an agent's social capital increases as overall social capital increases. Based on this argument, Lins et al. (2017) find that high-CSR firms in regions with high social trust experience smaller contractions in stock returns during financial crises than similar firms in regions with low social trust. Framing the argument in our context, we have the following hypothesis:

**Hypothesis 2 (H2)** *High-CSR firms in regions with high social trust use more trade credit in response to monetary contraction shocks than similar firms in regions with low social trust.* 

# 2.3. Market competitiveness

In the trade credit contract, suppliers bear the risk that their customers will not repay the debt in the future. Suppliers will have fewer incentives to provide trade credit if the risk increases. Since market competition might reduce profit margins, we infer that firms in more competitive industries have higher risks of defaulting. Suppliers are less likely to believe that those firms can repay the debt in the future. Thus, the relationship between CSR and trade credit under monetary contractions is disproportional. Those firms in more competitive industries will benefit more from greater CSR in terms of obtaining trade credit.

As Bennett, Pierce, Snyder, and Toffel (2013) and Flammer (2018) note, in industries with fierce competition, firms may engage more corrupt and unethical behaviors to reduce costs. Based on this argument, firms can use CSR as a signal strategy to inform their suppliers that they will maintain ethical standards in their activities and are trustworthy. Thus, greater CSR is an advantage for firms in industries with fierce competition looking to obtain trade credit.

Accordingly, we expect that being trustworthy is stronger in more competitive industries. This leads to the following hypothesis:

**Hypothesis 3 (H3)** The positive relationship between CSR and trade credit under monetary contractions is stronger in more competitive industries.

# 3. Data

We obtain the firm-level data from the quarterly Compustat files of North America. The dataset provides detailed information about balance sheets, income statement of cash flow and supplemental data items for over 24,000 publicly held companies. The sample periods extend from 1995Q1 to 2014Q1. We then restrict the firms covered in the sample

based on the following conditions: first, we drop firms in the utilities (4-digit Standard Industrial Classification (SIC) code from 4900 to 4999) and financial sectors (SIC code from 6000 to 6799); next, we exclude observations with a negative value of total assets, accounts payable, and costs of goods sold; third, to avoid potential errors incurred by possible outliers, we eliminate the top and bottom 1% value of each firm variable, including both dependent and independent variables; finally, we ensure that every firm in the sample has at least 2 years (8 quarters) of observations. Our ultimate sample contains 2,290 firms adding up to 62,268 observations. Every firm in the sample on average has over 27 observations.

Other than firm-level accounting data, we follow Lins et al. (2017) to construct the measure of CSR. We describe how to construct CSR in detail later. The original data are from MSCI ESG KLD STATS. This dataset provides information about environmental, social, and governance (ESG) performance indicators applied to a universe of publicly held companies at a yearly frequency.

# 3.1. Trade credit

This paper focuses on the relationship between CSR and firms' access to trade credit under monetary contractions. Following the literature related to trade credit (e.g., Love et al., 2007; Wu et al., 2014), we use accounts payable ( $AP_{i,l}$ ) as the measure of the volume of trade credit received. Accounts payable refer to the purchase of service and goods without immediate payment. In our analyses, we follow Choi and Kim (2005) and scale accounts payable by firms' total assets ( $AT_{i,t-1}$ ) at the beginning of the period. We report the descriptive statistics of trade credit (TC) in Table 1. The mean and median values of the ratio of accounts payable to total assets are 7.4 percent and 5.67 percent, respectively, with a standard deviation of 0.0627.

# 3.2. Corporate social responsibility

We collect firms' CSR information from MSCI ESG KLD STATS. This database presents environmental, social, and government ratings of roughly 3,000 US corporations at a yearly frequency and has been widely used in emerging literature investigating how CSR affects firm performance.<sup>1</sup> ESG STATS provide information on environmental, social, and governance performance in 13 different categories: community, diversity, employee relations, environment, human rights, product, alcohol, gambling, firearms, military, nuclear, tobacco, and corporate governance. Lins et al. (2017) pay close attention to the first five categories following Servaes and Tamayo (2013). The authors exclude the categories of product and corporate governance because these two categories are considered to contain components beyond the scope of CSR. They do not consider the categories involved in penalizing participation in the six controversial industries, as firms

<sup>&</sup>lt;sup>1</sup>For example, Hong and Kostovetsky (2012) use CSR to test whether fund managers making donations to Democratic candidates prefer tilting their portfolios toward stocks with a high level of CSR compared to non-donors or Republican donors. Deng et al. (2013) find that acquirers benefit from high CSR in terms of short- and long-run merger performance, the time cost and the probability of completing a merger. Borisov, Goldman, and Gupta (2016) show that the value associated with lobbying decreases more for firms with a worse CSR reputation in response to a guilty plea. For more literature related to CSR, please refer to Servaes and Tamayo (2013), Krüger (2015) and Lins et al. (2017).

	Mean	Min	Max	Median	S.D.
Dependent variable					
TC (%) (Trade credit received)	7.40	0.31	40.27	5.67	6.27
Core independent variables of interest					
MP (Monetary policy index)	0.0046	-0.089	0.041	0.0070	0.021
CSR (Corporate social responsibility)	-0.19	-1.53	1.74	-0.21	0.50
Firm-level control variables					
log(AT) (Firm size)	7.08	3.69	11.34	6.97	1.50
$(log(AT))^2$ (Firm size squared)	52.45	13.64	128.54	48.55	22.25
Tobin'sQ (%) (Tobin's Q)	199.15	76.11	825.96	164.04	111.51
COGS/AT (%) (Operation scales)	17.34	0.55	91.43	13.72	14.26
△ COGS/AT (%) (Operation scale changes)	0.26	-14.54	14.85	0.19	2.84
INVT/AT (%) (Inventory stock)	10.62	0	57.31	8.21	10.79
<i>RE/AT</i> (%) (Retained earnings)	5.01	-657.88	104.80	21.99	76.53
<i>DLTT/AT</i> (%) (Long-term debt)	17.87	0	89.45	14.82	17.73
Industry-level liquidity needs					
Inventories/sales (%)	12.51	0	60	13.22	7.70
Cash conversion cycles	81.32	0	285.51	87.43	46.53

#### Table 1. Summary statistics.

Note: In the regressions, we normalize the measure of *MP* and *CSR* to zero mean and unit standard deviation. These transformations will facilitate our calculation about the economic significance of the estimated effects.

in those industries can do nothing to change their CSR ratings except exiting those industries.

Lins et al. (2017) compute CSR as follows. First, to coordinate the possible different measurement varying over time, the authors scale every firm-year strength (concern) of each category by the maximum rating value of strengths (concerns) of the corresponding category in that corresponding year. This step yields an index of strengths (concerns) ranging from 0 to 1 for each category-year observation. Next, the index of net CSR for each category-year is obtained by subtracting the index of strengths from that of concerns, ranging from -1 to 1. Finally, the authors accumulate the net CSR index over the five categories, namely, community, diversity, employee relations, environment, and human rights, to obtain the primary measure of CSR whose range is from -5 to 5.

The level of CSR varies substantially across firms. Online Appendix Figure A1 demonstrates the distribution of firms' CSR levels in each year. It is shown that the variations of CSR across firms are substantial. During the sample period, the first quartile, median, and third quartile of CSR did not vary largely, indicating that a specific firm's CSR is generally stable over time. As reported in Table 1, in the sample, the lowest CSR score is -1.53, and the highest score is 1.74. The mean and median values of CSR in the sample are -0.19 and -0.21, respectively, with a standard deviation of 0.50. To facilitate our calculation about the economic significance of the estimated effects, we normalize the measure of CSR to zero mean and unit standard deviation, and use the normalized value in the regressions.

# **3.3.** Monetary policy

An appropriate measure of monetary policy (MP) is essential for our analyses. Our baseline analyses use the monetary policy index developed by Nakamura and Steinsson (2018). They construct this measure using a high frequency identification (HFI) strategy that depends on the unexpected change in the policy indicator within a 30-minute

window surrounding the scheduled fed announcement. In contrast with other studies using HFI to identify monetary policy, Nakamura and Steinsson (2018) use a composite measure of changes in interest rates at five different maturities: the federal funds rate immediately following the FOMC meeting, the expected federal funds rate immediately following the next FOMC meeting, and expected 3-month eurodollar interest rates at horizons of two, three, and four quarters. The raw data are at a monthly frequency. We convert monthly data to a quarterly frequency by using the arithmetic mean of the monthly value within the corresponding quarter. An increase in *MP* reflects a monetary contraction. We normalize the measure of *MP* to zero mean and unit standard deviation, and use the normalized value in the regressions.

This paper focuses on the impact that corporate social responsibility has on trade credit during periods of monetary contraction. It is crucial to ensure that our results are not sensitive to alternative measures of monetary policy. Jarociński and Karadi (2018) also identify monetary policy shocks based on high frequency identification. They provide two measures of monetary policy index. One combines HFI and sign restrictions. The other combines HFI and "poor man's" sign restrictions. For illustrative purpose, the evolutions of the latter monetary policy index and our primary monetary policy index are presented in Online Appendix Figure A2. It can be observed from the figure that the alternative index provided by Jarociński and Karadi (2018) is highly correlated with but not identical to our primary monetary policy index developed by Nakamura and Steinsson (2018). The correlation coefficient between these two indices is 0.78. In robustness check section, we report the estimation results based on the alternative measures of monetary policy.

# 3.4. Industry-level liquidity needs

An appropriate index of industry-level liquidity needs is important for our analyses. Some industries require more liquid funds for certain technical reasons, such as a long production process. Firms in industries with relatively high liquidity needs may obtain more trade credit from their suppliers in response to monetary contraction shocks, and thus, CSR may have a larger impact.

We follow Raddatz (2006) and use data from Compustat to construct the measure of industry-level liquidity needs. In our analyses, liquidity needs are proxied by the ratio of inventories to sales. Raddatz (2006) argues that this ratio captures the fraction of inventories financed by ongoing revenues. The higher this ratio is, the higher the level of industry-level liquidity needs. We calculate industry-level liquidity needs based on the following two steps. First, for each firm, we calculate the sum of inventories and the sum of total sales over the relevant periods, and then compute the overall ratio of all firms within the corresponding industry as the measure of industry-level liquidity needs. In this paper, we divide our sample firms into 56 industries based on two-digit SIC codes. We restrict the sample to the period from 1975 to 1994, which ensures that the measure of liquidity needs is predetermined. (If the sample period is extended to 2015 and we construct the measure following the same procedures as previously, we find that the former measure is highly correlated with the latter one.) Industries are classified into "high-liquidity-needs industries" and "low-liquidity-needs industries" depending on whether their measures of

industry-level liquidity needs are above the median of all industries. Firms are grouped into the "high" and "low" groups based on the industries they belong to.

The summary statistics of industry-level liquidity needs are reported in Table 1. The mean and median values of this variable are 12.51 percent and 13.22 percent, respectively, with a standard deviation of 0.077. The industry group of transportation service (SIC code 47) and social services (SIC code 83) have the lowest value of liquidity needs, 0, whereas the industry group of Building Constructions – General Contractors & Operative Builders (SIC code 15) has the highest liquidity needs, 60 percent.

To check the robustness of our results, in robustness check section we inspect whether our results still hold if we divide our sample based on another measure of industry-level liquidity needs. The alternative measure is cash conversion cycles (*CCC*) developed by Richards and Laughlin (1980). It is equal to the days of inventory outstanding (*DIO*) plus days of sales outstanding (*DSO*) and minus days payables outstanding (*DPO*). We measure *DIO* by the ratio of inventories to costs of goods sold multiplied by 365, *DSO* by the ratio of account receivable to sales multiplied by 365, and *DPO* by the ratio of account payable to costs of goods sold multiplied by 365. *CCC* traces the lifecycle of cash used for a business activity. It follows the cash as it is first converted into inventory and accounts payable, then into expenses for product or service development, through sales and accounts receivable, and then back into cash in hand. Essentially, *CCC* represents how fast a company can convert the invested cash from start (investment) to end (returns). The higher the *CCC* is, the higher the degree of liquidity needs.

# 3.5. Firm-level control variables

We include firm-fixed effects in our empirical specification to control for time-invariant unobservable firm characteristics that are likely to affect firms' access to trade credit. For example, firms' ownership structure is related to their access to credit markets (Lin & Ye, 2018), which may in turn affect their ability to receive trade credit from their suppliers. Some firm-specific time-varying characteristics are considered to have a substantial impact on firms' access to trade credit, and hence, these variables should be included as controls in our regressions. We select these control variables following Choi and Kim (2005) and Levine et al. (2018). To mitigate the concern about endogeneity, we lag some control variables for one period.

*Firm size*. The impact of firm size on trade credit received is unclear. On the one hand, large firms may have a reasonable amount of financial standing and goodwill which could facilitate their access to trade credit. On the other hand, Peterson & Rajan (1997) and Choi and Kim (2005) find that firm size is negatively associated with trade credit received because investment opportunities decline in firm size. We use the natural logarithm of one-period-lagged total assets ( $log(AT_{i,t-1})$ ) as the measure of firm size. In addition, following Choi and Kim (2005) and Wu et al. (2014), we add the squared term of firm size, ( $log(AT_{i,t-1})$ )<sup>2</sup>, to capture the possible nonlinear effects of firm size.

*Tobin's* Q. Tobin's Q is defined as the ratio of a firm's market value to the replace cost of its book value. In our analyses, firms' book value is proxied by their total assets. The market value of a company is equal to the sum of its total assets, the product of equity price  $(PRCC_{i,t})$  timing common shares outstanding  $(CSHO_{i,t})$  and minus common/

ordinary equity ( $CEQ_{i,t}$ ). Tobin's Q can reflect a firm's investment opportunities. A firm is likely to increase its investment and thus needs more trade credit if Tobin'sQ is larger than one.

Operation scales and scale changes. Since firms use trade credit for the purpose of transactions, the volumes of trade credit are associated with firms' operation scales. Following existing studies (e.g., Choi & Kim, 2005; Love et al., 2007), we use firms' costs of goods sold ( $COGS_{i,t}$ ) to index their operation scales and scale this variable by firms' total assets lagged for one period. We also include the ratio of changes in costs of goods sold to one-period-lagged total assets in our regressions.

Stock of inventory. The relationship between inventories and the use of trade credit is unclear. On the one hand, firms can easily liquidate their inventories during periods of tight credit. Thus, they may depend on trade credit less. On the other hand, firms with excessive inventories may face a cash-flow shortfall and require more trade credit. We scale firms' inventories ( $INVT_{i,t-1}$ ) by their total assets ( $AT_{i,t-1}$ ).

*Retained earnings*. Choi and Kim (2005) find that retained earnings are negatively associated with the use of trade credit, implying that firms with more internal funds depend less on external financing. We include the ratio of retained earnings ( $RE_{i,t-1}$ ) to total assets ( $AT_{i,t-1}$ ) as a control variable.

*Long-term debt*. We follow Levine et al. (2018) and control for the one-period-lagged ratio of long-term debt ( $DLTT_{i,t-1}$ ) to total assets ( $AT_{i,t-1}$ ).

# 4. Empirical analyses

This section presents the empirical analyses. We start by examining whether the impact of monetary contraction on trade credit is affected by a firm's CSR level. Then, we conduct a set of robustness checks on our benchmark results. Finally, we extend our analyses to investigate the roles played by regional social trust and the degree of market competitiveness.

# 4.1. Main results

Figure 1 presents some preliminary visual results. The sample firms are assigned to two groups. One is the high-CSR group whose CSR in a given period is above the median in that period, whereas the other one is the low-CSR group whose CSR in a given period is below the median in that period. Firm-fixed effects are excluded from the trade credit to total asset ratio and CSR. Figure 1(a) presents the relationship between monetary policy index and the mean of trade credit in the high-CSR group, and Figure 1(b) presents the low-CSR group. We can see that in the high-CSR group, the use of trade credit rises more as the degree of monetary contraction intensifies, which is in line with our conjecture.

To quantitatively assess whether firms with higher levels of CSR receive more trade credit than other firms in response to monetary contraction shocks, we begin our analyses using the following empirical specification:

$$TC_{i,t} = \beta_0 + \beta_1 * MP_t * CSR_{i,t} + \beta_2 * MP_t + \beta_3 * CSR_{i,t} + \Theta * \mathbf{Firm}_{i,t} + u_i + \varepsilon_{i,t} \quad (1)$$



(b) Low-CSR group

**Figure 1.** Correlations between monetary policy index and trade credit for firm groups with different CSR levels. Note: This figure shows the relationship between monetary policy index and the mean value of the trade credit to total assets ratio (%) for two firm groups with different CSR levels. Firm-fixed effects are excluded from the trade credit to total asset ratio and CSR. Figure 1(a) presents the relationship for firms with CSR in a given period above the median in that period. Figure 1(b) presents the relationship for firms with CSR in a given period below the median in that period.

where  $TC_{i,t}$  denotes trade credit received by firm *i* during period *t*, measured by the ratio of firm *i*'s accounts payable  $(AP_{i,t})$  in period *t* to one-period-lagged total assets  $(AT_{i,t-1})$ .  $CSR_{i,t}$  denotes firm *i*'s CSR in period *t*. It equals firm *i*'s CSR at the beginning of the corresponding year.  $MP_t$  is the monetary policy index developed by Nakamura and Steinsson (2018). **Firm**<sub>*i*,*t*</sub> is a vector of time-varying firm variables (e.g., firm size, Tobin's Q, and operation scales) introduced in the previous section. We control for firmfixed effects,  $u_i$ , in equation (1).  $\varepsilon_{i,t}$  is the error term. Heteroscedasticity robust standard errors are clustered at the firm and quarter levels.

We are primarily interested in the coefficient of the interaction between  $MP_t$  and  $CSR_{i,t}$ ,  $\beta_1$ . It captures firms' differential responses to monetary contraction shocks with different levels of CSR. According to **H1a**, higher CSR helps firms obtain more trade credit during periods of monetary contraction. Thus, a positive  $\beta_1$  supports this hypothesis.

The results are presented in column (i) of Table 2. We have two findings. First, the coefficient on  $MP_t$  is positive and highly significant (t = 8.28), suggesting that firms will use more trade credit in response to monetary contraction shocks. This finding is consistent with existing studies (e.g., Choi & Kim, 2005). Second, more importantly, the coefficient on interaction term,  $MP_t * CSR_{i,t}$ , is positive and highly significant (t = 3.20), suggesting that firms with higher levels of CSR receive more trade credit than other firms under monetary contractions. This finding is consistent with **H1a**. It is concerned that firm characteristics may be associated with CSR. For example, large firms invest more in CSR. Thus, the impact of CSR on monetary policy transmissions may merely be a result of large firm size. To better isolate the association between CSR and trade credit under monetary contractions, we additionally control for the interactions between  $MP_t$  and **Firm**<sub>*i*,*t*</sub>. This approach allows the impact of monetary contraction on trade credit to vary by firm size, inventory and so on. We present the results in Online Appendix Table A1. Our finding about the significant positive value of  $\beta_1$  still holds.

The economic magnitudes are substantial. To see this, consider a hypothetical "average-CSR" firm with  $CSR_{i,t}$  equal to the sample average value (-0.19) and a hypothetical "high-CSR" firm with  $CSR_{i,t}$  one standard deviation higher than the average (0.31 = -0.19 + 0.50). Furthermore, hold everything else about these firms constant. The estimated coefficient indicates that a one-standard-deviation monetary contraction shock is associated with an increase in trade credit received of 0.085 percent of the firms' total assets for the average-CSR firm and an increase of 0.118 percent (= 0.085% + 0.033%) for the high-CSR firm. Thus, the high-CSR firm receives 39 percent (= 0.033/0.085) more trade credit than the average firm after a one-standard-deviation shock of monetary contraction.

To further identify the supply effects, we check the heterogenous impacts of CSR on trade credit under monetary contractions. Our strategy relies on firms' liquidity needs with exogenous monetary contraction shocks. The sample is divided into two groups based on firms' industry-level liquidity needs. Firms in industries whose liquidity needs are above the median are assigned to the "high" group, and the other firms are assigned to the "low" groups. We then estimate equation (1) for these two groups, separately, and compare their values of coefficient  $\beta_1$ . A larger  $\beta_1$  for the high group favors H1b.

		Liquidit	y needs
	Full sample	High	Low
Variable	(i)	(ii)	(iii)
$MP_t * CSR_{i,t}$	0.033***	0.066***	0.0035
,	(0.010)	(0.015)	(0.014)
MPt	0.085***	0.14***	0.026*
	(0.010)	(0.016)	(0.013)
CSR <sub>i,t</sub>	0.078***	0.044*	0.11***
	(0.016)	(0.023)	(0.022)
$log(AT_{i,t-1})$	0.067	0.70*	-0.60*
	(0.27)	(0.40)	(0.34)
$(log(AT_{i,t-1}))^2$	-0.026**	-0.045**	-0.0033
	(0.012)	(0.018)	(0.016)
Tobin'sQ <sub>t-1</sub>	0.15***	0.22***	0.085***
	(0.018)	(0.027)	(0.024)
$COGS_{i,t}/AT_{i,t-1}$	3.70***	4.68***	2.93***
	(0.066)	(0.10)	(0.085)
$\Delta COGS_{i,t} / AT_{i,t-1}$	-0.038**	-0.068***	-0.023
	(0.014)	(0.021)	(0.021)
$INVT_{i,t-1}/AT_{i,t-1}$	0.29***	-0.39***	1.23***
	(0.059)	(0.070)	(0.11)
$RE_{i,t-1}/AT_{i,t-1}$	-0.38***	-0.92***	-0.12***
	(0.036)	(0.062)	(0.041)
$DLTT_{i,t-1}/AT_{i,t-1}$	-0.095***	-0.11***	- 0.094***
	(0.022)	(0.036)	(0.029)
Firm-fixed effect	Yes	Yes	Yes
F-Statistic $(\beta_{1,H} - \beta_{1,L} = 0)$		9.45***	
Observations	62,268	28,808	33,460
Number of firms	2,290	973	1,317
Adj- <i>R</i> <sup>2</sup>	0.86	0.85	0.85

#### Table 2. Main results.

Note: Statistical significance: \*\*\*p < 0.01; \*\*p < 0.05; \*p < 0.1. Heteroscedasticity robust standard errors clustered at the firm and quarter levels are reported in parentheses. This table presents the results of equation (1):

 $TC_{i,t} = \beta_0 + \beta_1 * MP_t * CSR_{i,t} + \beta_2 * MP_t + \beta_3 * CSR_{i,t} + \Theta * Firm_{i,t} + u_i + \varepsilon_{i,t}$ .  $TC_{i,t}$  denotes trade credit received of firm *i* during period *t*. Recall that it is equal to the ratio of firm *i*'s accounts payable ( $AP_{i,t}$ ) in period *t* to one-period-lagged total assets ( $AT_{i,t-1}$ ).  $CSR_{i,t}$  denotes firm *i*'s CSR in period *t*.  $MP_t$  is the monetary policy index developed by Nakamura and Steinsson (2018). Firm\_{i,t} is a vector of time-varying firm variables (e.g., firm size, Tobin's Q, and inventory stock) introduced in the previous section. We control for firm-fixed effects,  $u_i$ , in equation (1).  $\varepsilon_{i,t}$  is the error term. Column (i) presents the results on the full sample. Columns (ii) and (iii) show the results on the high-liquidity-needs group and the low-liquidity-needs group, respectively. We use the ratio of inventories to sales to measure liquidity needs. The high group means that the ratio is above the median value, while the low group means the ratio is below the median.  $\beta_{1,H}$  and  $\beta_{1,t}$  are the estimators of the high group and the low group, respectively.

Columns (ii) and (iii) in Table 2 present the results for the high and low groups, respectively. The coefficient of the interaction term,  $MP_t * CSR_{i,t}$ , for the high group is positive and highly significant (t = 4.30). As with the low group, the coefficient loses its statistical significance. Furthermore, we can see that the coefficient for the high group is much larger than that for the low group (0.066 vs. 0.0035). The F-statistic of 9.45 indicates that the difference between them is highly significant. The result suggests that high-liquidity-needs firms with higher CSR receive more trade credit than similar firms with lower CSR during monetary contraction periods, which is consistent with H1b. Specifically, among firms in industries with high liquidity needs, the high-CSR firm receives 47 percent (= 0.066/0.14) more trade credit than the average-CSR firm after a one-standard-deviation monetary contraction shock. The coefficient on the interaction

term is not significant for firms in the low-liquidity-needs group. This result suggests that CSR mainly works for high-liquidity-needs firms.

### 4.2. Robustness checks

In this subsection, we check the robustness of our results. We first control for industryspecific time-fixed effects. Then, we control for other relevant firm characteristics. Moreover, we use instrumental variable estimation to see whether our results hold. Finally, we use alternative measures of monetary policy and industry-level liquidity needs.

# 4.2.1. Control industry-specific time-fixed effects

Firms' CSR may be related to industrial characteristics. For example, firms with high demand for trade credit may invest more in CSR for some precautionary reasons. Thus, high-CSR firms may be equally trustworthy as low-CSR firms but face high demand for trade credit. If this is the case, our results simply capture the impact of the demand channel on the relationship between monetary contractions and trade credit, not the trust channel. In addition, one main concern about our benchmark analyses is the possibility that our results simply capture the effect of the aggregate time trend common to all firms. For example, during expansionary periods, central banks may implement "leaning against the wind" monetary policy (monetary contractions). Meanwhile, firms increase their investment in CSR and the use of trade credit. If this is the case, an omitted variable bias may arise if we do not exclude the effect of the aggregate time trend.

To address these concerns, we control for industry-specific time-fixed effects.<sup>2</sup> Thus, the level effect of monetary policy is absorbed by the time-fixed effects. The new empirical specification is:

$$TC_{i,t} = \beta_0 + \beta_1 * MP_t * CSR_{i,t} + \beta_2 * CSR_{i,t} + \Theta * \mathbf{Firm}_{i,t} + u_i + u_{j,t} + \varepsilon_{i,t}$$
(2)

where  $u_{j,t}$  denotes the industry-specific time-fixed effects. Other variables are the same as in equation (1).

We present the results in Table 3. The order of the results is the same as in Table 2. The results are qualitatively same with our benchmark analyses. The coefficient on the interaction,  $MP_t * CSR_{i,t}$ , is positive and highly significant (t = 2.67). This result suggests that a monetary contraction is associated with a larger increase in trade credit received for the high-CSR firm. The economic magnitude does not change much compared to the benchmark analyses (0.029 vs. 0.033). Furthermore, when dividing our sample firms into two groups based on firms' liquidity needs like our benchmark analyses, we find that the coefficient on the interaction term keeps its significance (t = 3.19) for the high group but loses its significance for the low group. The F-statistic implies that the difference between these two groups is statistically significant. If we exclude the impact of other firm-level controls (e.g., firm size, Tobin's Q) on the

<sup>&</sup>lt;sup>2</sup>To exclude the effects of the demand channel, we can add the interactions of monetary contractions and industry dummies to equation (1). As with the effects of the aggregate time trend, we can control for time-fixed effects. Both effected are absorbed by industry-specific time-fixed effects.

		Liquidity	/ needs
Variable	Full sample (i)	High (ii)	Low (iii)
$MP_t * CSR_{i,t}$	0.029***	0.050***	0.0031
·	(0.011)	(0.016)	(0.014)
CSR <sub>i,t</sub>	0.065***	-0.0084	0.14***
	(0.016)	(0.023)	(0.023)
Control variables	Yes	Yes	Yes
Firm-fixed effect	Yes	Yes	Yes
Industry-specific time-fixed effect	Yes	Yes	Yes
F-Statistic $(\beta_{1,H} - \beta_{1,I} = 0)$		4.85***	
Observations	62,268	28,808	33,460
Number of firms	2,290	973	1,317
Adj-R <sup>2</sup>	0.87	0.87	0.86

Table 3. Robustness check: control industry-specific time-fixed effe
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Note: Statistical significance: \*\*\*p < 0.01; \*\*p < 0.05; \*p < 0.1. Heteroscedasticity robust standard errors clustered at the firm and quarter levels are reported in parentheses. This table presents the results of equation (2):  $TC_{i,t} = \beta_0 + \beta_1 * MP_t * CSR_{i,t} + \beta_3 * CSR_{i,t} + \Theta * Firm_{i,t} + u_i + u_{j,t} + \varepsilon_{i,t}$ .  $TC_{i,t}$  denotes trade credit received of firm *i* during period *t*. Recall that it is equal to the ratio of firm *i's* accounts payable ( $AP_{i,t}$ ) in period *t* to one-period-lagged total assets ( $AT_{i,t-1}$ ).  $CSR_{i,t}$  denotes firm *i's* CSR in period *t*.  $MP_t$  is the monetary policy index developed by Nakamura and Steinsson (2018). Firm<sub>i,t</sub> is a vector of time-varying firm variables (e.g., firm size, Tobin's Q, and inventory stock) introduced in the previous section. We control for firm- and industry-specific time-fixed effects,  $u_i$  and  $u_{j,t}$ , in equation (2).  $\varepsilon_{i,t}$  is the error term. Column (i) presents the results on the full sample. Columns (ii) and (iii) show the results on the high-liquidity-needs group and the low-liquidity needs. The high group means that the ratio is above the median value, while the low group means the ratio is below the median.  $\beta_{1,H}$  and  $\beta_{1,L}$  are the estimators of the high group and the low group, respectively.

transmissions of monetary contraction shocks, our results still hold. We present these results in Online Appendix Table A2.

# 4.2.2. Control other relevant firm characteristics

In the benchmark analyses, high-CSR firms obtain more trade credit under monetary contractions because they are more trustworthy. That is to say, firms' CSR behaves like signals of trustworthiness. However, CSR can also signal other firm characteristics, which in turn affect the positive relationship between monetary contraction and trade credit. To alleviate this concern, in Online Appendix Table A1 we add the interactions of monetary policy index and firm-level controls to equation (1). This subsection considers more firm-level characteristics, including corporate governance, product quality, profitability, and brand loyalty, which are possibly related to CSR. First, firms with good governance are thought to be more trustworthy. For example, Farber (2005) argue that fraudulent firms can restore their trustworthiness by improving corporate governance. Next, firms can use CSR to signal product quality, because customers might believe that the firms that pay closer attention to quality have more incentives to invest in CSR activities (Fisman, Heal, & Nair, 2008). High-CSR firms may be equally trustworthy as low-CSR firms but care more about their product quality. Third, more profitable firms are likely to invest more in CSR because they can afford to pay expenditures on CSR activities. At the same time, such firms may obtain more trade credit from their suppliers under monetary contractions, as they are in good financial condition. If this is the case, CSR serves as a signal of firms' profitability. Fourth, firms with higher brand loyalty are likely to be

trusted by their stakeholders. These firms may strategically invest more in CSR to enhance loyalty.

As discussed above, our benchmark analyses may simply capture the effects of firms' governance, product quality, profitability, or brand loyalty. To address this concern, we add the proxies for firms' governance, product quality, profitability, and brand capital, as well as their interactions with monetary policy index, to equation (1). The new empirical specification is:

$$TC_{i,t} = \beta_0 + \beta_1 * MP_t * CSR_{i,t} + \beta_2 * MP_t + \beta_3 * CSR_{i,t} + \beta_4 * CGOV_{i,t} * MP_t + \beta_5 * CGOV_{i,t} + \beta_6 * Product_{i,t} * MP_t + \beta_7 * Product_{i,t} + \beta_8 * Profit_{i,t} * MP_t + \beta_9 * Profit_{i,t} + \beta_{10} * Brand_{i,t} * MP_t + \beta_{11} * Brand_{i,t} + \Theta * Firm_{i,t} + u_i + \varepsilon_{i,t}$$
(3)

where  $CGOV_{i,t}$ ,  $Product_{i,t}$ ,  $Profit_{i,t}$ , and  $Brand_{i,t}$  denote the proxies for corporate governance, product quality, profitability, and brand capital, respectively. We obtain the raw data of corporate governance and product quality from MSCI ESG Stats Database and construct the variables  $CGOV_{i,t}$  and  $Product_{i,t}$ , following the procedure of constructing  $CSR_{i,t}$ .  $Profit_{i,t}$  equals the ratio of firms' earnings before interest and taxes (*EBIT*) to total assets (*AT*).  $Brand_{i,t}$  denotes firm *i*'s brand capital in period *t*.<sup>3</sup> All these three variables are at a yearly frequency. Consistent with  $CSR_{i,t}$ , we let the quarterly value of the corresponding variables be identical to their value in the relevant year. We lag them for one year to mitigate the endogeneity problem. Other variables are the same as in equation (1).

Table 4 shows the estimations of equation (3). Our previous analyses still hold. First, when we use the total sample, the coefficient on the interaction term,  $MP_t * CSR_{i,t}$ , is still positive and keep its significance (t = 2.57). The economic magnitude changes little compared to the benchmark result in Table 2 (0.028 vs. 0.033). Second, when dividing our sample into two subsamples based on industry-level liquidity needs, we find that the coefficient on the interaction term for the high group is positive and keeps its significance (t = 3.43). The F-statistic, 5.66, suggests that it is significantly larger than the coefficient for the low group (0.055 vs. 0.0048). If we add the interactions of monetary policy index and firm-level controls (e.g., firm size, Tobin's Q) to equation (3), our results still hold. We present these results in Online Appendix Table A3.

# 4.2.3. Use instrumental variable estimation

Although in subsection 4.2.1 and subsection 4.2.2 we have taken actions to alleviate omitted variable bias, our baseline analyses still suffer from potential endogeneity caused by reverse causality in the relationship between CSR and firms' access to trade credit.

<sup>&</sup>lt;sup>3</sup>Following the literature, this paper defines brand capital as the accumulation of the investment in advertisement:  $Brand_{i,t} = (1 - \delta) * Brand_{i,t-1} + \frac{AdvExp_{i,t}}{CPl_t}$ ,  $Brand_{i,0} = \frac{AdvExp_{i,0}}{g + \delta}$ .  $AdvExp_{i,t}$  is firm *i*'s expenses on advertising in year *t*.  $CPl_t$  is the consumer price index in year *t*.  $AdvExp_{i,0}$  is firm *i*'s expenses on advertising in the initial year.  $\delta$  is the yearly depreciation rate of brand capital. We follow Belo, Lin, and Vitorino (2014) and set  $\delta = 50\%$ . *g* is the average growth rate of advertising expenditures and equals 10%.

		Liquidit	ty needs
	Full sample	High	Low
Variable	(i)	(ii)	(iii)
$MP_t * CSR_{i,t}$	0.028***	0.055***	0.0048
,	(0.011)	(0.016)	(0.011)
MPt	0.086***	0.13***	0.029**
	(0.010)	(0.016)	(0.013)
CSR <sub>i,t</sub>	0.087***	0.049**	0.14***
	(0.016)	(0.023)	(0.022)
$MP_t * CGOV_{i,t}$	0.0068	-0.0033	0.028*
	(0.012)	(0.018)	(0.015)
CGOV <sub>i,t</sub>	0.0055	0.039**	-0.055***
	(0.014)	(0.019)	(0.018)
$MP_t * Product_{i,t}$	0.031***	0.035**	0.0049
	(0.010)	(0.015)	(0.014)
Product <sub>i,t</sub>	-0.074***	-0.048**	-0.093***
	(0.016)	(0.024)	(0.021)
$MP_t * Profit_{i,t}$	0.013	0.021	-0.018
	(0.012)	(0.019)	(0.014)
Profit <sub>i,t</sub>	-0.0055	-0.17***	-0.034
	(0.011)	(0.032)	(0.024)
$MP_t * Brand_{i,t}$	0.017	0.025	0.019
	(0.011)	(0.018)	(0.014)
Brand <sub>i,t</sub>	0.10**	0.19**	0.062
	(0.046)	(0.075)	(0.053)
Control variables	Yes	Yes	Yes
Firm-fixed effect	Yes	Yes	Yes
F-Statistic $(\beta_{1,H} - \beta_{1,L} = 0)$		5.66**	
Observations	62,268	28,808	33,460
Number of firms	2,290	973	1,317
Adj-R <sup>2</sup>	0.86	0.85	0.85

Table 4. Robustness check: control other relevant firm characteristics.

Note: Statistical significance: \*\*\*p < 0.01; \*\*p < 0.05; \*p < 0.1. Heteroscedasticity robust standard errors clustered at the firm and quarter levels are reported in parentheses. This table presents the results of equation (3):  $\varepsilon_{i,t}$ , where  $CGOV_{i,t}$ , *Product<sub>i,t</sub>*, *Profit<sub>i,t</sub>*, and *Brand<sub>i,t</sub>* denote the proxies for corporate governance, product quality, profitability, and brand capital, respectively.  $TC_{i,t}$  denotes trade credit received of firm *i* during period *t*. Recall that it is equal to the ratio of firm *i's* accounts payable ( $AP_{i,t}$ ) in period *t* to one-period-lagged total assets ( $AT_{i,t-1}$ ).  $CSR_{i,t}$  denotes firm *i's* CSR in period *t*.  $MP_t$  is the monetary policy index developed by Nakamura and Steinsson (2018). Firm<sub>i,t</sub> is a vector of time-varying firm variables (e.g., firm size, Tobin's Q, and inventory stock) introduced in the previous section. We control for firm-fixed effects,  $u_i$ , in equation (3).  $\varepsilon_{i,t}$  is the error term. Column (i) presents the results on the full sample. Columns (ii) and (iii) show the results on the high-liquidity-needs group and the low-liquidity-needs group, respectively. We use the ratio of inventories to sales to measure liquidity needs. The high group means that the ratio is above the median value, while the low group means the ratio is below the median.  $\beta_{1,H}$  and  $\beta_{1,L}$  are the estimators of the high group and the low group, respectively.

Better access to trade credit might make firms less financially constrained and invest more in CSR activities (Hong, Kubik, & Scheinkman, 2012). To address this concern, we propose two instrumental variables (IVs) for CSR.

Following Lev and Sougiannis (1996) in their study on R&D and Hanlon, Rajgopal, and Shevlin (2003) in their study on stock return grants, we generate the first instrumental variable by computing the mean of CSR index (excluding the value of the focal firm) for each industry-year pair. The industry-year-mean of CSR is an appealing instrumental variable. On the one hand, a firm's engagement in CSR is likely to be influenced by other firms' CSR within the same industry over time. The industry-year-mean of CSR is likely to be highly correlated with a firm's CSR. Thus, this variable satisfies the relevance condition. On the other hand, how the industry-year-mean of CSR

affects one firm's access to trade credit is not immediately apparent other than through its effects on the firm's CSR. This implies that the exclusion restriction is satisfied as well.

The second instrumental variable is the blue state dummy. It equals one if a firm is headquartered in a blue or Democratic state and zero otherwise. The intuition behind this variable is that companies in the blue state are more susceptible to activists' pressure to adopt CSR policies (e.g., Albuquerque, Koskinen, & Zhang, 2019; Baron, 2001). In this vein, firms headquartered in blue states are likely to engage more in CSR activities (Di Giuli & Kostovetsky, 2014; Rubin, 2008). Thus, this blue state dummy is expected to be highly associated with firms' CSR index. Furthermore, there is little evidence to believe that the political affiliation of the state can directly affect firms' access to trade credit other than through the channel of CSR. The arguments above suggest that the blue dummy satisfies the relevance conditions and the exclusion restriction.

Table 5 shows the IV estimation results of equation (1). The F-test and the Hansen-J test suggest that the instrumental variables are valid.<sup>4</sup> The baseline results still hold. First, the coefficient of the interaction term in column (i) is positive and maintains its significance (t = 2.28). The estimated economic magnitude is larger than the baseline results (0.062 vs. 0.033). A one-standard-deviation monetary contraction shock is associated with an increase in trade credit of 0.144 percent (= 0.082% + 0.062%) of a firm's assets for the high-CSR firm, 76 percent (= 0.062/0.082) larger than that for the average-CSR firm. Second, when dividing the sample into two subsamples based on industry-level liquidity needs, the coefficient on the interaction term maintains its significance (t = 3.06) for the high-liquidity-needs group but loses its significance for the low-liquidity-needs group. The F-statistic implies that the difference between these two groups is statistically significant. Our IV estimation results are consistent with H1a and H1b.

# 4.2.4. Use alternative measures of monetary policy and liquidity needs

We inspect whether our previous results are sensitive to alternative measures of monetary policy and industry-level liquidity needs. We replace our primary monetary policy index with the indices developed by Jarociński and Karadi (2018). We utilize the cash conversion cycles as the measure of industry-level liquidity needs. Our previous results hold. The detailed analyses are reported in Online Appendix A5.

# 4.2.5. Use dynamic panel model

It is reasonable to expect the trade credit to be a persistent variable for a given firm. The level of trade credit in the current period is probably highly relevant to the level in the past period. Considering this, we revised equation (1) by including the one-period-lagged trade credit level on the right-hand side of the equation. The regression model becomes:  $TC_{i,t} = \beta_0 + \beta_1 * TC_{i,t-1} + \beta_2 * MP_t * CSR_{i,t} + \beta_3 * MP_t + \beta_4 * CSR_{i,t} + \Theta * Firm_{i,t} + u_i + \varepsilon_{i,t}$ . We estimate such a dynamic panel model using the approach of system-GMM (general-ized method of moments). The regression results are reported in Online Appendix Table

<sup>&</sup>lt;sup>4</sup>Two independent variables are instrumented: the CSR index and the interaction of monetary policy and CSR index. Sanderson-Windmeijer multivariate F-test, developed by Sanderson and Windmeijer (2016), is more suitable to test the relevance condition. Our estimation can pass this test.

		Liquidit	y needs
Variable	Full sample (i)	High (ii)	Low (iii)
$MP_t * CSR_{i,t}$	0.062**	0.15***	0.0056
	(0.027)	(0.050)	(0.032)
MPt	0.082***	0.13***	0.025*
	(0.010)	(0.016)	(0.013)
CSR <sub>i,t</sub>	-0.049	-0.11	0.069
*	(0.055)	(0.084)	(0.070)
Control variables	Yes	Yes	Yes
Firm-fixed effect	Yes	Yes	Yes
F-Statistic $(\beta_{1H} - \beta_{1L} = 0)$		6.20**	
Observations	62,268	28,808	33,460
Number of firms	2,290	973	1,317
F-Statistic 1	964.96	337.60	629.77
F-Statistic 2	508.06	262.65	257.68
Hansen J-Statistic p-value	0.68	0.52	0.30

Table J. Nobustiless Check, use instrumental variable estimat	Tabl	le 5. Robustne	ess check: u	se instrumental	variable estimatior
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Note: Statistical significance: \*\*\*p < 0.01; \*\*p < 0.05; \*p < 0.1. Heteroscedasticity robust standard errors clustered at the firm and guarter levels are reported in parentheses. This table presents the variable instrumental estimation results of equation (1):  $TC_{i,t} = \beta_0 + \beta_1 * MP_t * CSR_{i,t} + \beta_2 * MP_t + \beta_3 * CSR_{i,t} + \Theta * Firm_{i,t} + u_i + \varepsilon_{i,t}$  denotes trade credit received of firm i during period t. Recall that it is equal to the ratio of firm i's accounts payable  $(AP_{i,t})$  in period t to one-period-lagged total assets  $(AT_{i,t-1})$ . CSR<sub>i,t</sub> denotes firm i's CSR in period t. MPt is the monetary policy index developed by Nakamura and Steinsson (2018). Firm<sub>i,t</sub> is a vector of time-varying firm variables (e.g., firm size, Tobin's Q, and inventory stock) introduced in the previous section. We control for firm-fixed effects,  $u_i$ , in equation (1),  $\varepsilon_i$ , is the error term. Column (i) presents the results on the full sample. Columns (ii) and (iii) show the results on the high-liquidity-needs group and the low-liquidity-needs group, respectively. We use the ratio of inventories to sales to measure liquidity needs. The high group means that the ratio is above the median value, while the low group means the ratio is below the median.  $\beta_{1,H}$ and  $\beta_{1,l}$  are the estimators of the high group and the low group, respectively.

A7. The estimated coefficient of  $MP_t * CSR_{i,t}$  is significantly positive and supports our previous argument.

# **4.2.6.** Use a dummy to denote the CSR level and interact it with monetary policy index

In the previous estimated specifications, we have explored the interaction between CSR and the monetary policy index. However, the effect may not be linear in the level of CSR. For instance, it might depend on whether firms rank high in the CSR performance, relative to those with a low ranking. Considering this, we explore a specification where *MP* is interacted with a binary dummy denoting whether the firm has a CSR index above or below the median. The regression is based on this equation:  $TC_{i,t} = \beta_0 + \beta_1 * MP_t * D_{i,t}^{HighCSR} + \beta_2 * MP_t * D_{i,t}^{LowCSR} + \beta_3 * CSR_{i,t} + \Theta * \mathbf{Firm}_{i,t} + u_i + \varepsilon_{i,t}$ .  $D_{i,t}^{HighCSR}$  is a dummy variable that equals 1 if the CSR score of firm *i* in period *t* is above the sample median level, and 0 otherwise.  $D_{i,t}^{LowCSR} = 1 - D_{i,t}^{HighCSR}$ . The regression results are reported in Online Appendix Table A8. The estimated coefficient of  $MP_t * D_{i,t}^{HighCSR}$ are significantly positive, while the coefficient of  $MP_t * D_{i,t}^{LowCSR}$  is not significant. The results indicate that firms with a relatively high CSR ranking can use more trade credit after monetary contraction shocks than firms with a low CSR ranking. This is consistent with our previous research findings.

# 4.2.7. Use lagged firm-level control variables

In the regression specification of equation (1), we use the control variable of firms' operation scales (COGS) in period t, and the control variables of firms' other characteristics in period t - 1. To inspect whether our results are sensitive to the timing of firm-level control variables and avoid simultaneity issues, we try a regression model with COGS in period t - 1. We also try regressions with all firm-level control variables dated at t - 2, t - 3, t - 4. Our main results hold. As an illustration, Online Appendix Table A9 reports the estimates if the firm-level control variables in period t - 4 are used.

# 4.2.8. Use alternative criteria to classify firms into high- and low-liquidity-needs groups

We examine whether the positive coefficient of  $MP_t * CSR_{i,t}$  for the high-liquidity-needs firms is robust if we use alternative criteria to classify firms into high- and low-liquidityneeds groups. We consider three different classification approaches. (a) In the first approach, we compute the ratio of inventories to total sales for each firm in each period. The median of this ratio of all firms within the corresponding industry in a particular period is used as the measure of industry-level liquidity needs in that period. Then, in each period, each firm is put into the "high" or "low" group depending on if it has an individual liquidity-needs ratio above or below the measure of industry-level liquidity needs of its industry. (b) In the second approach, in each period, each industry is grouped into the "high-liquidity-needs" or "low-liquidity-needs" category depending on whether its measure of industry-level liquidity needs is above or below the median of all industries in that period. Then, in each period, firms are put into the "high" and "low" groups based on the categories of industries they belong to. (c) In the third approach, we directly compare a firm's inventories to total sales ratio in each period with the median value of this ratio of all firms in the same period. The firm with a ratio above the sample median is classified into the "high" group, otherwise it is classified into the "low" group.

We try these three criteria to classify firms into high- and low-liquidity-needs groups, and estimate equation (1) for different groups. No matter how we classify the groups, the results are in line with our previous finding: the coefficient of  $MP_t * CSR_{i,t}$  for the high-liquidity-needs firms is positive and statistically significant. The estimation results are reported in Online Appendix Table A10.

# 4.2.9. Exclude the samples during the 2007–2009 financial crisis period

Our study sample covers the 2007–2009 global financial crisis period. In the great recession period, the relationship among trade credit, CSR, and monetary policy might be special and different from the case in normal times. To further examine the robustness of our research findings, we eliminate the samples during 2007–2009 and re-estimate equation (1). The estimated coefficients are reported in Online Appendix Table A11. Our previous findings hold.

# 4.3. Extended analyses

Our interpretation of the advantage of high-CSR firms in obtaining trade credit during periods of monetary contractions is that such firms are thought to be more trustworthy through their engagement in CSR activities. In this subsection, we assess additional

implications of the view that CSR facilitates firms' access to trade credit under monetary contractions. We test our **H2** and **H3**. At the end of this subsection, we conduct additional extended analyses by examining whether the interaction between CSR and monetary contraction has a durative effect on trade credit in future periods, and whether the effect is asymmetric in different periods.

# 4.3.1. Regional social trust

To test **H2**, we exploit regional variation in social trust to explore whether high-CSR firms' access to trade credit differs across states with different levels of social trust. We obtain the index of state-level social trust from the survey conducted by the Gallup company. (The data are available from the website https://news.gallup.com/poll/123986/utah-south-dakota-best-places-lose-wallet.aspx.) In this survey, people are asked whether their neighbors are thought to be trustworthy. This index of social trust reflects the degree that people express trust in their neighbors within the relevant state. There is considerable variation in social trust across states. Nevada has the lowest value of social trust, 60, while Utah and South Dakota have the highest value, 85.

To test our conjecture, we use the following empirical specification:

$$TC_{i,t} = \beta_0 + \beta_1 * MP_t * CSR_{i,t} * Trust_r + \beta_2 * MP_t * CSR_{i,t} * (1 - Trust_r) + \beta_3 * MP_t * Trust_r + \beta_4 * MP_t * (1 - Trust_r) + \beta_5 * CSR_{i,t} * Trust_r + \beta_6 * CSR_{i,t} * (1 - Trust_r) + \Theta * Firm_{i,t} + u_i + \varepsilon_{i,t}$$
(4)

where  $Trust_r$  is a dummy indicator which equals 1 if state r's value of social trust is above the sample median value and 0 otherwise. We are interested in the triple interaction terms,  $CSR_{i,t} * MP_t * Trust_r$  and  $CSR_{i,t} * MP_t * (1 - Trust_r)$ , which capture the effects of CSR on the relationship between monetary contraction and trade credit in states with high and low levels of social trust, respectively. **H2** predicts that  $\beta_1 > \beta_2$ .

We show the estimations of equation (4) in Table 6. The first column uses the full sample, and column (ii) and (iii) use the high- and low-liquidity-needs groups, respectively. We have two findings. First, in column (i), the coefficient on the triple interaction term,  $MP_t * CSR_{i,t} * Trust_r$  is much larger than the coefficient on  $MP_t * CSR_{i,t} * (1 - Trust_r)$  (0.057 vs. 0.0081). The F-statistic, 5.42, implies that the difference is statistically significant. This finding is consistent with **H2**. Higher CSR increases firms' access to trade credit more if such firms are located in high-trust regions. Next, when dividing the sample into two subsamples based on firms' industry-level liquidity needs, we find that the coefficient on the triple interaction term,  $MP_t * CSR_{i,t} * Trust_r$ , for the high-liquidity-need group keeps its significant. The difference between these two coefficients (0.080 vs. 0.024) is significant. Thus, in high-trust regions, high-liquidity-needs firms with higher levels of CSR.

### 4.3.2. Industry-level competitiveness

To test H3, we explore whether market competitiveness affects high-CSR firms' access to trade credit under monetary contractions. We use the Herfindahl-Hirschman index (HHI) to measure the degree of market competition. This index is calculated as  $HHI_{s,t} =$ 

		Liquidity	/ needs
Variable	Full sample (i)	High (ii)	Low (iii)
$MP_t * CSR_{i,t} * Trust_r$	0.057***	0.080***	0.024
	(0.015)	(0.022)	(0.020)
$MP_t * CSR_{i,t} * (1 - Trust_r)$	0.0081	0.041**	-0.013
	(0.014)	(0.020)	(0.020)
$MP_t * Trust_r$	0.11***	0.17***	0.031
	(0.015)	(0.022)	(0.021)
$MP_t * (1 - Trust_r)$	0.060***	0.10***	0.020
	(0.014)	(0.022)	(0.017)
Control variables	Yes	Yes	Yes
Firm-fixed effect	Yes	Yes	Yes
F-Statistic $(\beta_1 - \beta_2 = 0)$		5.42**	
F-Statistic $(\beta_{1,H} - \beta_{1,L} = 0)$		3.59*	
Observations	62,268	28,808	33,460
Number of firms	2,290	973	1,317
Adj-R <sup>2</sup>	0.86	0.85	0.85

### Table 6. Extended analysis: regional social trust.

Note: Statistical significance: \*\*\*p < 0.01; \*\*p < 0.05; \*p < 0.1. Heteroscedasticity robust standard errors clustered at the firm and quarter levels are reported in parentheses. This table presents the results of equation (4):  $TC_{i,t} = \beta_0 + \beta_1 * MP_t * CSR_{i,t} * Trust_r + \beta_2 * MP_t * CSR_{i,t} * (1 - Trust_r)$ 

 $+\beta_3 * MP_t * Trust_r + \beta_4 * MP_t * (1 - Trust_r) + \beta_5 * CSR_{i,t} * Trust_r + \beta_6 * CSR_{i,t} * (1 - Trust_r)$ 

 $+\Theta * \operatorname{Fim}_{i,t} + u_i + \in_{i,t}$ , where *Trust*<sub>r</sub> is a dummy indicator that equals 1 if state r's value of social trust is above the sample median value and 0 otherwise.  $TC_{i,t}$  denotes trade credit received of firm *i* during period *t*. Recall that it is equal to the ratio of firm *i's* accounts payable ( $AP_{i,t}$ ) in period *t* to one-period-lagged total assets ( $AT_{i,t-1}$ ).  $CSR_{i,t}$  denotes firm *i's* CSR in period *t*.  $MP_t$  is the monetary policy index developed by Nakamura and Steinsson (2018). Firm<sub>i,t</sub> is a vector of time-varying firm variables (e.g., firm size, Tobin's Q, and inventory stock) introduced in the previous section. We control for firm-fixed effects,  $u_i$ , in equation (4).  $\in_{i,t}$  is the error term. Column (i) presents the results on the full sample. Columns (ii) and (iii) show the results on the high-liquidity-needs group and the low-liquidity-needs group, respectively. We use the ratio of inventories to sales to measure liquidity needs. The high group means that the ratio is above the median value, while the low group means the ratio is below the median.  $\beta_{1,H}$  and  $\beta_{1,L}$  are the estimators of the high group and the low group, respectively.

 $\sum_{i} \theta_{i,s,t}^{2}$  where  $HHI_{s,t}$  is the HHI of industry *s* in period *t*.<sup>5</sup>  $\theta_{i,s,t}$  denotes firm *i*'s market share in sales within industry *s* in period *t*. The higher  $HHI_{s,t}$  is, the lower the degree of market competition. We compute  $\theta_{i,s,t}$  using data from Compustat. This dataset only collects accounting information of publicly listed firms. Thus, a larger value of  $HHI_{s,t}$  might simply arise from the fact that this dataset only contained a limited number of firms for industry *s* in period *t*. To address this concern, we follow Aghion, Farhi, and Kharroubi (2019) and exclude observations for all industries with  $HHI_{s,t}$  higher than 0.95.

To test our hypothesis, we use the following empirical specification:

$$\varepsilon_{i,t}$$
 (5)

where  $MC_{s,t}$  is a dummy indicator for the degree of market competitiveness which equals 1 if  $HHI_{s,t}$  is below the median value in period *t* and 0 otherwise. We are interested in the triple interaction terms,  $MP_t * CSR_{i,t} * MC_{s,t}$  and  $MP_t * CSR_{i,t} * (1 - MC_{s,t})$ , which capture the effects of CSR on the relationship between monetary contraction and trade credit

 $<sup>{}^{5}</sup>HHI_{s,t}$  is at the yearly frequency. To remain consistent with our empirical specification, we extend  $HHI_{s,t}$  to quarterly frequencies by letting the quarterly value be identical to the value in the corresponding year. For example,  $HHI_{s,2000Q1} = HHI_{s,2000}$ .

in industries with high and low levels of market competition in the corresponding period, respectively. H3 predicts that  $\beta_1 > \beta_2$ .

Table 7 shows the estimations of equation (5). The results are consistent with our predictions. First, in column (i), the coefficient on the triple interaction term,  $MP_t * CSR_{i,t} * MC_{s,t}$  is much larger than the coefficient on  $MP_t * CSR_{i,t} * (1 - MC_{s,t})$  (0.057 vs. 0.013). The F-statistic, 4.38, implies that the difference is significant. Higher CSR increases firms' access to trade credit more if such firms face high degrees of industry-level market competition. This finding is consistent with H3. Next, when dividing the sample into two subsamples based on firms' liquidity needs, we find that the coefficient on the triple interaction term,  $MP_t * CSR_{i,t} * MC_{s,t}$ , for the high-liquidity-needs group maintains its significant. The difference between these two coefficients (0.11 vs. 0.015) is significant. Thus, in industries with higher degrees of market competition, high-liquidity -needs firms with high levels of CSR.

# 4.3.3. Durative effect on trade credit in future periods

The previous analyses focus on the effects during the quarter the monetary policy shock is realized. However, the impacts of the shock may last for several periods. In order to examine this possibility, we run complementary regressions that replace the dependent variable in equation (1) with trade credit in future periods. То be precise, the regression equation is formulated as this:  $TC_{i,t+h} = \beta_0 + \beta_1 * MP_t * CSR_{i,t} + \beta_2 * MP_t + \beta_3 * CSR_{i,t} + \Theta * \mathbf{Firm}_{i,t} + u_i + \varepsilon_{i,t},$ where h > 0 and  $TC_{i,t+h}$  is trade credit in period t + h.

We inspect the situation for h = 1, 2, 3, 4, and find that the coefficient of  $MP_t * CSR_{i,t}$  for the full sample and the high-liquidity-needs group is significantly positive for h = 1 and 2. In other words, it is detected that the effect on trade effect is durative for two quarters. The coefficient estimates are demonstrated in Online Appendix Table A12.

# 4.3.4. Asymmetric effect of monetary policy shock

The regression models in previous analyses assume a symmetric effect of monetary policy shock: the estimated effect holds for both positive and negative values of  $MP_t$ . However, the effect might actually be asymmetric. To examine the asymmetry, we analyze if there is a differential effect depending on the sign of  $MP_t$ , by using this regression equation:  $TC_{i,t} = \beta_0 + \beta_1 * MP_t * CSR_{i,t} * D_t^{PositiveMP} + \beta_2 * MP_t * CSR_{i,t} * D_t^{NegativeMP}$  $+\beta_3 * MP_t + \beta_4 * CSR_{i,t} + \Theta * Firm_{i,t} + u_i + \varepsilon_{i,t}$ .  $D_t^{PositiveMP}$  is a dummy variable that equals 1 if  $MP_t > 0$ , and 0 otherwise.  $D_t^{NegativeMP} = 1 - D_t^{PositiveMP}$ .

Online Appendix Table A13 demonstrates the regression results. It is found that the effect of monetary policy shock interacted with CSR is asymmetric: the coefficient of  $MP_t * CSR_{i,t} * D_t^{PositiveMP}$  is significantly positive, and the coefficient of  $MP_t * CSR_{i,t} * D_t^{NegativeMP}$  is insignificant. This implies that, during monetary contraction periods, firms with higher levels of CSR can use more trade credit than firms with lower levels of CSR. However, when the monetary policy is expansionary, there are not substantial differences of trade credit usage among firms with different levels of CSR.

		Liquidity	needs
Variable	Full sample (i)	High (ii)	Low (iii)
$MP_t * CSR_{i,t} * MC_{s,t}$	0.057***	0.11***	0.015
· · ·	(0.016)	(0.022)	(0.021)
$MP_t * CSR_{i,t} * (1 - MC_{s,t})$	0.013	0.035*	-0.011
	(0.014)	(0.021)	(0.017)
$MP_t * MC_{s,t}$	0.071***	0.097***	0.030
	(0.014)	(0.021)	(0.018)
$MP_t * (1 - MC_{s,t})$	0.092***	0.16***	0.015
	(0.015)	(0.023)	(0.018)
Control variables	Yes	Yes	Yes
Firm-fixed effect	Yes	Yes	Yes
F-Statistic $(\beta_1 - \beta_2 = 0)$		4.38**	
F-Statistic $(\beta_{1,H} - \beta_{1,L} = 0)$		9.36***	
Observations	62,268	28,808	33,460
Number of firms	2,290	973	1,317
Adj-R <sup>2</sup>	0.86	0.85	0.85

Table 7.	Extended	analysis:	market	competitiveness
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Note: Statistical significance: \*\*\*p < 0.01; \*\*p < 0.05; \*p < 0.1. Heteroscedasticity robust standard errors clustered at the firm and quarter levels are reported in parentheses. This table presents the results of equation (5):  $TC_{i,t} = \beta_0 + \beta_1 * MP_t * CSR_{i,t} * MC_{s,t} + \beta_2 * MP_t * CSR_{i,t} * (1 - MC_{s,t})$ 

 $+\beta_3 * MP_t * MC_{s,t} + \beta_4 * MP_t * (1 - MC_{s,t})$ 

+ $\beta_5 * CSR_{i,t} * MC_{s,t} + \beta_6 * CSR_{i,t} * (1 - MC_{s,t})$ 

 $+ \beta_7 * MC_{s,t} + \Theta * \operatorname{Firm}_{i,t} + u_i + \in_{i,t,t}$ 

where  $MC_{s,t}$  is a dummy indicator which equals 1 if  $HHI_{s,t}$  is below the median value in period t and 0 otherwise.  $TC_{i,t}$  denotes trade credit received of firm i during period t. Recall that it is equal to the ratio of firm i's accounts payable  $(AP_{i,t})$  in period t to one-period-lagged total assets  $(AT_{i,t-1})$ .  $CSR_{i,t}$  denotes firm i's CSR in period t.  $MP_t$  is the monetary policy index developed by Nakamura and Steinsson (2018). Firm<sub>i,t</sub> is a vector of time-varying firm variables (e.g., firm size, Tobin's Q, and inventory stock) introduced in the previous section. We control for firm-fixed effects,  $u_i$ , in equation (5).  $\in_{i,t}$  is the error term. Column (i) presents the results on the full sample. Columns (ii) and (iii) show the results on the high-liquidity-needs group and the low-liquidity-needs group, respectively. We use the ratio of inventories to sales to measure liquidity needs. The high group means that the ratio is above the median value, while the low group means the ratio is below the median.  $\beta_{1,H}$  and  $\beta_{1,L}$  are the estimators of the high group and the low group, respectively.

# 5. Discussion and conclusions

This paper studies whether firms' CSR is related to firms' access to trade credit in response to monetary contraction shocks. Although there is a large body of literature on both monetary policy and CSR, the interaction between CSR and monetary policy transmissions is rarely discussed.

Our results indicate that firms with higher levels of CSR obtain more trade credit during monetary contraction periods than similar firms with lower levels of CSR. The positive relationship between firms' CSR and their access to trade credit under monetary contractions is stronger for those firms in industries with higher levels of liquidity needs. The findings are robust if we add industry-specific time-fixed effects to our benchmark empirical specification, exclude the impact of corporate governance, firms' profitability, product quality, and brand capital. We exploit regional social trust and industry market competitiveness to provide additional evidence for our benchmark results. We find that CSR increases firms' access to trade credit more if such firms are in high-trust regions or highly competitive industries.

This paper makes contributions to the existing studies in several ways. First, our paper adds to the emerging research about the impact of CSR on areas of corporate finance (e.g., Albuquerque et al., 2019; Deng, Kang, & Low, 2013; Flammer, 2018;

Flammer & Kacperczyk, 2019; Lins et al., 2017; Menz, 2010; Shiu & Yang, 2017). Among these studies, Cheng et al. (2014) find that firms can strategically increase their engagement in CSR to better access to finance by reducing agency costs rising from enhanced stakeholder engagement and mitigating information asymmetry via increasing transparency. Our analyses also investigate the role of CSR in firms' financing options and argue that CSR affects firms' financing behaviors via the channel of trust. Our paper, however, focuses on the informal credit market under monetary contractions. In this paper, we find that CSR is positively associated with firms' access to trade credit during periods of monetary contraction. Moreover, we find that this positive relationship is stronger for firms in industries with higher levels of liquidity needs.

Second, our analyses argue that CSR works via the channel of trust, which links our paper to the growing body of literature on the relationship between social capital/trust and economic outcomes (e.g., Ahn & Park, 2018; Duarte, Siegel, & Young, 2012; Knack & Keefer, 1997; Levine et al., 2018; Putnam, 1993, 2000). One strand of this literature demonstrates the importance of social capital from a macroeconomic perspective (e.g., Knack & Keefer, 1997). The other strand highlights the benefit from a microeconomic perspective (e.g., Levine et al., 2018; Wu et al., 2014). In particular, Levine et al. (2018) show that liquidity-dependent firms with higher levels of regional trust receive more trade credit from their suppliers during banking crises. Our study contributes to the latter strand and also focuses on firms' access to trade credit, like Levine et al. (2018). By doing so, we highlight a novel mechanism through which social capital may increase firms' resilience to monetary contractions – facilitated access to trade credit.

Finally, our paper contributes to the literature on the relationship between monetary policy and firms' use of trade credit (e.g., Choi & Kim, 2005; Mateut et al., 2006; Meltzer, 1960). Most of these studies show a positive relationship between monetary contraction and the use of trade credit. For example, Choi and Kim (2005) use quarterly data of US publicly listed firms and find that a monetary contraction is associated with an increase in the use of trade credit. Our paper follows the arguments in Choi and Kim (2005) but differs from them in two aspects. First, the monetary policy index in our analyses is identified by high frequency identification, while Choi and Kim (2005) use the changes in federal funds rate and a tight policy dummy identified by Romer and Romer (1993). Second, we use firmlevel social capital, CSR, to argue that trust is an important factor to affect this positive relationship.

Although our research contributes to existing studies in several ways, there are still limitations that call for future research. (a) First, this paper suggests that CSR can affect monetary policy transmission via the channel of trust. A natural question is whether CSR affects the transmission of other macroeconomic shocks. For example, Nagar, Schoenfeld, and Wellman (2019) argue that economic policy uncertainty (EPU) can increase the information asymmetry among investors. CSR can mitigate information asymmetry due to openly and honestly disclosed information by contracting parties (e.g., Dyer & Chu, 2003). Hence, studying how CSR affects the transmission of EPU shocks is an exciting avenue for future research. (b) Second, in this paper, CSR helps build social capital/trust and signal trustworthiness. However, firms can also use other strategies, such as non-corrupt behaviors, to build social capital and signal trustworthiness. It remains unknown whether our results still hold if firms use other strategies to build social capital or whether CSR is the most effective way to signal trustworthiness compared to other strategies. Future research could focus on these two questions by comparing the effects of different firm strategies that signal trustworthiness. (c) Third, this paper does not examine whether our findings about trade credit can be applied to the circumstance of bank credit. If the role of CSR is through trust or creditworthiness as suggested in our paper, this is probably reflected in bank credit as well. Typically, a contractionary monetary policy shock would cause a reduction in bank credits. However, the impact might be smaller for firms with higher CSR ratings because they are regarded as more trustworthy, and thus, are able to obtain more bank credits. This conjecture can be tested in future research.

# **Disclosure statement**

No potential conflict of interest was reported by the author(s).

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