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The impact of more able managers on corporate trade credit

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ABSTRACT

We investigate how high-ability managers affect trade credit policies of U.S. publicly traded companies from 2003 to 2016. Consistent with the prediction of an "Imbalance of power" in the supply chain, we find that firms with more able managers implement more favorable trade credit policies with both upstream and downstream business partners (i.e., fewer trade credit days in receivables, more trade credit days in payables, and lower net trade credit days), indicating that managerial ability is an important determinant of corporate trade credit. Our cross-sectional analyses provide further support for the bargaining power view of trade credit. The results are robust to various tests mitigating the endogeneity concerns. This study sheds light on the importance of more able managers in working capital and supply chain management.

1. Introduction

Managers are heterogeneous and manager traits can be classified with various dimensions. Managerial ability is an important trait of managers and a potential source of value creation for a firm. Theoretically, more able managers should understand their business better and have more managerial skills (Mahoney, 1995). Similarly, Demerjian et al. (2013) argue that high-ability managers are more knowledgeable of their client base and can form better judgments and estimates. Baik et al. (2011) posit that forecasts by more able managers reflect information about their ability to anticipate changes in their firms' underlying economics. Studies have shown that high managerial ability favorably affects various firm policies (e.g., Bertrand and Schoar, 2003; Demerjian et al., 2013; Cornaggia et al., 2017a, 2017b) and is associated with enhanced performance (Demerjian et al., 2012; Andreou et al., 2015) and firm value (e.g., Yung and Chen, 2018; Huang and Xiong, 2022b)[1]. Executives with high managerial ability tend to be hired as CEOs when they switch employers (Fee and Hadlock, 2003). Overall, the literature suggests that managerial ability plays a significantly positive role in value creation and is firms' sought-after specific intangible asset.

Trade credit management is an important component of a firm's daily operations. Cosci et al. (2020) indicate that most firms in the U.S. and European countries have invested significantly in accounts receivables and have a significant amount financed with accounts payables.[2] According to the aggregate balance sheet of nonfinancial corporate business in the U.S. in 2020, trade receivables of nonfinancial firms constitute 8.2% of the total assets and trade payables account for 12.59% of the total liabilities.[3] In this paper, we investigate how more able managers affect trade credit policies with a sample of 137,022 firm-quarter observations of 5330 U.S. firms from 2003 to 2016.

Firms have an implicit stake in their trading partners' business. Trade credit decisions reflect a firm's relations with its business partners, placing an important foundation on how earnings and cash flows are generated. The use of trade credit not only benefits a firm but also brings potential costs and risks to the firm. Benefits from trade credit received include short-term financing and extra time to evaluate product

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[1] Refer to the literature review section for detailed discussions on the effects of managerial ability on firm policies

[2] The study of Cosci et al. (2020) is based on nearly 8500 firm-year observations of Italian nonfinancial firms from 2006 to 2015 since Italy has the highest level of trade credit in Europe. See details of trade credit in Europe in Footnote 4 of their study.

[3] With the total assests of 50040.4 billion, trade receivables of 4105.2 billion, and trade payables of 3061.9 billion dollars, respectively. We obtained the data from the following website:https://www.federalreserve.gov/releases/z1/20210610/html/b103.htm

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quality (e.g., Burney et al., forthcoming; Long et al., 1993; Smith, 1987). Levine et al. (2018) show that trade credit is an essential factor in corporate resilience during banking crises and trade credit from suppliers can help a firm survive tough times.[4] Studies also show that trade credit can be a powerful tool for large firms to bully their smaller suppliers using their bargaining power (Giannetti et al., 2011; Murfin and Njoroge, 2015; Wilson and Summers, 2002), which may further benefit these large firms.[5] However, receiving trade credits from suppliers may put a firm in a disadvantageous position in terms of the purchase price and potential supply disruption.

Meanwhile, firms grant customers credit sales to provide liquidity. Extending trade credit to customers can help a firm's customers financially and allow the firm to exercise price discrimination, which assists the firm to build better customer relations, secure more future sales, and increase firm value (e.g., Burney et al., forthcoming). However, making credit sales increases capital tied up to accounts receivables, and firms may have to seek additional external financing to fund receivables. Further, credit customers' default can bring significant financial problems to a firm, especially the default of large major customers.[6] Studies show that financial distress can spill over from customers to their suppliers (e.g., Jorion and Zhang, 2009; Helwege and Zhang, 2016; Lian, 2017), creating an up to two-year negative impact on their suppliers' financial health (Lian, 2017). Extending too much trade credit to customers can be detrimental to a firm.

Given the critical role of trade credit in a firm's operations, understanding the link between managerial ability and trade credit policies is important. Khoo and Cheung (2021) find a positive association between managerial ability and accounts payable. However, accounts payable management only reflects one aspect of a firm's trade credit policies. As equally important as accounts payable in a firm's working capital management, accounts receivable is an integral part of its trade credit policies. Firms manage the two accounts concurrently as accounts payable helps firms allay market imperfection and accounts receivable advances their growth (Ferrando and Mulier, 2013). We argue that managerial ability not only affects its trade credit uptake but also affects its trade credit extension. As a result, focusing only on one aspect of trade credit policies does not capture the true association between managerial ability and trade credit. Two theories may explain the association between more able managers and trade credit: *Imbalance of power and Resource redistribution*.

An imbalance of power exists in the supply chain. High managerial ability empowers a firm, which determines suppliers' willingness to grant trade credit to the firm and the terms of trade credit. The higher the managerial ability in a firm, the easier it is to convince its suppliers to extend trade credit with favorable terms. Taking trade credit from its suppliers enables a firm to postpone payments and obtain extra time to evaluate products purchased. Similarly, we expect more capable managers to identify high-quality customers and exert better payment terms to ensure speedy collections, such as implementing tightened trade credit requirements, charging higher prices, and shortening credit terms. Further, firms with more able managers should have high-quality products. Confidence in the quality of the products and/or post-sale services in firms with high-ability managers induces customers to pay promptly and hence reduces days in receivables. The *Imbalance of power theory* predicts that firms with more able managers have stronger bargaining power over their customers and suppliers and are highly trusted by these trading partners, leading to more favorable credit policies, i.e., fewer days in receivables and more days in payables (*Imbalance of power hypothesis*).

The *Resource redistribution theory* can also explain corporate trade credit practices. Firms having better access to the capital market provide liquidity to their trading partners by extending more trade credit to customers and making speedy payments to suppliers. Firms with high-ability managers make better firm decisions (e.g., Chen et al., 2015; Chen and Lin, 2018; Khurana et al., 2018; Garcia-Sanchez and Garcia-Meca, 2018; Gan, 2019), are more transparent (Baik et al., 2011; Baik et al., 2018), and have lower cost of capital (Franco et al., 2017) and better performance (Demerjian et al., 2012; Andreou et al., 2015). The *Resource redistribution theory* predicts that firms with more able managers should provide their trading partners with more liquidity, resulting in more days in receivables and fewer days in payables (*Resource distribution hypothesis*).

We measure managerial ability as the residuals from regressing firm efficiency scores, estimated using the data envelopment analysis (DEA) approach to capture the efficiency in transforming corporate resources into revenues relative to their industry peers, on firm characteristics (Demerjian et al., 2012). This estimation process can alleviate the endogeneity concern in our study as trade credit proxies are individual firm-based measures.[7] We measure a firm's credit policies with days in accounts receivable (REC_DAYS) and days in accounts payable (PAY_DAYS), which are the average number of days of trade credit granted to customers and the average number of days of trade credit received from suppliers, respectively. Since firms made the two types of trade credit decisions simultaneously, we construct NET_DAYS as the difference between REC_DAYS and PAY_DAYS to measure net trade credit days in receivables.[8] We regress the three measures of trade credit policies on one-period lagged managerial ability while controlling for year and industry or firm fixed effects and other firm characteristics and mechanisms that may affect trade credit. In addition, we test the value impact of more able managers' trade credit policies by regressing Tobin's Q on the trade credit proxies while controlling for other firm characteristics and channels, such as operation capital, through which firms can increase value.

Our results show that firms with more able managers have fewer trade credit days in receivables, more trade credit days in payables, and lower net trade credit days. The impact of managerial ability on trade credit policies is not only statistically significant but also economically meaningful. Our baseline model results indicate that a one standard deviation increase in managerial ability is associated with a 4-day reduction in receivables, a 47.84-day extension in payables, and a 50-day reduction in net trade credit a year.

We conduct several cross-sectional analyses to further examine the "*Imbalance of Power hypothesis*" of trade credit. Financially constrained firms have less negotiation power than their counterparties (Blazenko and Vandezande, 2003; Giannetti et al., 2011; Gonçalves et al., 2018; Khoo and Cheung, 2021). We test whether financial constraints modify the association between managerial ability and trade credit policies. The results show that high-ability managers in financially distressed firms further reduce customer receivables but extract less payables from their suppliers. Trade credit can substitute bank financing (Delannay and Weill, 2004; Nilsen, 2002; Love et al., 2007; Bastos and Pindado, 2013), especially when market liquidity is scarce during a financial crisis. We find more able managers can obtain more favorable trade credit terms during the financial crisis than non-financial crisis period. Third, market competition can affect firms' bargaining power, leading to changes in trade credit policies (Love et al., 2007; Murfin and Njoroge, 2015). We factor the impact of market power on the association between

[4] Levine et al. (2018) find that liquidity-dependent firms in high-trust countries obtain more trade credit and suffer from smaller decreases in profits and employment during banking crises than similar firms in low-trust economies.

[5] For example, Murfin and Njoroge (2015) note that highly rated borrowers with unfettered access to capital markets, such as Walmart, may also borrow from smaller and weaker suppliers via trade credit.

[6] Major customer-dependent firms have higher cash flow risk because the loss of a major customer could lead to a sizable drop in a firm's cash flows (Hertzel et al., 2008; Dhaliwal et al., 2016; Campello and Gao, 2017).

[7] See more detailed explanations in Section 3.2.2.

[8] See Section 3.2 and Appendix A for detailed variable constructions.

managerial ability and trade credit policies in our analysis and show that more able managers have more significant effects on trade receivables and payables in more competitive industries, where firms have less monopoly power. Collectively, these results indicate that the effects of managerial ability on trade credit are conditional on firms' power relative to their trading partners.

We conduct additional tests to check the robustness of our results. First, we employ several alternative proxies for managerial ability to alleviate the concerns for measurement error in our primary proxy. Second, we use an instrumental variable approach to alleviate the simultaneity and reverse causality concerns in our baseline results. Third, we employ the Heckman selection model to reduce the bias from managers self-selecting into firms with more favorable trade credit policies. Fourth, we conduct our analysis using a weighted sample derived from Entropy Balancing (EB) as in Canil et al. (2019). Fifth, we use CEO and CFO turnovers as exogenous shocks to examine the associations between managerial ability changes and trade credit policy changes around management turnovers to confirm the causal relation between the two. Additionally, we use tariff cuts as exogenous shocks and the performance of CEO's last employer to further check the robustness of the results. Sixth, we run analyses with various subsamples to disentangle different roles of product types and various governance monitoring. Finally, we add all operational conditions mentioned above and all other possible mechanisms that may affect operational efficiency. The effects of managerial ability on the trade credit policy proxies remain virtually unchanged. Further analysis shows that trade credit policies on both receivables and payables in firms with more capable managers are more value-enhancing.[9]

Collectively, the results provide robust empirical evidence that more capable managers implement better trade credit policies, which is consistent with the *Imbalance of power hypothesis*. We add to the literature on managerial ability and working capital management (e.g., Bertrand and Schoar, 2003; Andreou et al., 2015; Gan, 2019; Yung and Chen, 2018; Burney et al., forthcoming; Khoo and Cheung, 2021). We show that managerial ability is an important determinant of a firm's credit purchase and sales with its upstream and downstream business partners, incremental to the effects of other factors documented in previous studies (Gonçalves et al., 2018; Love et al., 2007; Garcia-Appendini and Montoriol-Garriga, 2013).

Second, we extend the study of Khoo and Cheung (2021), who focus on the association between managerial ability and trade credit from suppliers. We advance their study by investigating the effects of more able managers on trade credit policies with both suppliers and customers, which uncovers the overall impact of managerial ability on trade credit policies. Empirically, we conduct a much more complicated and thorough analysis than that in Khoo and Cheung (2021). Being able to identify good customers and ensure their timely payment is fundamental to a firm's success. To the best of our knowledge, we are the first to explore how managerial ability affects trade credit extended to customers.

Furthermore, we illustrate that firms with more competent managers facilitate their firms to gain more bargaining power over their trading partners, shedding light on more effective supply chain management. The findings that firms with more able managers are more attractive to both upstream and downstream business partners suggest that hiring more able managers can help firms gain competitive advantages. High-ability managers can keep their firms afloat even in liquidity shocks and competitive industries. The valuation analysis shows that trade credit policies implemented by more able managers are value-enhancing after controlling for various channels contributing to value, confirming that more able managers implement more favorable trade credit policies from a different angle. The valuation analysis also advances the study of Khoo and Cheung (2021).

[9] See detailded discussions of these empirical tests in the result sections.

The paper proceeds as follows. Section 2 reviews the literature and develops our testable hypotheses. Section 3 describes the data and the methodology. Section 4 presents the empirical analyses and results. Section 5 discusses the results of additional analysis and Section 6 concludes the paper.

2. Literature review and hypothesis development

2.1. Trade credit

Trade credit plays a financial role and serves as a substitute for bank credit. Trade credit is an important source of corporate funding (Petersen and Rajan, 1997; Demirguc-Kunt and Maksimovic, 2001; Ge and Qiu, 2007; Wu et al., 2014; Murfin and Njoroge, 2015). A trade credit net borrower, i.e., a firm with more payables than receivables (a negative net trade credit), could use trade debt to substitute for bank loans. Using firm-level data from 34 countries from 1990 to 2011, Levine et al. (2018) document that trade credit accounts for 25% of the average firm's total debt financing, suggesting that firms use lower-cost trade credit to finance their daily operations and investments. Trade credit financing is one of the largest and most crucial short-term financing options in the United States (Lehar et al., 2020; Cunat, 2007; Murfin and Njoroge, 2015).

Trade credit also acts as a product quality guarantee (Long et al., 1993; Smith, 1987). Granting longer trade credit terms to important buyers may help a firm stimulate further sales. Trade credit contracts have insurance properties embedded in the risk-sharing arrangements in the trade credit networks (Amberg et al., 2021). Trade credit received allows firms to defer payments, hence alleviating their liquidity problem. Garcia-Appendini and Montoriol-Garriga (2013) find that firms with high liquidity levels before the 2007–2008 financial crisis increased trade credit to their clients when bank credit was scarce, supporting that firms provide liquidity insurance to their clients. Similarly, Amberg et al. (2021) argue that trade credit positions are economically important sources of liquidity for firms. Firms use trade credit to manage liquidity by postponing payments on trade credit claims held by their suppliers and increasing the maturity of future trade credit contracts (Wilner, 2000; Cunat, 2007) or by increasing the amount of credit drawn from suppliers and decreasing the amount issued to customers (Amberg et al., 2021). These studies provide supporting evidence that firms extract liquidity from both upstream and downstream counterparties in the supply chain to overcome liquidity shocks. Afrifa et al. (2021) find that trade receivables and payables are the conduits through which firms achieve efficient inventory management. Studies have shown that trade credit provides a useful buffer for financially constrained firms (McGuinness et al., 2018; Ferrando and Mulier, 2013; Love et al., 2007).

Extending trade credit to customers can also help a firm maintain good customer relations and secure more sales. However, trade credit granted to customers has possible negative consequences for a firm, such as the risk of slow payment and/or debt default, and consequently leads to unanticipated additional financing needs (Sopranzetti, 1998; Wilner, 2000; Fisman and Love, 2003). Islam and Wheatley (2021) find that firms located in countries characterized by severe weather events prefer to use less trade credit, suggesting that trade credit is associated with risk. Jorion and Zhang (2009) document that trade creditors with large exposure, on average, exhibit an increased distress risk in the years following a debtor failure evidenced by creditor delisting and rating downgrade. Similarly, Jacobson and Schedvin (2015) find that trade debtor failures impose an increased failure risk on trade creditors affected, suggesting that trade credit extended to customers can propagate corporate failure. As indicated earlier, even highly rated firms with great access to capital markets may often borrow from smaller and weaker suppliers through trade credit. Furthermore, these large credit-worthy firms receive the most favorable trade credit terms, such as the longest maturities, from smaller suppliers (Klapper et al., 2012).

Studies show that smaller firms sell with a low margin to large customers, supply more trade credit, and tolerate late payment due to their low bargaining power in the supply chain (Giannetti et al., 2011; Murfin and Njoroge, 2015; Wilson and Summers, 2002; Cosci et al., 2020). The above literature shows that trade credit has both benefits and costs. We argue that value-seeking managers tend to maximize the benefits and minimize the costs and risks of trade credit.

2.2. Managerial ability

Managerial ability is perceived as a valuable intangible asset of a firm. Managerial ability is associated with various firm decisions and outcomes, such as credit ratings (Cornaggia et al., 2017a, 2017b), debt usage (Yung and Chen, 2018), risk-taking (Yung and Chen, 2018; Andreou et al., 2016; Curi and Lozano-Vivas, 2020), investment (Bertrand and Schoar, 2003; Andreou et al., 2015; Louca et al., 2017; Gan, 2019), information environment (Baik et al., 2018), profitability of mergers and acquisitions (Chen and Lin, 2018), bond credit rating assignments and changes (Harper et al., 2019), the likelihood of bankruptcy (Leverty and Grace, 2012), earnings quality (Demerjian et al., 2013), firm performance (Demerjian et al., 2012; Andreou et al., 2015), and firm value (Yung and Chen, 2018).[10] Studies have documented ample empirical evidence supporting that managerial ability favorably affects a firm and helps the firm create value.

For example, Gan (2019) documents that CEO managerial ability increases investment efficiency. Demerjian et al. (2020) find that high-ability managers are significantly more likely to engage in intentional smoothing associated with improved future operating performance that benefits shareholders, the managers, or both. High managerial ability is associated with low cash effective tax rates (Koester et al., 2017), low likelihood of goodwill impairment (Sun, 2016; Huang and Xiong, 2022a), and low levels of goodwill impairment losses (Sun, 2016). Andreou et al. (2016) argue that managerial ability can be quantified as a key performance indicator for the prudential supervision of banks. Higher managerial ability is associated with higher franchise value, contributing to decreased bank risk-taking, particularly for small banks and during the financial crisis (Curi and Lozano-Vivas, 2020). Bui et al. (2018) indicate that the ability of top managers substantially influences the quality of a firm's decision-making and information disclosure, hence affecting bank loans. Empirically, they find that firms showing a persistently superior managerial ability over previous years enjoy a lower loan spread, suggesting that firms with high-ability managers can reduce the cost of capital. The same logic might also hold with firms' suppliers just as with other lenders, suggesting that firms with more able managers may obtain better trade credit terms from their suppliers.

On the other hand, due to their better performance and low cost of capital or easy access to the capital markets, firms with more able managers may be willing and able to provide trade credit to their customers to increase sales and/or exercise price discrimination. In addition, managerial ability increases firm transparency (Baik et al., 2011; Baik et al., 2018), making a firm more attractive to its both upstream and downstream trading partners in the supply chain.

2.3. Managerial ability and trade credit

We derive our testable hypotheses from theories of trade credit and managerial ability. Two theories, the *Imbalance of power theory* and the *Resource redistribution theory* in the supply chain, may help explain the relation between managerial ability and trade credit policies.

Managers with superior ability should be able to negotiate better trade credit terms with their trading partners. First, like any other contract, trade credit results from negotiations between two parties. The imbalance of power in the supply chain leads to more favorable trade credit terms for the party with greater bargaining power. Firms with high-quality managers make better decisions, have a lower risk of default, and perform better, entitling them to more bargaining power over their trading partners. Theoretically, they can exert stricter trade credit terms on both customers and suppliers, given their stronger bargaining power. Empirically, Fabbri and Klapper (2008) show that Chinese small- and medium-sized enterprises, i.e., those with weak market power, are more likely to extend trade credit and have a larger share of credit sales; Murfin and Njoroge (2015) find evidence that large investment-grade buyers borrow from smaller suppliers and smaller vendors finance their large trade partners by reducing their own capital expenditure; Cosci et al. (2020) find that net lenders, i.e., those with positive net trade credit, are more likely to be financially constrained than net borrowers, are smaller, have less market power, and pay higher costs of debt, suggesting that the power imbalance in the supply chain enables net borrowing firms to delay payments to their suppliers. Similarly, other scholars find that small firms with low bargaining power sell to large customers with low margins, supply more trade credit, and even tolerate payment delays (Wilson and Summers, 2002; Fabbri and Klapper, 2008; Giannetti et al., 2011). Pike et al. (2005) find that longer trade credit terms, or greater tolerance of late payment, are found when the sellers are smaller and associated with low customer concentration. These studies provide strong evidence that power imbalance is an important factor in explaining trade credit practices.

Second, rational suppliers tend to reduce uncertainty about payment intention. Suppliers usually have an information advantage over their client firms, leading to more confidence in their customers with more able managers. They should be willing to provide more trade credit to those with lower default risk and good firm performance, such as those managed by high-ability managers. Bonsall et al. (2017) find that managerial ability is an important factor that bond market participants impound into their assessments of firm credit risk. Baik et al. (2011) show that CEO ability adds credibility to management forecasts, thus increasing firm transparency. We can reasonably extend such arguments and expect that more able managers add credibility to their firms' operation, current performance, and positive perspective for the future, making their firms more attractive to their trading partners. Reversely, Smith (1987) argues that suppliers withdraw their support when they lose confidence in their distressed clients. In the same vein, Garcia-Appendini and Montoriol-Garriga (2020) find that firms approaching bankruptcy, on average, curtail trade credit compared to those non-bankruptcy firms, suggesting that suppliers lose confidence in financially distressed firms and reduce the supply of trade credit.

The literature discussed above indicates that suppliers' confidence plays a vital role in granting trade credit to their clients. Firms shrink the supply of trade credit to their less important or financially troubled customers and grant better trade credit terms to those they have more confidence in. Therefore, we expect that firms are willing to extend more trade credit with better terms to firms with more able managers due to their creditworthiness, even at the expense of their own growth (costs of downstream lending), such as extended payment periods. A discriminatory pricing strategy is a common practice in competitive industries

[10] Other examples of the impact of managerial ability include income smoothing (Baik et al., 2020), bank liquidity (Andreou et al., 2016), readability of narrative disclosure in 10-k report (Hasan, 2020), tax avoidance (Khurana et al., 2018; Koester et al., 2017), the formation of tax-efficient dividend policies (Guan et al., 2018), timeliness of financial reporting (earnings announcement lag, audit report lag, and probability of a late US Securities and Exchange Commission filing) (Abernathy et al., 2018), financial reporting fraud (Wang et al., 2017), and open market repurchase completion rates (Cao et al., 2019). In sum, more able managers are associated with more favorable value-enhancing policies, which may benefit shareholders in the long run. However, occasionally, high-ability managers may engage in some opportunistic behavior, such as opportunistic financial reporting in financially distressed firms to maximize their equity-based compensation and cope with debt refinancing pressure, which increases audit risks and results in greater audit fees (Gul et al., 2018).

where there are high non-separable costs. Pike et al. (2005) argue that trade credit terms can be viewed as an important element of a firm's sales package. Lengthening a credit period is equivalent to a price reduction (Emery, 1984; Mian and Smith, 1992).

Third, firms assess their risks in trade credit policies. We argue that firms with stronger bargaining power can negotiate good trade credit terms with their downstream trade partners as well. We predict that firms with high-ability managers can reduce uncertainty about payment intention by selecting credit-worthy customers, exercising price discrimination, or giving their customers incentives to make early payments. Since customers have more confidence in the quality of products, a low likelihood of disruption of the supply chain, and better post-sale service in firms with more able managers, they may be willing to accept unfavorable trade credit terms.

The imbalance of power in the supply chain and the resulting variation in trading partners' confidence predict that firms with more able managers have more influence over their trading partners. Firms with high-ability managers can exploit their bargaining power over their customers and suppliers and negotiate more favorable trade credit terms for themselves.

H_1. : Firms with more able managers have fewer days in receivables, more days in payables, and hence fewer net trade credit days (Imbalance of power hypothesis).

The traditional view of trade credit suggests that trade credit favors an efficient redistribution of resources. The *Resource redistribution theory* suggests that firms with more able managers should be able to get cheaper funds and are willing to financially help their upstream and downstream trading partners in the supply chain, especially when their counterparties face cash flow shortfalls.[11] Schwartz (1974) proposes a model in which firms that can obtain funds at relatively low costs offer trade credit to customers that would otherwise have to pay higher costs to outside financial institutions, suggesting that the relative cost of trade credit induces firms to borrow from other firms through trade credit. Murfin and Njoroge (2015) indicate that trade credit may decline if a firm's cost of credit goes up. Costello (2020) documents liquidity spill-over effects in the supply chain. Specifically, Costello (2020) finds that U.S. firms with greater exposure to a large and exogenous decline in bank financing pass this liquidity shock to their downstream customers by reducing trade credit granted and the total supply of goods and services, suggesting a constrained firm reduces the volume of deferred payment from customers. If constrained firms contract trade credit to their downstream customers, we predict that firms with more able managers may be more willing to stretch trade credit to their customers and pay their suppliers faster since they are less likely to face liquidity constraints than those with less able managers,[12] leading to more days in receivables and fewer days in payables.

Trade credit also serves as a competitive tool for firms to develop and maintain good relationships with their trading partners in the supply chain to ensure further sales and avoid any supply chain disruption. Cunat (2007) points out that firms have a stake in their clients' survival, making them willing to support their clients through trade credit. Huyghebaert (2006) argues that stringent collection can damage customer relationships, and suppliers desiring to maintain an enduring product market relationship grant more concessions to customers in financial distress than other lenders do. These studies suggest that customers also have some market power over their suppliers. Hence, firms with high-ability managers should be able to transfer their customers' power to their own advantage. Gonçalves et al. (2018) argue that the cost of lost sales due to disruptions in production is higher for high- than for low-market power firms. They find that firms with high market power increase their net trade credit days during the crisis. High market power firms are characterized by high quality differentiated products and services, and we argue that a firm's market power also increases with its managerial ability. Firms with more able managers have stronger market power, resulting in greater access to external resources such as cheaper funds.

High-ability managers recognize damages from disruptions in the supply chain and sales loss. They may provide better credit terms to their suppliers and customers, such as adjusting the amount of trade credit granted, slowing down collections from their customers, and/or speeding up payments to their suppliers. Firms with more able managers may be able to fund receivable growth with new debt or other sources of financing such as a reduction in cash holdings. If the *Resource redistribution theory* dominates the *Imbalance of power theory* in trade credit policies, we predict that firms with more able managers tend to extend more trade credit to customers and/or reduce trade credit days in payables.

As discussed earlier, trade credit is also viewed as an implicit product warranty. Firms with high-ability managers may use trade credit to promote their products and further expand their customer base. Given their confidence in the quality of their products, firms with more able managers may be more willing to give customers extra time to conduct a product quality assessment before making payments while less likely to reduce the price. They can use trade credit as a price-discriminating tool and charge a higher price for those with a longer credit period. Therefore, firms with high-ability managers have longer receivable days.

According to the *Resource redistribution theory* and liquidity requirements, firms with more able managers are willing and able to provide more help to their trading partners by extending liquidity, resulting in more days in receivables and fewer days in payables.

H_2. : Firms with more able managers have more days in receivables and fewer days in payables, and hence more net trade credit days (Resource redistribution hypothesis).

3. Data and Methodology

3.1. Sample

We begin our sample with all firms headquartered in the U.S. in the Compustat North America Fundamentals Quarterly database from 2003 to 2016. The sample starts from 2003 because the data coverage is more consistent from 2003. We exclude financial (Standard Industrial Classification (SIC) codes 6000–6999) and utility firms (SIC codes 4900–4999). Following Box et al. (2018), we also require that sample firms have non-negative revenue, positive net assets, and non-missing SIC code. We then merge this sample with managerial ability scores (available to 2016) from the study of Demerjian et al. (2012). Lastly, we require that observations have non-missing values on our key variables. Our final sample includes 137,022 firm-quarter observations of 5330 firms from 2003 to 2016.

3.2. Variables

3.2.1. Trade credit proxies

We use accounts receivable, accounts payable, and net trade credit to measure a firm's trade credit policies. Accounts receivable/payable captures the amount of trade credit provided to customers/obtained from suppliers, and net trade credit measures trade credit provided to customers net of trade credit received from suppliers. Following the existing literature, we scale accounts receivable by sales and accounts payable by cost of goods sold to measure the role of trade credit in providing financing to support economic activities (Love et al., 2007;

[11] Contrary to the traditional view, Cosci et al. (2020) find evidence that inefficient redistribution tends to prevail in the trade credit market in Italy.

[12] Costello (2020) notes that suppliers with liquidity constraints may demand cash in advance, cash on delivery, or shorter payment terms. Huang et al. (2022) find that firms with higher managerial ability face few financial constraints.

Table 1
Sample Statistics.

Panel A – Sample Statistics

	N	Mean	P50	Min	Max	S.D.
REC_DAYS	137,022	50.685	49.811	0.000	147.083	29.929
PAY_DAYS	137,022	55.954	39.229	4.944	348.820	61.645
NET_DAYS	137,022	-4.783	5.314	-272.832	88.821	60.582
ABILITY	137,022	-0.004	-0.030	-0.197	0.454	0.126
PROFIT MARGIN	137,022	0.330	0.371	-2.175	0.884	0.470
FREE COLLATERAL	136,973	0.236	0.153	0.009	0.867	0.227
SHORT DEBT	137,022	0.030	0.004	0.000	0.285	0.058
CASH	137,020	0.209	0.126	0.002	0.829	0.218
OCF	136,907	0.024	0.035	-0.537	0.280	0.119
RSI	137,022	0.037	0.000	-0.037	4.423	0.094
Panel B - Univariate tests						
	HIGH ABILIGY		LOW ABILITY		Diff	
	Mean	Median	Mean	Median	Mean	Median
REC_DAYS	49.264	47.990	51.816	51.025	-2.552 * **	-3.035 * **
PAY_DAYS	66.191	44.078	51.202	36.763	14.989 * **	7.315 * **
NET_DAYS	-16.387	-1.397	1.020	8.568	-17.407 * **	-9.965 * **
Panel C - Correlation matrix						
	(1)	(2)	(3)	(4)	(5)	(6)
REC_DAYS (1)	1					
PAY_DAYS (2)	0.22 * **	1				
NET_DAYS (3)	0.27 * **	-0.86 * **	1			
ABILITY (4)	-0.05 * **	0.18 * **	-0.20 * **	1		
PROFIT MARGIN (5)	0.03 * **	0.24 * **	-0.23 * **	0.27 * **	1	
FREE COLLATERAL (6)	-0.25 * **	0.08 * **	-0.20 * **	-0.14 * **	0.00	1
SHORT DEBT (7)	0.03 * **	0.03 * **	0.00	-0.04 * **	-0.05 * **	0.01 * *
CASH (8)	0.01 * **	0.06 * **	-0.05 * **	0.19 * **	-0.16 * **	-0.41 * **
OCF (9)	-0.12 * **	-0.12 * **	0.06 * **	0.13 * **	0.35 * **	0.20 * **
RSI (10)	0.04 * **	0.06 * **	-0.04 * **	0.12 * **	-0.26 * **	-0.22 * **
	(7)	(8)	(9)	(10)		
SHORT DEBT (7)	1					
CASH (8)	-0.17 * **	1				
OCF (9)	-0.12 * **	-0.26 * **	1			
RSI (10)	-0.01 *	0.44 * **	-0.45 * **	1		

This table presents the summary statistics. The sample covers 137,022 firm-quarter observations of 5330 unique firms from fiscal year 2003–2016. Panel A presents the summary statistics for the sample. In Panel B, we divide the sample into subsamples using the tercile distribution of ABILITY in each industry and year and provide univariate test results on the trade credit proxies for firms in the 1st and 3rd terciles. Panel C presents the pairwise correlations of the variables. Refer to Appendix A for detailed variable definitions. All continuous variables are winsorized at the upper and the lower 2% of the sample distribution. * ** , * *, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Gonçalves et al., 2018). Specifically, we measure trade credit to customers with REC_DAYS, constructed as accounts receivable scaled by sales and multiplied by the number of days in a quarter. This measure is essentially the accounts receivable scaled by daily sales for each quarter and can be interpreted as the average number of days of trade credit extended to customers. Similarly, we construct trade credit received from suppliers (PAY_DAYS) as accounts payable scaled by the cost of goods sold and multiplied by the number of days in a quarter. PAY_DAYS measures the average number of days of trade credit received from suppliers. Lastly, since firms determine working capital accounts jointly, we calculate net trade credit (NET_DAYS) as the difference between REC_DAYS and PAY_DAYS (Love et al., 2007; Gonçalves et al., 2018).

3.2.2. *Managerial ability scores*

Demerjian et al. (2012) use a two-step approach to estimate managerial ability. In the first stage, they employ the data envelopment analysis (DEA) approach to create an efficient frontier of production to maximize sales revenue given the levels of inputs by year. The DEA efficiency score is a relative-based value measured as the ratio of revenue over seven input variables, including 1) cost of goods sold, 2) net property, plant, and equipment, 3) capitalized operating leases, 4) selling, general, and administrative costs, 5) capitalized research and development costs, 6) purchased goodwill, and 7) other intangibles. They further scale the focal firms' DEA efficiency scores by the highest efficiency score within a group consisting of comparable firms. So, the final efficiency score is an ordinal ranking capturing a focal firm's efficiency relative to the most efficient firms in the group, i.e., those with an efficiency score located on the frontier. In the second stage, they estimate managerial ability as the residual from regressing firm efficiency score (an relative-based measure) on variables capturing firm characteristics.[13]

This two-step estimation methodology should mitigate the endogeneity in our study for two reasons. First, our trade credit proxies are individual firm-based measures and firm efficiency score is a relative-based measure. Second, since the managerial ability score is the residual from regressing firm efficiency on firm characteristics, it should be orthogonal to firm-level variables, such as trade credit proxies. Furthermore, this measure of managerial ability has been widely used in the existing literature (e.g., Krishnan and Wang, 2015; Cornaggia et al., 2017a, 2017b; Bonsall et al., 2017; Cheung et al., 2017). We, therefore, adopt the continuous managerial ability score derived by Demerjian et al. (2012) (ABILITY).[14]

Managerial ability-induced better firm performance should be persistent (Brown et al., 1999; Mikhail et al., 2004). A high managerial ability score in one period may reflect positive noises in estimating firm efficiency rather than actual managerial ability. Following Bui et al. (2018), as a robustness check, we employ ABILITY_High3 and ABILITY_High5 to capture the persistence of managerial skills. ABILITY_High3/ABILITY_High5 is an indicator variable that equals one if ABILITY is above the industry median throughout the previous

[13] See more details of the methodology in Demerjian et al. (2012).
[14] The data for managerial ability are available at: http://faculty.washington.edu/pdemerj/data.html

three/five years, and zero otherwise.

3.2.3. Control variables

We include a variety of control variables to capture the impact of market power, liquidity, collateral, and relationship-specific investments on trade credit management (Gonçalves et al., 2018; Love et al., 2007; Garcia-Appendini and Montoriol-Garriga, 2013). We measure a firm's market power with PROFIT MARGIN, calculated as the difference between revenue and cost of goods sold scaled by revenue.[15] We measure liquidity with cash balance (CASH), operating cash flow (OCF), and short-term debt (SHORT DEBT),[16] all these variables are scaled by total assets. We use the availability of free collateral, defined as property, plant, and equipment minus short-term debt scaled by assets, to control for the distinction in trade credit management between firms with more and less collateral (Garcia-Appendini and Montoriol-Garriga, 2013; Gonçalves et al., 2018). Dass et al. (2015) argue that trade credit may serve as a commitment device for a firm to invest in its customers. We employ RSI, constructed as research and development expenditures scaled by assets, to proxy for relationship-specific investment (RSI). Following Gonçalves et al. (2018), we winsorize all continuous variables at the 2 and the 98 percentiles to mitigate the bias arising from outliers. Appendix A details the definition and calculation of all variables.

4. Results

4.1. Summary statistics and univariate tests

Table 1 reports the summary statistics. Panel A displays the summary statistics for the whole sample. The mean and the median values of receivable days (REC_DAYS)/payable days (PAY_DAYS)/net trade credit days (NET_DAYS) are 50.69 and 49.81 days/55.95 and 39.23 days/− 4.78 and 5.31 days, respectively. These variable distributions are consistent with those in Gonçalves et al. (2018). The average/median managerial ability score (ABILITY) is − 0.004/− 0.03, consistent with those in Bonsall et al. (2017) and Lee et al. (2018).

Panel B provides univariate comparisons of the trade credit proxies for firms with high- and low-ability managers. We divide the sample into subsamples using the terciles of ABILITY in each industry-year and define firms as having high/low-ability managers if they belong to the highest/lowest tercile of the sample distribution. The average firm with high managerial ability extends trade credit to its customers for 49.26 days, compared to 51.82 days for the average firm with low managerial ability. The difference is significant at the 1% level. The average firm in the highest tercile of ABILITY pays its suppliers in 66.19 days, relative to 51.20 days for those in the lowest tercile of ABILITY. The difference of 14.99 days is significant at the 1% level. The comparison of the mean net trade credit days shows that firms with more able managers have 17.41 fewer net trade credit days than those with less able managers. The univariate tests on the differences in the median trade credit proxies provide similar results. The results are consistent with H_1 that firms with more capable managers tend to provide less trade credit to customers while obtaining more trade credit from suppliers.

Panel C provides the correlation matrix of the variables. Echoing the results in Panel B, we find that more able manager-led firms can obtain more favorable trade credit, i.e., fewer REC_DAYS and NET_DAYS, and more PAY_DAYS. The correlations between other control variables and the proxies for trade credit are largely consistent with the literature.

Collectively, the results in Panels B and C indicate that firms with more able managers are associated with shorter receivable days and longer payable days, providing preliminary support for H_1 that firms with high-ability managers negotiate better trade credit terms with their customers and suppliers, resulting in fewer days in which their capital is tied up in receivables.

4.2. Baseline analysis

Table 2 reports the results of our baseline regressions. Models 1–3 control for year and industry fixed effects to mitigate bias attributable to unobserved heterogeneity in time and industry on trade credit management. Models 4–6 replace industry-fixed effects with firm-fixed effects. To alleviate the concern that trade credit policies and firm efficiency (used to derive managerial ability proxy) may be determined simultaneously in equilibrium, we lag all independent variables by one period. The statistical inference is drawn based on the heteroscedasticity-robust standard errors clustered at the firm level. We report standardized coefficient estimates to directly show the strength of the impact of managerial ability (ABILITY) on trade credit management proxies relative to other control variables.

The coefficient of ABILITY is negative and significant in Model 1, suggesting that firms with more able managers provide significantly shorter receivable days to their customers. Model 2 shows that firms with more able managers obtain significantly longer payable days from their suppliers, consistent with the findings in Khoo and Cheung (2021). Model 3 shows that firms with more able managers are associated with significantly shorter net trade credit periods, indicating an overall more favorable trade credit policy from their trading partners. The results from Models 4–6 are quantitatively similar.

Furthermore, the effect of ABILITY on trade credit policies is also economically sizable. For instance, Model 2 shows the impact of ABILITY on PAY_DAYS is the largest. The parameter estimate of ABILITY in Model 1 indicates that a one standard deviation increase in managerial ability is associated with a reduction of one receivables day a quarter ($0.033 \times 29.929 = 0.99$) or four receivable days a year. The parameter estimate of ABILITY in Model 2 shows that a one standard deviation increase in managerial ability is associated with an extension of 11.96 payable days a quarter ($0.190 \times 61.65 = 11.96$) or 47.84 payable days a year. The parameter estimate of ABILITY in Model 3 suggests that a one standard deviation increase in managerial ability is associated with a reduction of 12.54 net trade credit days a quarter ($0.207 \times 60.582 = 12.54$) or 50 net trade credit days a year. In addition, we use alternative measures for trade credit policies (i.e., AR/SALES, AP/COGS, and the difference between AR/SALES and AP/COGS). The results stay qualitatively similar to those in our baseline analyses. For brevity, we present the detailed results in Table 1A of the Internet Appendix.

The coefficient estimates of our control variables are consistent with the literature. Firms with higher market power (PROFIT MARGIN) are associated with shorter receivable days and payable days (Blazenko and Vandezande, 2003; Dass et al., 2015). Firms engaged in relation-specific investment provide their customers with less trade credit (Dass et al., 2015). Moreover, consistent with Gonçalves et al. (2018), we find that CASH has a negative association with both account receivable days and net trade credit days, OCF has a positive association with net trade credit days, and FREE COLLATERAL is negatively related to net trade credit days.

Organization capital (OC) facilitates the match between human resources and production facilities and hence affects the efficiency of a firm to use its resources to improve firm performance (Bharadwaj, 2000; Eisfeldt and Papanikolaou, 2013). OC can effectively reduce a firm's reliance on managerial effort (Gao et al., 2021). Our findings in Table 2 may be driven by operation capital rather than managerial ability. We, therefore, include operation capital to our baseline regressions as an

[15] The relation between market power and trade credit is inconclusive in existing studies, with some proposing firms with more market power extend more trade credit (Biais and Gollier, 1997; Wilner, 2000), and others showing firms with lower bargaining power provide customers with more trade credit (Giannetti et al., 2011; Dass et al., 2015). Gonçalves et al. (2018) find that the negative impact of market power on trade credit obtained from suppliers is stronger in the post-crisis period than in the pre-crisis period.

[16] We set SHORT DEBT to zero if missing.

Table 2
Managerial ability and trade credit.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Variables	REC_DAYS	PAY_DAYS	NET _DAYS	REC_DAYS	PAY_DAYS	NET _DAYS
ABILITY	-0.033 * **	0.194 * **	-0.207 * **	-0.018 * **	0.079 * **	-0.086 * **
	(−3.219)	(13.058)	(−14.067)	(−3.246)	(8.322)	(−9.319)
PROFIT MARGIN	-0.035 * **	-0.103 * **	0.082 * **	-0.041 * **	-0.040 * **	0.017
	(−3.879)	(−8.194)	(6.651)	(−5.747)	(−3.885)	(1.642)
FREE COLLATERAL	-0.225 * **	-0.004	-0.109 * **	-0.134 * **	0.021	-0.084 * **
	(−12.571)	(−0.244)	(−6.411)	(−6.516)	(0.891)	(−3.796)
SHORT DEBT	0.022 * *	0.039 * **	-0.021 * *	0.007	0.010 * *	-0.004
	(2.179)	(4.629)	(−2.472)	(1.553)	(2.058)	(−0.717)
CASH	-0.154 * **	-0.020	-0.057 * **	-0.096 * **	0.002	-0.052 * **
	(−12.155)	(−1.388)	(−3.927)	(−8.091)	(0.145)	(−4.076)
OCF	-0.046 * **	-0.113 * **	0.088 * **	-0.009 *	-0.034 * **	0.031 * **
	(−5.956)	(−12.487)	(9.617)	(−1.775)	(−5.643)	(5.346)
RSI	-0.035 * **	-0.048 * **	0.028 *	-0.017 * **	0.001	-0.009
	(−4.255)	(−2.650)	(1.645)	(−3.150)	(0.179)	(−1.222)
Constant	62.219 * **	58.510 * **	4.201 * *	57.683 * **	54.232 * **	3.402 *
	(66.089)	(30.385)	(2.247)	(63.600)	(26.831)	(1.747)
Observations	131,563	131,563	131,563	131,563	131,563	131,563
Adj. R-squared	0.356	0.243	0.252	0.748	0.681	0.692
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effect	Yes	Yes	Yes	No	No	No
Firm fixed effect	No	No	No	Yes	Yes	Yes
Clustered std err by firm	Yes	Yes	Yes	Yes	Yes	Yes

This table presents the regression results of tests on the effects of managerial ability on trade credit policies. REC_DAYS is trade receivables scaled by sales times the number of days in a quarter. PAY_DAYS is accounts payable scaled by COGS times the number of days in a quarter. NET_DAYS is REC_DAYS minus PAY_DAYS. ABILITY is the continuous managerial ability score in Demerjian et al. (2012). Models 1–3 control for industry and year fixed effects, where industries are defined using the 3-digit SIC codes. Models 4–6 control for firm and year fixed effects. Heteroscedasticity robust t-statistics clustered at the firm level are reported in parentheses. Refer to Appendix A for detailed variable descriptions. * ** , * *, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

additional control variable. We construct organization capital as in Gao et al. (2021). The results are consistent with those in Table 2. We conclude that omitting organization capital does not bias our baseline results.[17] The detailed results of including organization capital are reported in Table 2A of the Internet Appendix.

4.3. Cross-sectional analyses

We argue that it is the imbalance of power between trading partners and the corresponding variation in their confidence that lead to more favorable trade credit policies in firms with more able managers. In this subsection, we provide further evidence to support this argument.

4.3.1. The effect of liquidity constraints

Studies suggest that financial constraints affect a firm's trade credit policies (Blazenko and Vandezande, 2003; Giannetti et al., 2011; Gonçalves et al., 2018; Khoo and Cheung, 2021). Financially constrained firms are subject to lower liquidity as they encounter higher costs when accessing external financial markets (Almeida and Campello, 2002; Whited and Wu, 2006). Firms facing financial constraints may have greater incentives to shrink receivable days and/or stretch payable days to alleviate the financing pressure. In addition, firms' financial constraints can weaken their bargaining power to trading partners, leading to changes in trade credit policies.

We conduct subsample analysis to test the effect of financial constraints on the association between managerial ability and trade credit policies. Specifically, we divide our sample into subsamples using three different proxies for financial constraints. As indicated in Duchin et al. (2010), Garcia-Appendini and Montoriol-Garriga (2013), and Gonçalves et al. (2018), this approach can also help detangle the different effects of managerial ability and financial constraints on trade credit policies. We measure financial constraints with the Whited-Wu index (Whited and Wu, 2006), the Hadlock-Pierce index (Hadlock and Pierce, 2010),[18] and firm size (Gilchrist and Himmelberg, 1995; Almeida et al., 2004). Financially constrained firms are those with Whited-Wu index or Hadlock-Pierce index above the sample median, or firm size below the sample median.

Table 3 displays the results. Panels A, B, and C present the results using the Whited-Wu index, the Hadlock-Pierce index, and firm size to proxy financial constraints, respectively, where Models 1, 3, and 5/2, 4, and 6 show the results of financially unconstrained/constrained firms. The coefficients of ABILITY echo those in our baseline regressions for both subsamples. Importantly, we find that high-ability managers in financially distressed firms tighten trade credit to their customers by further reducing receivable days. The results hold for all the three financially constrained measures. We also document some evidence that financially distressed firms with more able managers appear to lose some of their bargaining power with their suppliers, evidenced by the weaker positive association between managerial ability and PAY_DAY than that of their financially unconstrained counterparts. In addition, the overall favorable impact of more able managers on trade credit (NET_DAY) in financially distressed firms declines compared to that in financially unconstrained firms. Collectively, the results indicate that financial constraints play an important role in firms' trade credit policies even in the presence of high-ability managers, however, more able managers can still impose significant pressure on their trading partners, tougher on customers and softer on suppliers.

Trade credit can serve as a substitute for bank financing (Delannay and Weill, 2004; Nilsen, 2002; Love et al., 2007; Bastos and Pindado, 2013). Financial crises lead to an increased scarcity of funds and overall financial market risk (Gonçalves et al., 2018), which can significantly reduce corporate liquidity. As such, suppliers are more likely to reduce investments in customer relationships by tightening credit terms during a financial crisis. For example, Alfaro et al. (2021) find that firms adjust their trade credit policies in credit supply shock. Costello (2020) finds

[17] Refer to Gao et al. (2021) for details of the construction of operation capital.

[18] Formulas for the Whited-Wu and Hadlock-Pierce indices are provided in Appendix A.

Table 3
Managerial ability and trade credit: Financial constraints.

Panel A - High vs. Low Whited Wu index	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	REC_DAYS		PAY_DAYS		NET_DAYS	
Variables	Low	High	Low	High	Low	High
ABILITY	-0.04 * **	-0.055 * **	0.127 * **	0.078 * **	-0.148 * **	-0.099 * **
	(−2.705)	(−4.630)	(6.658)	(3.501)	(−7.858)	(−4.544)
PROFIT MARGIN	0.010	0.027 *	0.192 * **	0.306 * **	-0.186 * **	-0.29 * **
	(0.79)	(1.781)	(10.948)	(17.494)	(−11.032)	(−16.929)
FREE COLLATERAL	-0.229 * **	-0.205 * **	0.021	-0.006	-0.144 * **	-0.089 * **
	(−8.386)	(−9.829)	(0.725)	(−0.301)	(−4.959)	(−4.750)
SHORT DEBT	0.06 * **	0.003	0.029 * *	0.052 * **	0.012	-0.046 * **
	(3.477)	(0.339)	(2.299)	(5.180)	(0.96)	(−4.688)
CASH	-0.13 * **	-0.147 * **	-0.005	0.05 * **	-0.06 * **	-0.119 * **
	(−7.965)	(−8.905)	(−0.253)	(2.969)	(−3.061)	(−6.884)
OCF	-0.044 * **	-0.069 * **	-0.08 * **	-0.24 * **	0.057 * **	0.202 * **
	(−4.897)	(−6.343)	(−8.149)	(−17.382)	(5.685)	(14.549)
RSI	0.001	-0.033 * **	0.024	-0.015	-0.025	-0.003
	(0.08)	(−3.235)	(1.565)	(−0.713)	(−1.452)	(−0.156)
Constant	67.262 * **	65.128 * **	55.353 * **	39.339 * **	13.952 * *	25.308 * **
	(20.182)	(27.843)	(8.182)	(8.210)	(2.174)	(5.339)
Chi-squared stats for the difference in ABILITY coefficients	22.0 * **		0.01		0.72	
Observations	63,926	62,889	63,926	62,889	63,926	62,889
Adj. R-squared	0.459	0.301	0.316	0.284	0.341	0.277
Industry and year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Clustered std err by firm	Yes	Yes	Yes	Yes	Yes	Yes
Panel B - High vs. Low Hadlock-Pierce index index	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
	REC_DAYS		PAY_DAYS		NET_DAYS	
Variables	Low	High	Low	High	Low	High
ABILITY	-0.049 * **	-0.053 * **	0.108 * **	0.092 * **	-0.131 * **	-0.113 * **
	(−3.204)	(−4.521)	(5.384)	(4.648)	(−6.530)	(−5.922)
PROFIT MARGIN	0.018 * **	0.028 *	0.205 * **	0.289 * **	-0.196 * **	-0.275 * **
	(1.166)	(1.892)	(11.153)	(17.931)	(−10.905)	(−17.174)
FREE COLLATERAL	-0.256 * **	-0.201 * **	-0.021	0.019	-0.116 * **	-0.114 * **
	(−9.563)	(−9.931)	(−0.782)	(0.968)	(−4.374)	(−5.954)
SHORT DEBT	0.042 * *	0.015	0.024 * *	0.064 * **	0.008	-0.051 * **
	(2.102)	(1.627)	(2.241)	(6.025)	(0.648)	(−5.416)
CASH	-0.139 * **	-0.121 * **	0.007	0.052 * **	-0.076 * **	-0.112 * **
	(−8.540)	(−7.790)	(0.326)	(3.315)	(−3.432)	(−6.871)
OCF	-0.048 * **	-0.076 * **	-0.077 * **	-0.242 * **	0.049 * **	0.204 * **
	(−5.263)	(−6.967)	(−7.849)	(−17.757)	(5.026)	(14.716)
RSI	0.016	-0.04 * **	0.051 * **	-0.028	-0.043 * *	0.007
	(1.032)	(−3.804)	(2.829)	(−1.328)	(−2.243)	(0.373)
Constant	64.861 * **	62.371 * **	43.411 * **	46.522 * **	22.07 * **	16.138 * **
	(39.906)	(47.540)	(12.045)	(15.626)	(6.469)	(5.570)
Chi-squared stats for the difference in ABILITY coefficients	5.83 * *		5.65 * *		8.27 * **	
Observations	66,304	65,263	66,304	65,263	66,304	65,263
Adj. R-squared	0.471	0.305	0.345	0.258	0.374	0.249
Industry and year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Clustered std err by firm	Yes	Yes	Yes	Yes	Yes	Yes
Panel C - High vs. Low Firm Size	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
	REC_DAYS		PAY_DAYS		NET_DAYS	
Variables	High	Low	High	Low	High	Low
ABILITY	-0.042 * **	-0.055 * **	0.129 * **	0.069 * **	-0.152 * **	-0.089 * **
	(−2.832)	(−4.633)	(6.833)	(3.078)	(−8.084)	(−4.119)
PROFIT MARGIN	0.017	0.027 *	0.201 * **	0.298 * **	-0.195 * **	-0.282 * **
	(1.173)	(1.745)	(11.876)	(17.245)	(−11.784)	(−16.699)
FREE COLLATERAL	-0.223 * **	-0.205 * **	0.041	-0.018	-0.16 * **	-0.078 * **
	(−8.118)	(−9.934)	(1.425)	(−0.935)	(−5.624)	(−4.087)
SHORT DEBT	0.063 * **	0.001	0.030 * *	0.056 * **	0.012	-0.051 * **
	(3.724)	(0.135)	(2.436)	(5.500)	(0.983)	(−5.187)
CASH	-0.13 * **	-0.144 * **	0.010	0.05 * **	-0.074 * **	-0.119 * **
	(−7.966)	(−8.790)	(0.493)	(2.939)	(−3.569)	(−6.793)
OCF	-0.045 * **	-0.072 * **	-0.079 * **	-0.247 * **	0.056 * **	0.206 * **
	(−4.817)	(−6.542)	(−7.360)	(−18.001)	(5.109)	(14.894)
RSI	0.004	-0.035 * **	0.027	-0.016	-0.027	-0.003
	(0.21)	(−3.325)	(1.538)	(−0.758)	(−1.338)	(−0.174)
Constant	62.382 * **	64.807 * **	41.979 * **	47.80 * **	21.312 * **	17.113 * **
	(39.398)	(46.826)	(11.003)	(15.971)	(6.054)	(5.710)
Chi-squared stats for the difference in ABILITY coefficients	20.48 * **		3.68 * *		1.21	
Observations	66,247	65,320	66,247	65,320	66,247	65,320
Adj. R-squared	0.469	0.294	0.33	0.265	0.355	0.259
Industry and year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Clustered std err by firm	Yes	Yes	Yes	Yes	Yes	Yes

This table presents the regression results of tests on the effects of managerial ability on trade credit policies for firms with and without financial constraints. We measure financial constraints with the Whited-Wu index (Whited and Wu, 2006), the Hadlock-Pierce index (Hadlock and Pierce, 2010), and firm size (the logarithm of assets) in Panels A, B, and C, respectively. Firms are defined as financially constrained/unconstrained if the WW and HP indices are above/below the sample median.

Firms are defined as financially constrained if firm size is below the sample median. In each panel, Models 1, 3, and 5/2, 4, and 6 show the results of financially unconstrained/constrained firms. The pairwise comparisons of the difference in the coefficient estimates of ABILITY for financially unconstrained and constrained firms are presented at the bottom of each panel. All models control for industry and year fixed effects, where industries are defined using the 3-digit SIC codes. Heteroscedasticity robust t-statistics clustered at the firm level are reported in parentheses. Refer to Appendix A for detailed variable descriptions. * ** , * *, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

that U.S. firms exposed to a large decline in bank lending during the global financial crisis substantially reduced trade credit extended to their customers. Levine et al. (2018) find that liquidity-dependent firms in high-trust countries obtain more trade credit during banking crises than similar firms in low-trust economies, reconciling the two possible relations between trade credit usage and social trust. Therefore, we argue that firms with more able managers should further reduce trade credit to customers to preserve their own liquidity during a financial crisis, implying a stronger negative relation between REC_DAYS and ABILITY. Meanwhile, more able managers should be able to obtain better trade credit terms from their suppliers when the market experiences a negative liquidity shock, implying a stronger positive relation between PAY_DAYS and ABILITY.

We define the financial crisis period as 2007 and 2008 and divide our sample into financial crisis and non-crisis periods. We run our baseline regressions separately for the two subsamples and provide tests on the difference in the coefficient of ABILITY. Models 1, 3, and 5/2, 4, and 6 in Table 4 show the results of the non-crisis/crisis period. The coefficient of ABILITY is more negative/positive for the subsample of the crisis period than the non-crisis period in the regressions with REC_DAYS/PAY_DAYS as the dependent variable. Firms with more capable managers can tighten trade credit to customers and stretch trade credit from suppliers during the crisis than non-crisis period. Consistently, we find that the impact of more able managers on reducing net trade credit is greater during the financial crisis.

4.3.2. *The effect of industry concentration*

Love et al. (2007) and Murfin and Njoroge (2015) posit that market competition affects trade credit policies by impacting firms' bargaining power. If the favorable trade credit policies in firms with more able managers are due to their stronger bargaining power, we expect to see more significant effects of more able managers on trade credit in more competitive industries, where firms' market power is lower relative to more concentrated industries. We employ quarterly sales-based Herfindahl index (HERFINDAHL, constructed as the sum of the square of sales of each firm to total sales in an industry) for each industry to capture the industry competition (i.e., firm market power), where a lower Herfindahl index indicates more competitive industries and vice versa.

We divide our sample into subsamples using the median value of HERFINDAHL and repeat our baseline regressions separately for the two subsamples. Models 1, 3, and 5/2, 4, and 6 of Table 5 show the results of the subsample of low/high sales based Herfindahl index. The effects of ABILITY on REC_DAYS, PAY_DAYS, and NET_DAYS are consistent between the two subsamples. Interestingly, the Chi-squared tests for the differences in the coefficient of ABILITY between the two subsamples suggest that managerial ability exerts a stronger impact among firms in more competitive industries. Firms with more able managers have fewer receivable days, more payable days, and shorter net trade credit days in more competitive industries than those in more concentrated industries. The results suggest that the favorable effects of managerial ability on trade credit policies are more evident in more competitive industries, where firms have less monopoly power.

Ideally, we fully control for the impact of product market factors by using firms with more buyers/sellers to examine receivable days/payable days. However, the lack of specific data on the sample firms' buyers and sellers prevents us from identifying such cases. Alternatively, we use product market fluidity or instability (FLUIDITY) as an alternative proxy for the product market. FLUIDITY, constructed by Hoberg et al. (2014) using firms' product descriptions, measures changes in rival firms' products relative to a firm's products[19]. FLUIDITY captures the competitive threats faced by a firm in its product market. A higher value of FLUIDITY indicates higher competitive threats from rival firms' products, suggesting lower bargaining power a firm has. We dissect our sample using the median value of FLUIDITY and rerun the analysis in Table 5. Consistent with the results in Table 5, the impact of managerial ability is significantly stronger in firms subject to more competitive threats (i.e., lower bargaining power) than those subject to less competitive threats, confirming that more able managers increase their firms' bargaining power, enabling their firms to negotiate better trade credit terms with their trading partners. For brevity, we report the results in Table 3A of the Internet Appendix.

The results in Tables 4 and 5 provide further support for H_1 by showing that the effect of managerial ability on trade credit is conditional on firms' bargaining power relative to their trading partners. Conversely, these results are inconsistent with H_2 that firms redistribute their resources to their trading partners especially during liquidity shocks and when firms are operating in more competitive industries.

5. Additional analysis

We conduct a variety of tests to mitigate bias attributable to measurement error in the managerial ability proxy, omitted variable, sample selection, and the potential matching between managers and their hosting firms. Furthermore, we examine whether the effect of more able managers on trade credit management is consistent across different variables that may create concerns for confounding effects in our baseline regressions. We attempt to gauge under what circumstance managers' ability improves trade credit management. Lastly, we analyze whether more able managers help improve firm performance through trade credit policies.

5.1. *Address endogeneity concern*

5.1.1. *Alternative proxies for managerial ability*

Our proxy for managerial ability (ABILITY) is estimated as the residual from regressing the firm efficiency score, an ordinal ranking capturing a focal firm's efficiency relative to the most efficient firms in the group, on firm characteristics determining operating efficiency. As indicated earlier, this two-step estimation process can largely address the joint determination of managerial ability and trade credit proxies, as trade credit policies are individual firm-based measures. Nevertheless, we present the results of using alternative managerial ability proxies in this subsection to further reduce the potential measurement error in ABILITY.

5.1.1.1. Managerial skill versus luck. To mitigate the potential concern that our managerial ability proxy simply captures the positive noises in the firm efficient estimation, we replace ABILITY with ABILITY_High3 and ABILITY_High5 to measure managerial skills and re-run the baseline regression. Table 6 displays the results. Models 1–3/4–6 show the results of using ABILITY_High3/ABILITY_High5. In Model 2, the significant and positive coefficient of ABILITY_High3 suggests that firms with managers having an ability score higher than the industry median throughout the prior three years enjoy increased trade credit days from their suppliers by 6.10 days (= 0.099 × 61.65) a quarter. In Model 3, the significant and negative coefficient of ABILITY_High3 shows firms with managers

[19] Refer to Hoberg et al. (2014) for details of the construction of FLUIDITY.

Table 4
Managerial ability and trade credit: Financial crisis.

	Model 1 REC_DAYS	Model 2	Model 3 PAY_DAYS	Model 4	Model 5 NET_DAYS	Model 6
	Non-crisis	Crisis	Non-crisis	Crisis	Non-crisis	Crisis
ABILITY	-0.043 * **	-0.062 * **	0.095 * **	0.133 * **	-0.115 * **	-0.158 * **
	(−4.107)	(−3.599)	(6.903)	(5.015)	(−8.364)	(−6.092)
PROFIT MARGIN	0.023 * *	0.024	0.261 * **	0.233 * **	-0.249 * **	-0.215 * **
	(1.996)	(1.301)	(21.273)	(10.634)	(−20.433)	(−10.080)
FREE COLLATERAL	-0.227 * **	-0.211 * **	-0.006	0.044	-0.109 * **	-0.143 * **
	(−12.426)	(−9.050)	(−0.326)	(1.615)	(−6.528)	(−5.460)
SHORT DEBT	0.022 * *	0.027 * *	0.050 * **	0.033 * **	-0.030 * **	-0.017
	(2.114)	(2.042)	(5.665)	(2.734)	(−3.485)	(−1.424)
CASH	-0.144 * **	-0.136 * **	0.039 * **	0.056 * **	-0.111 * **	-0.117 * **
	(−11.137)	(−7.639)	(2.758)	(2.741)	(−7.757)	(−5.684)
OCF	-0.064 * **	-0.060 * **	-0.190 * **	-0.224 * **	0.156 * **	0.188 * **
	(−7.666)	(−4.142)	(−18.077)	(−13.147)	(14.521)	(11.074)
RSI	-0.029 * **	-0.027 * *	0.002	-0.012	-0.019	-0.001
	(−3.442)	(−1.971)	(0.185)	(−0.366)	(−1.558)	(−0.027)
Constant	64.155 * **	61.038 * **	47.750 * **	42.448 * **	16.935 * **	18.161 * **
	(57.841)	(50.175)	(20.664)	(14.771)	(7.616)	(6.606)
Chi-squared stats for the difference in ABILITY coefficients	4.59 * *		11.45 * **		15.08 * **	
Observations	110,116	21,451	110,116	21,451	110,116	21,451
Adj. R-squared	0.355	0.364	0.281	0.276	0.287	0.289
Industry and year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Clustered std err by firm	Yes	Yes	Yes	Yes	Yes	Yes

This table presents the regression results of tests on the effects of managerial ability on trade credit policies during the financial crisis and non-crisis periods. By defining the financial crisis period as year 2007–2008, we divide our sample into subsamples of the financial crisis period (Models 2, 4, and 6) and the non-crisis period (Models 1, 3, and 5). The pairwise comparisons of the difference in the coefficient estimates of ABILITY during the financial crisis and non-crisis periods are presented at the bottom of the table. All models control for industry and year fixed effects, where industries are defined using the 3-digit SIC codes. Heteroscedasticity robust t-statistics clustered at the firm level are reported in parentheses. Refer to Appendix A for detailed variable descriptions. * ** , * *, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 5
Managerial ability and trade credit: Industry concentration.

	Model 1 REC_DAYS	Model 2	Model 3 PAY_DAYS	Model 4	Model 5 NET_DAYS	Model 6
Variables	Low	High	Low	High	Low	High
ABILITY	-0.062 * **	-0.029 *	0.116 * **	0.079 * **	-0.142 * **	-0.094 * **
	(−5.113)	(−1.850)	(5.750)	(4.820)	(−7.088)	(−5.728)
PROFIT MARGIN	0.028 *	0.015	0.293 * **	0.170 * **	-0.277 * **	-0.160 * **
	(1.827)	(1.003)	(18.673)	(8.764)	(−17.822)	(−9.032)
FREE COLLATERAL	-0.219 * **	-0.221 * **	0.003	-0.001	-0.099 * **	-0.128 * **
	(−8.753)	(−9.673)	(0.139)	(−0.036)	(−4.644)	(−5.287)
SHORT DEBT	-0.001	0.047 * **	0.045 * **	0.053 * **	-0.038 * **	-0.019 *
	(−0.057)	(3.441)	(3.813)	(4.969)	(−3.488)	(−1.654)
CASH	-0.175 * **	-0.081 * **	0.036 * *	0.038 * *	-0.111 * **	-0.085 * **
	(−10.796)	(−5.027)	(2.011)	(2.225)	(−6.173)	(−5.188)
OCF	-0.044 * **	-0.088 * **	-0.230 * **	-0.143 * **	0.206 * **	0.091 * **
	(−3.778)	(−8.615)	(−16.127)	(−12.299)	(14.273)	(7.780)
RSI	-0.024 * *	-0.015	-0.019	0.036 * *	0.007	-0.048 * **
	(−2.264)	(−1.243)	(−0.956)	(2.094)	(0.365)	(−3.214)
Constant	66.767 * **	61.323 * **	50.813 * **	43.734 * **	15.720 * **	18.835 * **
	(45.674)	(40.863)	(15.135)	(14.395)	(4.701)	(6.892)
Chi-squared stats for the difference in ABILITY coefficients	20.88 * **		33.03 * **		57.80 * **	
Observations	66,557	65,010	66,557	65,010	66,557	65,010
Adj. R-squared	0.293	0.420	0.240	0.338	0.234	0.379
Industry and year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Clustered std err by firm	Yes	Yes	Yes	Yes	Yes	Yes

This table presents the regression results of tests on the effects of managerial ability on trade credit policies for firms operating in more competitive industries and those in more concentrated industries. We use the median value of the quarterly sales-based Herfindahl index to divide our sample into subsamples of firms in the industries with more competitions (lower sales-based Herfindahl index) and those in the concentrated industries (higher sales-based Herfindahl index). Models 1, 3, and 5/2, 4, and 6 show the results of the subsample of low/high sales based Herfindahl index. The pairwise comparisons of the difference in the coefficient estimates of ABILITY for firms in competitive and concentrated industries are presented at the bottom of the table. All models control for industry and year fixed effects, where industries are defined using the 3-digit SIC codes. Heteroscedasticity robust t-statistics clustered at the firm level are reported in parentheses. Refer to Appendix A for detailed variable descriptions. * ** , * *, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

having an ability score higher than the industry median throughout the prior three years decrease net trade credit by 6.2 days (= 0.102 × 60.582) a quarter. The results are quantitatively similar in Models 4–6 when ABILITY_High5 is used. The results provide further evidence supporting H_1 that firms with more able managers can obtain more relaxed trade credit from suppliers and provide unfavorable trade credit

Table 6
High ability or luck.

Variables	Model 1 REC_DAYS	Model 2 PAY_DAYS	Model 3 NET _DAYS	Model 4 REC_DAYS	Model 5 PAY_DAYS	Model 6 NET _DAYS
ABILITY_High3	-0.005	0.099 * **	-0.102 * **			
	(−0.634)	(11.400)	(−11.525)			
ABILITY_High5				-0.008	0.100 * **	-0.104 * **
				(−0.901)	(10.231)	(−10.448)
PROFIT MARGIN	-0.044 * **	-0.066 * **	0.043 * **	-0.047 * **	-0.062 * **	0.037 * **
	(−4.862)	(−4.839)	(3.159)	(−5.056)	(−4.369)	(2.645)
FREE COLLATERAL	-0.228 * **	-0.017	-0.097 * **	-0.229 * **	-0.023	-0.092 * **
	(−11.912)	(−0.924)	(−5.337)	(−11.454)	(−1.191)	(−4.883)
SHORT DEBT	0.020 *	0.041 * **	-0.023 * *	0.021 *	0.040 * **	-0.021 * *
	(1.890)	(4.519)	(−2.533)	(1.898)	(4.273)	(−2.278)
CASH	-0.158 * **	-0.005	-0.071 * **	-0.159 * **	-0.006	-0.071 * **
	(−11.713)	(−0.337)	(−4.530)	(−11.367)	(−0.358)	(−4.326)
OCF	-0.046 * **	-0.091 * **	0.066 * **	-0.044 * **	-0.087 * **	0.064 * **
	(−5.720)	(−9.241)	(6.683)	(−5.357)	(−8.709)	(6.295)
RSI	-0.037 * **	-0.024	0.005	-0.037 * **	-0.019	-0.001
	(−4.178)	(−1.265)	(0.261)	(−4.066)	(−0.946)	(−0.035)
Constant	61.865 * **	51.391 * **	10.513 * **	62.390 * **	52.347 * **	10.152 * **
	(61.621)	(24.674)	(5.212)	(60.110)	(24.320)	(4.873)
Observations	116,636	116,636	116,636	107,422	107,422	107,422
Adj. R-squared	0.365	0.228	0.235	0.371	0.231	0.240
Industry and year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Clustered std err by firm	Yes	Yes	Yes	Yes	Yes	Yes

This table presents the robustness test results of the effects of managerial ability on trade credit policies using alternative managerial ability proxies. REC_DAYS is trade receivables scaled by sales times the number of days in a quarter. PAY_DAYS is accounts payable scaled by COGS times the number of days in a quarter. NET_DAYS is REC_DAYS minus PAY_DAYS. ABILITY_High3/ABILITY_High5 is an indicator variable that equals one if ABILITY is above the industry median throughout the prior three/five years, and zero otherwise. Models 1–3/4–5 show the results of using ABILITY_High3/ABILITY_High5. All models control for industry and year fixed effects, where industries are defined using the 3-digit SIC codes. Heteroscedasticity robust t-statistics clustered at the firm level are reported in parentheses. Refer to Appendix A for detailed variable descriptions. * ** , * *, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

terms to customers.

5.1.1.2. Return-based managerial ability proxy. We follow Bertrand and Mullainathan (2001), Garvey and Milbourn (2006), and Brookman and Thistle (2013) to estimate an alternative measure of managerial ability (SKILL) as follows:

$$R_{jt} = \alpha + \beta EWI_t + \gamma VWI_t + D_t + \varepsilon_{jt} \quad (1)$$

where R_{jt} is the raw return for firm *i* in year *t*. EWI_t and VWI_t are the equally weighted and value-weighted industry returns, respectively. We do not include market returns because our estimates include time indicator variables (D_t). Eq. (1) is estimated for the full sample. Managerial luck is the predicted value from this regression and managerial ability (SKILL) is the residual.[20]

We regress trade credit variables on SKILL and report the results in Table 7. Consistent with the results of our baseline regressions, SKILL is negatively related to REC_DAYS and NET_DAYS and positively related to PAY_DAYS. The results suggest minimal endogeneity bias arising from the potential joint determination of the trade credit variables and the managerial ability score (ABILITY) used in our primary analysis.

Table 7
Return-based proxy for managerial ability.

Variables	**Model 1** REC_DAYS	**Model 2** PAY_DAYS	**Model 3** NET _DAYS
SKILL	-0.006 * *	0.006 * *	-0.009 * **
	(−2.421)	(2.439)	(−3.622)
PROFIT MARGIN	0.006	0.297 * **	-0.292 * **
	(0.505)	(24.741)	(−24.836)
FREE COLLATERAL	-0.230 * **	0.065 * **	-0.176 * **
	(−11.817)	(3.337)	(−9.592)
SHORT DEBT	0.025 * *	0.039 * **	-0.020 * *
	(2.436)	(4.276)	(−2.245)
CASH	-0.153 * **	0.081 * **	-0.157 * **
	(−12.733)	(5.790)	(−11.212)
OCF	-0.075 * **	-0.188 * **	0.148 * **
	(−8.639)	(−17.174)	(13.311)
RSI	-0.034 * **	0.025 *	-0.044 * **
	(−4.037)	(1.823)	(−3.369)
Constant	64.955 * **	38.300 * **	26.677 * **
	(57.945)	(15.936)	(11.632)
Observations	131,214	131,214	131,214
Adj. R-squared	0.306	0.215	0.209
Industry fixed effects	Yes	Yes	Yes
Clustered std err by firm	Yes	Yes	Yes

This table presents the regression results of tests on the effects of managerial ability on trade credit policies using an alternative measure of managerial ability (SKILL) estimated as in Bertrand and Mullainathan (2001), Garvey and Milbourn (2006), and Brookman and Thistle (2013) (see detailed explanations of this variable in the text). REC_DAYS is trade receivables scaled by sales times the number of days in a quarter. PAY_DAYS is accounts payable scaled by COGS times the number of days in a quarter. NET_DAYS is REC_DAYS minus PAY_DAYS. All models control for industry fixed effects, where industries are defined using the 3-digit SIC codes. Refer to Appendix A for detailed variable descriptions. * ** , * *, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

5.1.2. Instrumental variable regressions

Our prior findings may be subject to caveat if some latent firm or manager characteristics drive the observed relations between managerial ability and trade credit proxies. For instance, more able managers are drawn to better-performed firms that can negotiate more favorable trade credit terms with their trading partners. To address the concern of omitted variables, we adopt the instrumental variable regressions, in which we instrument ABILITY with ABILITY_ANNUAL (i.e., the median values of managerial ability score in each year for each firm size quartile excluding the focal firm) and STATE INCOME CHANGE (i.e., the ratio of the logarithm of state median income change in year t to the logarithm of state median income change in year t-1). ABILITY_ANNUAL captures the availability of capable candidates for managerial positions in a specific year for similar sized firms and is presumably positively related

[20] Since we estimate managerial ability (SKILL) using firm raw returns and industry returns, SKILL and trade credit variables are not jointly determined.

to the managerial ability of a focal firm. Moreover, ABILITY_ANNUAL does not directly affect a focal firm's trade credit policies. STATE INCOME CHANGE captures the compensation attractiveness of a state to potential manager candidates but there is no evidence that STATE INCOME CHANGE directly affects a firm's trade credit policies. Hence, the two variables satisfy both the relevance and exclusion conditions as a valid instrument.

Table 8 displays the results. Model 1 shows the results of the first stage of the instrumental variable regression, in which we regress ABILITY on ABILITY_ANNUAL, STATE INCOME CHANGE, and all other control variables in our baseline regressions in Table 2. The coefficient on ABILITY_ANNUAL is positive and significant at the 1% level, implying that the managerial ability in similar sized peer firms in the same year as a focal firm is positively related to the focal firm's managerial ability. The F-statistics of the Cragg and Donald test are significant at the 1% level, which rejects the null hypothesis that ABILITY_ANNUAL and STATE INCOME CHANGE are weak instruments. In Models 2–4, we regress each of the trade credit policy variables on the predicted value of managerial ability (PREDICTED ABILITY) from the first-stage regression

Table 8
Instrumental variable regression.

Variables	Model 1 (Stage 1) ABILITY	Model 2 (Stage 2) REC_DAYS	Model 3 (Stage 2) PAY_DAYS	Model 4 (Stage 2) NET_DAYS
ABILITY_ANNUAL	0.299 * **			
	(31.08)			
STATE INCOME CHANGE	-0.015 *			
	-(1.83)			
PREDICTED ABILITY		-0.049 * *	0.182 * **	-0.172 * **
		(−2.02)	(6.54)	(−5.98)
PROFIT MARGIN	0.086 * **	0.021 * *	0.240 * **	-0.223 * **
	(81.20)	(2.41)	(23.92)	(−21.29)
FREE COLLATERAL	-0.041 * **	-0.237 * **	0.085 * **	-0.172 * **
	-(17.90)	(−51.87)	(17.04)	(−35.20)
SHORT DEBT	0.059 * **	0.026 * **	0.034 * **	-0.016 * **
	(10.52)	(8.63)	(10.48)	(−4.91)
CASH	0.096 * **	-0.143 * **	0.052 * **	-0.118 * **
	(44.62)	(−26.74)	(8.17)	(−17.72)
OCF	0.194 * **	-0.065 * **	-0.221 * **	0.183 * **
	(51.21)	(−11.91)	(−33.79)	(26.19)
RSI	0.246 * **	-0.025 * **	-0.008	-0.011
	(25.91)	(−4.53)	(−1.11)	(−1.45)
Observations	129,041			
Partial R-squared	0.0117			
Partial F-statistics	485.32			
R-squared		0.0527	0.104	0.102
Industry and year fixed effects	Yes	Yes	Yes	Yes
Hansen stats		0.100	0.868	0.360
Hansen p-value		0.752	0.351	0.548
Kleibergen-Paap rk Wald F		485.3	485.3	485.3

This table presents the robustness test results of the effects of managerial ability on trade credit policies using an instrumental variable regression. In the first stage, we instrument ABILITY with the median values of managerial ability score in each year for each firm size quartile except the focal firm (ABILITY_ANNUAL) and STATE INCOME CHANGE (the ratio of the logarithm of state median income change in year t to the logarithm of state median income change in year t-1). Model 1 reports the first-stage regression results. In the second stage (Models 2–4), we replace ABILITY with its predicted value from Model 1 (PREDICTED ABILITY). The tests for the validity of the instruments are reported at the bottom of the table. All models control for industry and year fixed effects, where industries are defined using the 3-digit SIC codes. Heteroscedasticity robust t-statistics clustered at the firm level are reported in parentheses. Refer to Appendix A for detailed variable descriptions. * ** , * *, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 9
Heckman self-selection model.

Panel A - Regressions of Trade Credit

Variables	Model 1 REC_DAYS	Model 2 PAY_DAYS	Model 3 NET_DAYS
ABILITY	-0.061 * **	0.098 * **	-0.126 * **
	(−5.452)	(6.203)	(−8.097)
PROFIT MARGIN	-0.048 *	0.090 * **	-0.106 * **
	(−1.942)	(2.778)	(−3.580)
FREE COLLATERAL	-0.186 * **	0.103 * **	-0.192 * **
	(−7.729)	(4.279)	(−8.568)
SHORT DEBT	0.004	0.024 * *	-0.018 * *
	(0.333)	(2.564)	(−1.981)
CASH	-0.179 * **	-0.032	-0.049 * *
	(−9.649)	(−1.571)	(−2.446)
OCF	-0.120 * **	-0.279 * **	0.224 * **
	(−7.669)	(−15.122)	(12.748)
RSI	-0.083 * **	-0.070 * *	0.034
	(−5.569)	(−2.327)	(1.259)
MILLS	-0.116 * **	-0.230 * **	0.183 * **
	(−3.574)	(−6.006)	(5.179)
Constant	85.251 * **	136.107 * **	-51.364 * **
	(14.253)	(8.595)	(−3.584)
Observations	97,542	97,542	97,542
Adj. R-squared	0.283	0.295	0.300
Industry and year fixed effects	Yes	Yes	Yes
Clustered std err by firm	Yes	Yes	Yes

Panel B - Collinearity Diagnostics

Variables	VIF	Tolerance	R-squared
ABILITY	1.24	0.8049	0.1951
PROFIT MARGIN	2.52	0.3967	0.6033
FREE COLLATERAL	1.23	0.8115	0.1885
SHORT DEBT	1.09	0.9204	0.0796
CASH	1.75	0.5718	0.4282
OCF	1.83	0.5457	0.4543
RSI	1.88	0.5331	0.4669
MILLS	3.28	0.3048	0.6952
Mean	1.85		

This table presents the robustness test results of the effects of managerial ability on trade credit policies using the Heckman selection model. In the first stage, we run a logit regression model with an indicator variable for high managerial ability, classified as those with ABILITY in the top quartile of the sample distribution, as the dependent variable. In the second stage, we add the inverse mills ratios estimated from the first-stage regression to control for the selection bias. Panel A displays the results of the second-stage regressions. Panel B presents the variance inflation statistics (VIF) of each of the independent variables in the second stage regression. All models control for industry and year fixed effects, where industries are defined using the 3-digit SIC codes. Heteroscedasticity robust t-statistics clustered at the firm level are reported in parentheses. Refer to Appendix A for detailed variable descriptions. * ** , * *, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

and the same set of control variables as those in the first-stage regression. Our results echo those in the baseline regressions. The insignificant Hansen J-statistics suggest that our model specification is correct, and the instruments are valid.

5.1.3. Heckman selection model

More able managers may self-select into firms with more favorable trade credit policies. We employ the Heckman selection model to address this issue. In the first stage, we run a logit regression with the dependent variable being an indicator variable for high managerial ability, defined as those with ABILITY in the top quartile of the sample distribution. In the second stage, we incorporate the inverse mills ratios (MILLS) estimated from the first-stage regression to control selection bias. Panel A of Table 9 displays the second-stage results.[21] Consistent with the results in the baseline regressions, the coefficient on ABILITY is

[21] The result of the first-stage Heckman selection analysis is available upon request.

negative and significant when REC_DAYS and NET_DAYS are the dependent variables and positive and significant when PAY_DAYS is the dependent variable. The consistent estimation results suggest that our results are consistent with the potential sample selection bias.

Lennox et al. (2012) point out that failure to meet exclusion restrictions in the first-stage regression can cause multi-collinearity in the second-stage regression. Panel B of Table 9 reports the variance inflation statistics (VIF) of each independent variable in the second stage regression. The average VIF statistics is 1.85, suggesting that multi-collinearity is not a concern.

5.1.4. Entropy balancing

Our baseline results may be subject to the concern that firms with more able managers can fundamentally differ from those with less able managers. To address this issue, we revisit our baseline model employing a weighted sample derived by entropy balancing (EB) as in Canil et al. (2019).

Unlike the propensity score matching approach (PSM), EB solves a constrained optimization to identify continuous weights for the control sample while keeping weights as close as possible to equally-weighted.[22] EB permits less researcher discretion than PSM by focusing almost solely on setting a tolerance for convergence of the algorithm, which overcomes the concern that 'seemingly innocuous design choices greatly influence sample composition and estimates' of PSM treatment effects (Shipman et al., 2016). The use of continuous weights in EB ensures that higher-order moments of covariate distributions such as variance and skewness are similar across treated and control samples, resulting in near-perfect covariate balance. Furthermore, EB preserves statistical power and generalizability since all control firms remain in the sample rather than a subset. Finally, by assigning continuous weights to all control observations, EB reduces idiosyncratic noise. Specifically, EB balances the covariates of treated and control samples by calculating weights for every control observation such that their mean, variance, and skewness distributional moments equal those of the treated observations.[23]

We define treated/control subsample as firms with managerial ability scores above/below the sample median. Table 10 displays the results. Panel A reports the distribution of the control variables after EB. We calculate the standardized differences in covariates between the treated and the control subsamples as the difference in the mean values of the two subsamples divided by the standard deviation of the treated sample. The standardized difference approaches zero when the distribution for a particular covariate is more similar between the treated and control samples.[24]

Panel B shows that the weighted OLS regression results are qualitatively similar to those in the baseline regressions. The associations between ABILITY and REC_DAYS and between ABILITY and NET_DAYS continue to be significantly negative, and ABILITY is consistently positively related to PAY_DAYS. Thus, our results are robust to a weighted sample design.

5.1.5. Management turnover

To further control the endogeneity concerns, we employ management turnover as an exogenous shock to examine the relation between the changes in managerial ability and the changes in firm trade credit policy upon an executive turnover. We use the Execucomp database to identify the departure dates of managers. However, as the departure dates are often unavailable for management team members except those of CEOs and most but not all CFOs, we are only able to identify 5667 firm-quarter observations with CEO changes and 6245 firm-quarter observations with CFO changes, totaling 10,736 firm-quarter observations with manager changes. The number of observations is slightly smaller than the sum of the number of observations of the two types of executive change because we eliminate duplicate observations whereby the CEO and the CFO depart in the same quarter.[25]

We require a firm to have trade credit data for at least 4 quarters before and 4 quarters after an executive's departure. Since the impact of management changes might take place over time, we calculate the changes in all variables in our baseline regression as the differences in the average values of these variables within 4/8/12-quarter event windows, excluding the turnover quarter.

Table 11 displays the results for the subsample of firms with management changes. Consistent with the baseline regression results, there is a significant and negative relation between the changes in REC_DAYS/NET_DAYS and the changes in managerial ability upon executive turnovers and a positive relation between the changes in PAY_DAYS and the changes in managerial ability, further confirming the associations between managerial ability and trade credit proxies are causal.

One may argue that changes around managerial turnovers and the managerial turnovers are jointly determined (Bertrand and Schoar, 2003; Fee et al., 2013; Kaplan et al., 2012). To further address the endogeneity concern, we use tariff cuts as an exogenous shock. Exogenous tariff changes are defined as in Frésard (2010). We use three tariff cut thresholds, including a reduction in tariff rate of 2, 2.5, and 3 times larger than its median change, respectively. Moreover, instead of using managerial ability scores of the focal firms, we measure managerial ability of the incoming CEOs under their prior employment in the year before they join the focal firms. Trade credit and the control variables are defined as those in Table 11. The results indicate that managerial ability is positively/negatively associated with PAY_DAYS/NET_DAYS, consistent with those from the baseline regressions and CEO turnover analysis in Table 11[26]. For brevity, we report the results in Table 4A of the Internet Appendix.

5.2. Other confounding effects

5.2.1. Product types

Due to high switching costs, customers of firms with differentiated products and services are less likely to default on credit purchases since payment default might result in a relationship breakup with their suppliers. As such, firms in these industries are more willing to provide trade credit to customers. Studies show that firms with differentiated goods and services are associated with a significantly higher level of accounts receivable and a longer collection period than those with standardized goods (Mian and Smith, 1992; Blazenko and Vandezande, 2003; Giannetti et al., 2011). We examine whether managerial ability affects trade credit differently with product types.

We adopt the classification method of Rauch (1999) to identify firms producing different products. Specifically, we classify firms producing differentiated/standardized goods as those with 2-digit SIC codes of 25, 27, 30, 32, 34, 35, 36, 37, 38, and 39/12, 14, 20, 22, 23, 24, 26, 28, 29, 31, and 33. The rest of the sample observations are classified as service firms. We segment our sample into three subsamples, each consisting of firms with one type of the products, and present the results in Table 12. Panels A, B, and C present the results of account receivable days, accounts payable days, and net trade credit days, respectively. In all the three panels, Models 1, 2, and 3 report the results of firms with

[22] The propensity score matching approach (PSM) assigns a weight of either one (matched) or zero (excluded) to each control observation based on the propensity score.

[23] See detailed discussions on the benefits of EB over PSM in Canil et al. (2019).

[24] According to Normand et al. (2001) and Austin (2011), a standard difference of less than 10% indicates a negligible difference in the mean of a covariate between treated and control groups.

[25] The sample attrition is provided in Appendix B.

[26] The tariff data is obtained from https://dataweb.usitc.gov/tariff/database. Refer to Frésard (2010) for details in identifying exogenous tariff changes.

Table 10
Entropy Balancing.

Panel A - After entropy balance

Treated (N = 61861)				Control (N = 69706)				
Mean	Variance	Skewness		Mean	Variance	Skewness	Std. diff.	Variance ratio
PROFIT MARGIN	0.437	0.134	-3.390	0.435	0.139	-3.437	0.005	0.986
FREE COLLATERAL	0.223	0.052	1.413	0.223	0.052	1.413	0.000	1.000
SHORT DEBT	0.028	0.003	2.936	0.028	0.003	2.936	0.000	1.000
CASH	0.232	0.049	1.035	0.232	0.049	1.034	-0.001	1.001
OCF	0.039	0.012	-1.465	0.039	0.012	-1.474	0.002	0.994
RSI	0.041	0.008	8.952	0.041	0.008	8.905	-0.002	1.005

Panel B - Regressions of Trade Credit

	Model 1	Model 2	Model 3
Variables	REC_DAYS	PAY_DAYS	NET_DAYS
ABILITY	-0.044 * **	0.119 * **	-0.136 * **
	(−16.661)	(41.627)	(−48.030)
PROFIT MARGIN	0.021 * **	0.245 * **	-0.234 * **
	(7.665)	(80.128)	(−77.102)
FREE COLLATERAL	-0.224 * **	0.005	-0.121 * **
	(−56.275)	(1.087)	(−28.899)
SHORT DEBT	0.023 * **	0.046 * **	-0.026 * **
	(9.536)	(17.943)	(−10.292)
CASH	-0.144 * **	0.037 * **	-0.112 * **
	(−47.045)	(11.017)	(−34.004)
OCF	-0.064 * **	-0.204 * **	0.166 * **
	(−23.551)	(−68.694)	(56.282)
RSI	-0.030 * **	-0.012 * **	-0.009 * **
	(−10.479)	(−3.699)	(−2.829)
Constant	79.150 * **	57.731 * **	22.804 * **
	(50.633)	(17.685)	(7.133)
Observations	131,567	131,567	131,567
Adj. R-squared	0.358	0.268	0.279
Industry and year fixed effects	Yes	Yes	Yes
Clustered std err by firm	Yes	Yes	Yes

This table presents the robustness test results of the effects of managerial ability on trade credit management using the Entropy Balanced sample. Treated and control subsamples are defined as firms with managerial ability scores above and below the sample median, respectively. Panel A reports the distribution of control variables after Entropy Balancing (EB). Standardized differences (Std. Diff.) are calculated as the difference in means between treated and control samples divided by the standard deviation of the treated sample for each covariate. Variance ratios are calculated as the ratio of the variance of each covariate in the treatment sample scaled by variance for the control sample. Panel B reports the results of the weighted ordinary least squares (Weighted OLS) regressions of trade credit on managerial ability and the control variables, using weights specified by the Entropy Balancing program used to achieve covariate balance. All models control for industry and year fixed effects, where industries are defined using the 3-digit SIC codes. Heteroscedasticity robust t-statistics clustered at the firm level are reported in parentheses. Refer to Appendix A for detailed variable descriptions. * ** , * *, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

standardized goods, differentiated goods, and services, respectively.

Panel A shows that the coefficient of ABILITY is negative and significant in Models 1 and 3. Furthermore, the pairwise comparison of the coefficient of ABILITY indicates that the effect of managerial ability on REC_DAYS is significantly different across firms with differentiated products. In Panel B, we find a positive impact of managerial ability on PAY_DAYS in service firms. Lastly, the results in Panel C suggest that managerial ability is associated with fewer net trade credit days in firms providing services and standardized goods, and the impact of managerial ability on net trade credit is most pronounced among service firms. Collectively, our results indicate that the impact of managerial ability on trade credit is mostly prevalent in service firms and those with standardized goods.

5.2.2. Governance quality

Cheung et al. (2017) document that more able managers may extract more rents under weaker scrutiny and such opportunistic behaviors are constrained by stronger monitoring. We examine whether the effect of managerial ability on trade credit management is conditional on monitoring effectiveness. Table 13 displays the results. In Panel A, we divide our sample into subsamples of firms with high and low monitoring quality using the median value of institutional ownership percentage and repeat our baseline regressions. Models 1, 3, and 5/2, 4, and 6 show the results of the subsample of firms with low/high institutional ownership. The coefficients of ABILITY are consistent with our baseline regressions for both subsamples. Moreover, the coefficient of ABILITY is significantly larger in firms with high institutional ownership than those with low institutional ownership, implying that more able managers can further stretch trade credit in payables under more effective monitoring. The significantly lower net trade credit days in firms with high institutional ownership confirm that trade credit management is further improved with effective monitoring. In Panels B and C, we employ the median values of the number of blockholders and the percentage of independent directors to create subsamples of firms with high and low levels of monitoring quality, respectively. Our results remain consistent. Collectively, these results suggest that our baseline regression results are not confounded by the potential relation between managerial ability and corporate governance quality. Importantly, the positive effect of high-quality managers on obtaining favorable trade credit from suppliers is more evident under stronger monitoring.

Table 11
Management turnover analysis.

	1	2	3	4	5	6	7	8	9
	Quarters (−4,−1) to (1, 4)			*Quarters (−8,−1) to (1, 8)*			*Quarters (−12,−1) to (1, 12)*		
Variables	REC_DAYS	PAY_DAYS	NET_DAYS	REC_DAYS	PAY_DAYS	NET_DAYS	REC_DAYS	PAY_DAYS	NET_DAYS
ABILITY	-0.011	0.041 * **	-0.042 * **	-0.026 * *	0.058 * **	-0.065 * **	-0.025 * *	0.052 * **	-0.061 * **
	(−0.976)	-3.289	(−3.289)	(−2.150)	-4.663	(−5.358)	(−2.091)	-4.252	(−5.033)
PROFIT MARGIN	-0.064 * **	0.298 * **	-0.359 * **	-0.027	0.267 * **	-0.304 * **	0.005	0.297 * **	-0.313 * **
	(−3.106)	-12.874	(−15.631)	(−1.281)	-11.205	(−12.375)	-0.239	-12.54	(−12.814)
FREE COLLATERAL	-0.032 * *	0.053 * **	-0.083 * **	-0.057 * **	0.065 * **	-0.112 * **	-0.065 * **	0.076 * **	-0.125 * **
	(−2.362)	-3.901	(−6.388)	(−4.502)	-5.013	(−9.002)	(−5.320)	-6.142	(−10.372)
SHORT DEBT	0.016	0.005	0.009	0.020 *	0.021 *	-0.006	0.021 *	0.028 * *	-0.007
	-1.29	-0.389	-0.713	-1.676	-1.696	(−0.440)	-1.814	-2.476	(−0.608)
CASH	-0.156 * **	-0.014	-0.075 * **	-0.160 * **	-0.01	-0.083 * **	-0.163 * **	-0.017	-0.078 * **
	(−11.451)	(−0.963)	(−5.116)	(−11.897)	(−0.731)	(−5.675)	(−12.253)	(−1.346)	(−5.540)
OCF	-0.080 * **	-0.091 * **	0.072 * **	-0.084 * **	-0.143 * **	0.119 * **	-0.100 * **	-0.188 * **	0.155 * **
	(−5.224)	(−5.761)	-4.837	(−5.869)	(−8.642)	(7.8)	(−7.541)	(−11.918)	-10.256
RSI	-0.054 * **	0.006	-0.036	-0.071 * **	0.028	-0.066 * **	-0.081 * **	-0.01	-0.029
	(−3.149)	-0.286	(−1.608)	(−5.019)	-1.586	(−3.397)	(−5.773)	(−0.589)	(−1.634)
Constant	-0.409	0.668	-1.14	-1.852 *	0.627	-2.797	-1.864 *	0.856	-3.452
	(−0.386)	-0.281	(−0.534)	(−1.665)	-0.262	(−1.124)	(−1.671)	-0.336	(−1.307)
Observations	10,736	10,736	10,736	10,736	10,736	10,736	10,736	10,736	10,736
Adj. R-squared	0.0533	0.103	0.145	0.0689	0.109	0.135	0.0821	0.127	0.138
Industry and year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clustered std err by firm	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

This table presents the regression results of tests on the effects of managerial ability on trade credit policies using management turnover as an exogenous shock. The dependent variables are changes in the three trade credit proxies (REC_DAYS, PAY_DAYS, and NET_DAYS) over various quarter windows around the management turnover quarter. The variable of interest, ABILITY is the changes in managerial ability score over the corresponding quarter windows. Models 1–3/4–6/7–9 show the results of the four/eight/tweleve quarter window around turnover. All models control for industry and year fixed effects, where industries are defined using the 3-digit SIC codes. Heteroscedasticity robust t-statistics clustered at the firm level are reported in parentheses. Refer to Appendix A for detailed variable descriptions. * ** , * *, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

5.3. Effects on firm value

We examine how the effects of managerial ability on firm trade credit policy affect firm value by controlling for other channels through which firm value is created.[27] We measure firm value with Tobin's Q.[28] We include operation capital (OC), return on assets (ROA), long-term debt to assets ratio (LONGDEBT), capital expenditure to assets ratio (CAPX), dividend payout ratio (DIVIDEND), the natural logarithm of firm assets (LNSIZE) as control variables.[29] Following the methodology in Hasan et al. (2021), we include interaction terms between managerial ability and these control variables to alleviate the concern that other corporate policies or firm characteristics contribute to higher firm value. We lag all independent variables by one period. Table 14 displays the results.

All the three trade credit proxies affect firm value as expected, i.e., more receivable days and more net trade credit day decrease firm value, and more payable days increase firm value. The coefficients of REC_DAYS * ABILITY and PAY_DAYS * ABILITY are positive and significant, suggesting that both receivable and payable policies implemented by more able managers are more value-enhancing than those implemented by low-ability managers. The effects of the control variables are consistent with the literature. For example, consistent with Bharadwaj (2000) and Eisfeldt and Papanikolaou (2013), we document organization capital increases firm value. Furthermore, the positive impact of organization capital is more pronounced in firms with more able managers. Overall, the results in Table 14 indicate more able managers implement value-enhancing trade credit policies.

5.4. Incorporating all explanatory factors and simultaneous equations model (SEM)

To further check the robustness of our results, we conduct additional analyses by incorporating all explanatory factors and employ the simultaneous equations model (SEM) to address omitted variable and endogeneity concerns. To save space, the detailed results of these analyses are reported in Tables 5A and 6A of the Internet Appendix.

First, we add all variables used to partition the sample to the baseline regression, including financial constraints (Whited-Wu index, WW), product market competition (FLUIDITY), indicator for crisis period (CRISIS) and corporate governance variables (institutional ownership, INSTOWN; the number of blockholders, BLOCKOWN; and the percentage of independent directors, INDDIR) to our baseline regressions. Second, in addition to sample partition variables mentioned above, we include two dummy variables, STDGOODS (coded as one for firms with standard goods, zero otherwise) and DIFFGOODS (coded as one for firms with diffferentiated goods, zero otherwise) to control different product types. The results stay qualitatively similar to the baseline regression results. See detailed results in Table 5A of the Internet Appendix.

Finally, we follow Lee et al. (2018) to use a system of simultaneous equation model (SEM) approach to alleviate endogeneity concerns from the simultaneous determination of trade credit policy and managerial ability. Specifically, we estimate two regressions simultaneously, one for the trade credit and one for managerial ability. In the trade credit regression (REC_DAYS/ PAY_DAYS/NET_DAYS), we control for the same set of variables as those in our main analysis. In the managerial ability regression, we include the trade credit proxy as an explanatory variable while controlling FREE COLLATERAL, OCF, and RSI from the baseline regression. Additionally, we use LNMKCAP (logarithm of the market value of equity) to measure firm market value and HERFINDAHL to capture market competition. We include industry and year-fixed effects

[27] We thank an anonymous reviewer for suggesting that we control for other channels through which value is created.

[28] Studies on the association between managerial compensation and corporate performance have employed Tobin's Q to measure firm value (Morck et al., 1988; Lang and Stulz, 1994; Yermack, 1996; Himmelberg et al., 1999; Palia, 2001; Benson et al., 2019).

[29] Bharadwaj (2000) and Eisfeldt and Papanikolaou (2013) document better firm performance in firms with higher levels of organization capital. In addition, firms with higher return on assets (ROA) are expected to have higher market value. Capital structure, dividend policies, and investment decisions are all shown to affect firm value (Jensen and Murphy, 1990; Gaver and Gaver, 1993).

Table 12
Managerial ability and trade credit: Different product types.

Panel A - REC_DAYS	Model 1	Model 2	Model 3
Variables	Standardized	Differentiated	Services
ABILITY	-0.091 * **	0.005	-0.047 * **
	(−4.155)	(0.177)	(−3.982)
Control variables	Yes	Yes	Yes
Constant	63.833 * **	65.250 * **	59.882 * **
	(33.044)	(44.855)	(38.327)
Chi-squared stats for the difference in ABILITY coefficients (1) vs. (2)	36.76 * **		
Chi-squared stats for the difference in ABILITY coefficients (1) vs. (3)	6.15 * **		
Chi-squared stats for the difference in ABILITY coefficients (2) vs. (3)	78.02 * **		
Observations	24,798	43,137	63,632
Adj. R-squared	0.178	0.139	0.442
Industry and year fixed effects	Yes	Yes	Yes
Clustered std err by firm	Yes	Yes	Yes
Panel B - PAY_DAYS	**Model 1**	**Model 2**	**Model 3**
Variables	Standardized	Differentiated	Services
ABILITY	0.040	0.025	0.137 * **
	(1.546)	(0.932)	(7.151)
Control variables	Yes	Yes	Yes
Constant	54.542 * **	39.499 * **	44.228 * **
	(12.390)	(13.994)	(13.330)
Chi-squared stats for the difference in ABILITY coefficients (1) vs. (2)	4.79 * *		
Chi-squared stats for the difference in ABILITY coefficients (1) vs. (3)	284.04 * **		
Chi-squared stats for the difference in ABILITY coefficients (2) vs. (3)	356.82 * **		
Observations	24,798	43,137	63,632
Adj. R-squared	0.277	0.137	0.322
Industry and year fixed effects	Yes	Yes	Yes
Clustered std err by firm	Yes	Yes	Yes
Panel C - NET _DAYS	**Model 1**	**Model 2**	**Model 3**
Variables	Standardized	Differentiated	Services
ABILITY	-0.083 * **	-0.023	-0.158 * **
	(−3.162)	(−0.801)	(−8.455)
Control variables	Yes	Yes	Yes
Constant	9.744 * *	25.309 * **	16.118 * **
	(2.390)	(8.784)	(5.155)
Chi-squared stats for the difference in ABILITY coefficients (1) vs. (2)	22.15 * **		
Chi-squared stats for the difference in ABILITY coefficients (1) vs. (3)	333.66 * **		
Chi-squared stats for the difference in ABILITY coefficients (2) vs. (3)	493.91 * **		
Observations	24,798	43,137	63,632
Adj. R-squared	0.228	0.156	0.334
Industry and year fixed effects	Yes	Yes	Yes
Clustered std err by firm	Yes	Yes	Yes

This table presents the regression results of tests on the effects of managerial ability on trade credit policies for firms producing different products. Following Rauch (1999), we classify firms producing differentiated goods as those with the 2-digit SIC codes of 25, 27, 30, 32, 34, 35, 36, 37, 38, and 39, standardized goods as those with the 2-digit SIC codes of 12, 14, 20, 22, 23, 24, 26, 28, 29, 31, and 33, and the remaining observations as those providing service goods. We create three subsamples with each consisting of one type of the products, and present the results of REC_DAYS, PAY_DAYS, and NET_DAYS in Panel A, B, and C, respectively. All models control for industry and year fixed effects, where industries are defined using the 3-digit SIC codes. Heteroscedasticity robust t-statistics clustered at the firm level are reported in parentheses. Refer to Appendix A for detailed variable descriptions. * ** , * *, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 13
Managerial ability and trade credit: Corporate governance.

Panel A - High vs. Low Institutional Ownership	Model 1 REC_DAYS	Model 2	Model 3 PAY_DAYS	Model 4	Model 5 NET_DAYS	Model 6
	Low	High	Low	High	Low	High
ABILITY	-0.043 * **	-0.050 * **	0.059 * **	0.142 * **	-0.079 * **	-0.163 * **
	(−3.440)	(−3.801)	(3.18)	(6.626)	(−4.272)	(−7.784)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Constant	63.785 * **	64.292 * **	48.577 * **	44.264 * **	15.449 * **	20.441 * **
	(45.107)	(40.929)	(14.318)	(14.78)	(4.705)	(7.333)
Chi-squared stats for the difference in ABILITY coefficients	0.96		22.74 * **		20.55 * **	
Observations	65,524	66,043	65,524	66,043	65,524	66,043
Adj. R-squared	0.298	0.458	0.261	0.334	0.253	0.366
Industry and year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Clustered std err by firm	Yes	Yes	Yes	Yes	Yes	Yes
Panel B - High vs. Low Number of Blockholders	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
	REC_DAYS		PAY_DAYS		NET_DAYS	
	Low	High	Low	High	Low	High
ABILITY	-0.043 * **	-0.050 * **	0.075 * **	0.142 * **	-0.095 * **	-0.162 * **
	(−3.862)	(−3.685)	(4.517)	"(6.617)"	(−5.831)	(−7.693)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Constant	64.093 * **	63.927 * **	49.859 * **	42.113 * **	14.763 * **	22.069 * **
	(50.512)	(42.014)	(16.589)	(13.976)	(5.13)	(7.826)
Chi-squared stats for the difference in ABILITY coefficients	0.26		24.10 * **		26.12 * **	
Observations	77,695	53,872	77,695	53,872	77,695	53,872
Adj. R-squared	0.322	0.441	0.267	0.319	0.26	0.359
Industry and year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Clustered std err by firm	Yes	Yes	Yes	Yes	Yes	Yes
Panel C - High vs. Low Percent of Independent Directors	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
	REC_DAYS		PAY_DAYS		NET_DAYS	
	Low	High	Low	High	Low	High
ABILITY	-0.038	-0.026	0.104 * **	0.126 * **	-0.116 * **	-0.143 * **
	(−1.582)	(−1.444)	(3.574)	(3.487)	(−3.909)	(−4.114)
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Constant	60.145 * **	63.998 * **	26.262 * **	27.161 * **	34.074 * **	35.820 * **
	(26.58)	(26.828)	(6.267)	(4.256)	(7.568)	(6.136)
Chi-squared stats for the difference in ABILITY coefficients	0.9		3.47 *		2.77 *	
Observations	15,261	14,264	15,261	14,264	15,261	14,264
Adj. R-squared	0.556	0.616	0.463	0.428	0.478	0.431
Industry and year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Clustered std err by firm	Yes	Yes	Yes	Yes	Yes	Yes

This table presents the regression results of tests on the effects of managerial ability on trade credit policies for firms with strong and weak corporate governance. In Panels A, B, and C, we use the median value of institutional ownership percentage, the number of blockholders, and the percentage of independent directors to create subsamples of firms with high and low levels of monitoring quality, respectively. In each panel, Models 1, 3, and 5/2, 4, and 6 show the results of firms with low/high governance quality. The pairwise comparisons of the difference in the coefficient estimates of ABILITY for firms with high and low governance quality are presented at the bottom of each panel. All models control for industry and year fixed effects, where industries are defined using the 3-digit SIC code. Heteroscedasticity robust t-statistics clustered at the firm level are reported in parentheses. Refer to Appendix A for detailed variable descriptions. * ** , * *, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 14
Firm value, managerial ability, and trade credit.

	Model 1	Model 2	Model 3
ABILITY	0.166 * **	0.174 * **	0.178 * **
	(9.528)	(10.526)	(10.787)
REC_DAYS	-0.067 * **		
	(−18.253)		
REC_DAYS * ABILITY	0.017 * *		
	(2.563)		
PAY_DAYS		0.046 * **	
		(11.325)	
PAY_DAYS * ABILITY		0.013 * *	
		(2.420)	
NET_DAYS			-0.078 * **
			(−19.117)
NET_DAYS * ABILITY			-0.003
			(−0.779)
OC	0.043 * **	0.041 * **	0.035 * **
	(8.280)	(7.837)	(6.488)
OC * ABILITY	0.014 * *	0.012 *	0.013 * *
	(2.182)	(1.869)	(2.060)
ROA	-0.010 * *	-0.000	0.000
	(−2.101)	(−0.013)	(0.099)
ROA * ABILITY	0.048 * **	0.048 * **	0.048 * **
	(8.559)	(8.687)	(8.676)
LONGDEBTt	-0.045 * **	-0.044 * **	-0.043 * **
	(−11.841)	(−11.497)	(−11.363)
LONGDEBT * ABILITY	0.006	0.006	0.005
	(1.239)	(1.069)	(0.962)
CAPXt	0.096 * **	0.096 * **	0.091 * **
	(24.218)	(23.869)	(22.691)
CAPX * ABILITY	-0.022 * **	-0.028 * **	-0.028 * **
	(−6.077)	(−6.985)	(−6.856)
DIVIDENDt	0.146 * **	0.152 * **	0.152 * **
	(40.894)	(42.647)	(42.796)
DIVIDEND * ABILITY	0.006	0.007	0.007
	(1.527)	(1.624)	(1.583)
LNSIZE	-0.053 * **	-0.058 * **	-0.060 * **
	(−14.019)	(−15.122)	(−15.692)
LNSIZE * ABILITY	-0.116 * **	-0.114 * **	-0.113 * **
	(−8.298)	(−8.187)	(−8.122)
Constant	2.098 * **	1.847 * **	1.916 * **
	(17.146)	(15.064)	(15.751)
Observations	100,588	100,588	100,588
Adj. R-squared	0.231	0.230	0.233
Year fixed effect	Yes	Yes	Yes
Industry fixed effect	Yes	Yes	Yes
Clustered std err by firm	Yes	Yes	Yes

This table presents the results of the tests on the effect of managerial ability on firm value through trade credit management by controlling for other channels through which firm value is created. Firm value is measured with Tobin's Q, constructed as the market value of assets scaled by the book value of assets. All independent variables are lagged by one time period. All models control for industry and year fixed effects, where industries are defined using the 3-digit SIC codes. Heteroscedasticity robust t-statistics clustered at the firm level are reported in parentheses. Refer to Appendix A for detailed variable descriptions. * ** , * *, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

in all regressions. We estimate the SEM with three-stage least square regression (3SLS), treating both ABILITY and proxies for trade credit as endogenous variables and allowing the error terms in both regressions to be correlated. The baseline results continue to hold. Therefore, we conclude that the positive effects of more able managers on favorable trade credit policies remain robust after we account for endogeneity. See detailed results in Table 6A of the Internet Appendix .

6. Conclusion

We examine how more able managers affect corporate trade credit. Using a large sample of U.S. firms from 2003 to 2016, we find that firms with more able managers enjoy more favorable trade credit characterized by fewer days in receivables and more days in payables. The results are robust to various model specifications, subsample analysis, alternative definitions of managerial ability, and exogenous shock analysis, indicating that the associations between managerial ability and trade credit policies are likely to be causal. We also document some evidence that more able managers' trade credit policies are value-enhancing.

The results are consistent with the premise that firms with more able managers have greater bargaining power over their trading partners. More able manager-led firms induce more confidence or trust from both upstream and downstream business partners who are willing to do business with them even with unfavorable credit sale terms, reflecting the impact of the imbalance of power within the supply chain on trade credit. The results further confirm that managerial ability is a valuable intangible asset to a firm. More able managers can empower their firms, which increases their firms' attractiveness to their customers and suppliers and makes it possible for them to exert tougher terms of credit purchases and sales on their trading partners. Firms can improve trade credit policies and hence improve firm value by employing more able managers.

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Appendix A. Variable definitions

Variables	Definitions
REC_DAYS	Accounts receivable scaled by sales multiplied by the number of days in a quarter.
PAY_DAYS	Accounts payable scaled by the cost of goods sold multiplied by the number of days in a quarter
NET_DAYS	The difference between REC_DAYS and PAY_DAYS
ABILITY	Continuous managerial ability score in Demerjian et al. (2012)
ABILITY_HIGH3	An indicator variable that equals one if ABILITY is above the industry median throughout the prior three years, and zero otherwise
ABILITY_HIGHT5	An indicator variable that equals one if ABILITY is above the industry median throughout the prior five years, and zero otherwise
PROFIT MARGIN	The difference between revenue and cost of goods sold scaled by revenue
SHORT DEBT	Short-term debt scaled by assets
CASH	The sum of cash and short-term investment scaled by assets
OCF	Operating cash flow scaled by assets
FREE COLLATERAL	Property, plant, and equipment minus short-term debt scaled by assets
RSI	Research and development expenditures scaled by total assets.
ABILITY_ ANNUAL	The median values of managerial ability score in each year for each firm size quartile excluding the focal firm
STATE INCOME CHANGE	The ratio of the logarithm of state median income change in year t to the logarithm of state median income change in year t-1
Whited-Wu index	WW index= −0.91 *Cash flow − 0.062 *Payout+ 0.021 *LTD-0.044 *log(total assets)+ 0.1021 *IndSG-0.035SG, where Cash flow is income before extraordinary items plus depreciation scaled by book value of total assets. Payout is an indicator variable that equals one if the sum of common dividends and preferred dividends are positive and zero otherwise. LTD is long-term debt scaled by book value of total assets. IndSG is the average industry sales growth, where industries are classified using the three-digit SIC industry codes. SG is sales growth rate for each firm.
Hadlock-Pierce index	HP index= −0.737 *Size+ 0.043 *Size2–0.048Age, where Size is the logarithm of inflation-adjusted total assets in 2004 dollars, Size2 is the squared value of Size, and Age is the number of years the firm is listed with a non-missing stock price on Compustat. We follow Hadlock and Pierce to cap Size at $4.5 billion and Age at 37 years.
Firm size (LNSIZE)	The logarithm of assets
Institutional ownership	The percent of firm shares held by institutional owners
Number of blockholders	The number of blockholders of a firm (i.e., shareholders with at least 5% of the firm's shares).
Percentage of independent directors	The number of independent directors scaled by the number of directors on the board.
Industry concentration (HERFINDAHL)	Sales-based Herfindahl index, constructed as the sum of the square of sales of each firm to total sales in an industry.
FLUIDITY	Product market competition, constructed by Hoberg et al. (2014) using firms' product descriptions, measures changes in rival firms' products relative to a firm's products. See details in Hoberg et al. (2014)
Tobin's Q	Market value of equity plus the book value of liabilities, scaled by the book value of total assets
ROA	Return on assets
LONGDEBT	Long-term debt scaled by total assets
CAPX	Year-to-date capital expenditures scaled by total assets
DIIVIDEND	Dividend payout ratio
OC	Organization capital, See details of the contruction of this variable in Gao et al. (2021)
LNMKCAP	The logarithm of the market value of equity

Appendix B: Sample attrition

Screening criteria	Firm-quarter observations
Original sample	137,022
Firms with available data in Execucomp, among which:	49,280
CEO change	5667
CFO change	6245
Firms without CEO and/or CFO change	38,544

Note: In our analysis, we eliminate duplicate observations whereby the CEO and the CFO depart in the same quarter.

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