Financial Development, Trade Credit and Corporate Cash Holding:

Cross-Country Analyses

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Abstract

The sensitivity of cash to trade credit is an important liquidity management issue in corporate finance. This paper investigates the effect of financial development on the relationship between trade credit and cash holdings in an international setting. Using firm-level data for 24,914 firms for the years 1990–2013 for 72 countries, we first document an asymmetric effect of trade payables and receivables on cash holdings: firms can use $1 of credit receivables to cover $3.80 of payables on cash holdings. We then find that firms in countries with higher levels of financial development substitute more receivables for cash. Our conclusions are robust after controlling for legal origin and the uneven distribution of the number of observations across countries.

JEL classification: G31; G32
Keywords: Cash; Trade credit; Financial development; Receivables; Payables; Cross countries

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1. Introduction

Trade credit and cash comprise a large percentage of firms' assets around the world. According to our statistics, the median of the ratio of accounts receivable (payable) to total assets from 24,914 firms listed in 72 countries between 1990 and 2013 is 14.6% (7.1%), and the median of the ratio of cash and cash equivalents to total assets is 7.1%. The existing literature has documented four motives for holding so much cash: the precautionary motive, the transaction motive, the agency motive, and the tax motive (Opler et al., 1999; Dittmar et al., 2003; Harford et al., 2008; Bates et al., 2009). A growing body of literature also studies why firms extend and use trade credit. The reasons that firms extend trade credit to their customers include informational advantage, price discrimination, switching costs, product quality guarantees and profitability problems (Giannetti et al., 2011),[1] whereas their motives for receiving trade credit are transactional and financial.[2]

Receivables are regarded as a cash substitute; a granter of trade credit can factor receivables or use them to secure loans from financial intermediaries, such as banks. Nevertheless, a user of trade credit needs to hold some cash for forthcoming trade payables, because repaying trade credit after the due date may incur costs such as late payment penalties, forgoing a possible cash discount, and a possible deterioration in credit reputation.

[1] Giannetti et al. (2011) provides a review of these theories. The motives of firms' extending trade credit to customers include informational advantage (Smith, 1987; Biais and Gollier, 1997; Cunat, 2007), price discrimination (Brennan et al., 1988), switching costs (Burkart and Ellingsen, 2004), product quality guarantees (Lee and Stove, 1993) and profitability problems (Molina and Preve, 2009).

[2] The transactional motive theory argues that using trade credit can reduce the transaction costs of paying bills and allows a firm to verify product quality before paying (Ferris, 1981; Smith, 1987; Long et al., 1993). The financial motive emphasizes that trade credit is a substitute for conventional short-term financing loans (Petersen and Rajan, 1997; Nilsen, 2002; Fishman and Love, 2003).

Thus, trade receivables and payables both have effects on firms' cash holdings; receivables reduce cash holdings, whereas payables have the opposite effect.

As cash is not productive, firms expect to be able to substitute receivables for cash and prefer to hold less cash for payables. Although it is important for firms' liquidity management, prior literature has paid relatively little direct attention to the sensitivity of cash holdings to receivables and payables. Most literature has not examined the separate effects of receivables and payables on cash holdings. Rather, in estimating its effect on cash holdings, net trade credit (trade credit receivables minus payables) has been treated as just one component of working capital. This will bias the effects of receivables and payables on cash holdings if they exert different effects to each other and to other components of net working capital. A study by Wu et al. (2012) is an exception that uses Chinese listed companies to investigate the different effects of receivables and payables on cash holdings.

The sensitivity of cash holdings to receivables and payables is affected by many factors, including the nature of the firm's receivables and payables, firm characteristics such as size, financial leverage and growth opportunities, and aspects of the market environment such as financial development. In this study, we investigate the sensitivity of cash holdings to trade credit in a cross-country setting with differing levels of financial development, as prior studies document considerable variation in the development of financial markets and sectors across countries (La Porta et al., 1997).

Prior literature has documented that development of the financial sector provides the industrial sector with better financial services (Dornbusch and Reynoso, 1989; Hasan et al., 2009). In a more developed financial sector, financial intermediaries, particularly banks, are

better able to identify and pool the credit risk of receivables and thus reduce the transaction costs incurred in factoring receivables or using receivables to secure loans. The better financial services available in more developed financial sectors lessen the costs incurred by firms converting their receivables into cash. Consequently, firms in countries with higher levels of financial development are likely to substitute receivables for cash.

Using data from 213,205 firm-year observations of 24,914 companies in 72 countries, we find that firms need to hold an additional $5.03 of cash for every $100 of credit payable, whereas $100 of credit receivable substitutes for $18.93 of cash. This finding is not consistent with the traditional wisdom that $1 of credit receivable covers $1 of credit payable in cash. On average, listed companies around the world can use $1 of receivables to cover $3.80 of payables in cash. This asymmetric effect of payables and receivables on cash holdings suggests that past studies may have drawn biased conclusions by treating net trade credit as just one component of working capital when estimating its effect on cash holdings. As the effects of payables and receivables on cash holdings are different, it is more appropriate to disentangle them.

In addition, we find that financial development exerts an asymmetric effect on the relationship between accounts payable and cash and the relationship between accounts receivable and cash. More specifically, accounts receivable can substitute for cash in countries with higher financial development, whereas there is no difference in whether firms hold cash for payables in countries with different levels of financial development. Our main findings hold even after controlling for legal origin. Although there is uneven distribution of number of observations across countries, WLS (weighted least square) regressions show that

our conclusion is not driven by a few countries with high numbers of observations.

We then examine whether the effect of financial development on the trade credit sensitivity of cash is homogenous across different types of firm. We find that the effect of financial development on the accounts receivable sensitivity of cash holdings is more pronounced for firms with larger size, lower market-to-book ratio, and higher leverage. This suggests that these firms benefit more from the development of the financial sector when substituting credit receivables for cash.

This study contributes to the literature in several ways. First, it extends research on the effects of financial development (Dornbusch and Reynoso, 1989; Hasan et al., 2009). It investigates the influence of financial development at the micro level by linking two important firm operations: trade credit and cash holding policies.[3] We demonstrate that financial development can help firms to make better use of trade credit as a short-term financing instrument. Wu et al. (2012) use the ratio of bank loans to the GDP of provinces in China as a proxy for regional financial deepening to examine the effect of regional financial deepening on the sensitivity of cash to trade credits for Chinese listed companies. Instead, this study uses both stock market development and financial intermediaries as financial development measures, and expands the scope of the study from a single country to a cross-country setting.

Second, we enrich existing studies on trade credit. Most literature on trade credit focuses on why firms extend and take credit (Petersen and Rajan, 1997; Cunat, 2007; Giannetti et al., 2011). This study instead examines how trade credit influences a firm's

[3] Only a few studies investigate the influence of financial development at the micro level, such as the way in which financing development affects firm growth and investment (Demirgüç-Kunt and Maksimovic, 1998; Beck et al., 2004; Khurana et al., 2006).

operations or, more specifically, its cash management policy. Our finding that payables and receivables exert different effects on cash holdings deepens our understanding of the difference between the demand and supply sides of trade credit.

Third, this study complements research on the determinants of cash holdings (Opler et al., 1999; Dittmar et al., 2003; Ozkan and Ozkan, 2004; Dittmar and Marht-Smith, 2007). Past studies have not examined trade credit as a separate determinant of cash holdings (Opler et al., 1999; Dittmar and Marht-Smith, 2007).[4] However, our results show that trade credit plays a significant role in explaining cash holdings, as it increases the explanatory power of the regression model of their determinants. Furthermore, the asymmetric influence of credit payables and credit receivables indicates that it is better to disentangle their distinct effects when considering their overall effect on cash holdings.

The remainder of the paper is organized as follows. Section 2 develops the hypotheses. Section 3 describes the data, variables, and methodology. Section 4 presents the empirical results and section 5 concludes the paper.

2. Hypothesis Development

Trade credit is one important source of short-term external finance for firms (Petersen and Rajan, 1997). When using trade credit, buyers need not pay for goods and services on delivery and can enjoy a short deferment period before payment is due. The delayed payments become accounts or notes payables on the balance sheet. The buyer must pay the

[4] Among the determinants of cash holdings examined in the literature, the term most closely related to trade credit is "net working capital," which is regarded as a liquidity substitute. Net trade credit (accounts receivable minus accounts payable) is just one component of net working capital (Opler et al., 1999; Dittmar and Marht-Smith, 2007).

payables before the due date or incur one of several possible costs of stretching accounts payables, including late payment penalties or interest, a possible deterioration in credit rating, and the cost of the cash discount forgone, if any. Consequently, in view of the precautionary motive, firms that use trade credit usually hold some additional cash to meet their future payment obligations for their accounts payables to enjoy a cash discount and avoid late payment penalties.

When offering trade credit, a supplier does not receive cash at the time it delivers the goods or services to the buyer. The future expected repayment becomes an account or note receivable on the balance sheet. These receivables can be regarded as a cash substitute in two channels. One is that the supplier can factor them or use them as collateral for financing from a bank, directly converting receivables into cash. The other channel is that the supplier's cash holdings for future investments can reduce as it expects to collect cash from the receivables at some point in the future. Credit receivables decrease a firm's cash holdings, in that the more receivables a firm has, the less cash it holds.

However, receivables are not perfect substitutes for cash, as they are less liquid and are subject to credit risk. There is uncertainty about collecting receivables on time, and firms are not always successful in collecting all receivables in full. If the suppliers factor them or use them as collateral for financing, they will be discounted by a factor or bank. Hence, receivables are discounted as a cash substitute. In other words, $1 of receivables cannot substitute for $1 of cash.

Moreover, we argue that the substitute ratio of receivables for cash is related to development of the financial sector. In a more developed financial sector, financial

intermediaries are better able to identify and pool the credit risk of receivables and thus reduce the transaction costs incurred in factoring receivables or using receivables to secure loans. The better financial services available in more developed financial sectors lessen the costs incurred by firms converting their receivables into cash. Hence, firms in countries with higher levels of financial development can substitute more of their receivables for cash.

The effect of financial development on the sensitivity of cash to payables is a tradeoff between the precautionary view and the agency cost view of cash holdings. The precautionary view of cash holdings holds that better financial development helps firms reduce the cost of raising funds from outsiders (Rajan and Zingales, 1998; Khurana et al., 2006), thus reducing the risk of cash shortages. Firms in countries with a high level of financial development can therefore hold less cash for payables. According to the agency cost view, excess cash holdings are due to managerial discretion (Harford et al., 2008). Dittmar et al. (2003) find that firms in countries with higher financial development hold more cash, as those firms can more easily raise external funds at lower cost. In this view, firms in countries with a high level of financial development will hold more cash for payables. Consequently, the effect of financial development on the sensitivity of cash to payables is unclear. We will leave this as an empirical issue. Based on the above discussion, we present the following hypothesis.

Hypothesis 1: *Firms in countries with higher levels of financial development can substitute more of their trade credit receivables for cash.*

3. Methodology and Data

3.1 Data and sample

Our financial data are taken from the FactSet database. Our sample period is 1990 to 2013. Following prior studies (Dittmar et al., 2003; Khurana et al., 2006), we exclude firms with operations in financial services (SIC codes starting with 6), firms that are considered governmental or quasi-governmental (SIC codes starting with 9), firms for which data for cash and equivalents and/or assets are missing, and firms that do not present consolidated financial statements. We also exclude firms in countries with fewer than 50 firm-year observations. The remaining sample consists of 213,205 firm-year observations of 24,914 companies from 72 countries.

Table 1 lists the number of firm-year observations and number of firms by country. The numbers of observations and firms are distributed unevenly across countries. The U.S. has the most firm-year observations (40,545) and the most firms (3,619), followed by Japan, which has 33,292 observations and 3,025 firms, and China, which has 16,171 observations and 2,601 firms. Forty countries have fewer than 1,000 firm-year observations and 37 countries have fewer than 100 firms. Malta has the fewest firm-year observations (56) and the Czech Republic has the fewest firms (9).

Insert Table 1 about here

3.2 Measurement of the key variables

(1) Trade credit and cash holding

As the total volume of trade credit is not available, prior studies usually use accounts payable and receivables to capture the offering and receipt of trade credit (Petersen and Rajan

1997; Fisman and Love 2003; Giannetti et al. 2011). We use total accounts payable/total assets and total accounts receivable/total assets to measure the use and offering of trade credit, respectively. The variables *CT_REV* and *CT_PAY* are respectively defined as accounts receivable and accounts payable deflated by total assets. The variable *CASH*, the cash ratio, is defined as the ratio of cash and cash equivalents to total assets.[5]

Table 1 reports the median values of trade credit, cash to assets and other control variables by country. Across the 72 countries, the overall median of cash and cash equivalents to total assets ratio is 7.1%. Bahraini firms have a median cash to assets ratio of 20.1%, the highest among our sample countries, followed by Hong Kong and Israeli firms, which have a median cash to assets ratio of 16.5% and 16.1%, respectively. The overall median of accounts receivable to total assets ratio is 14.6%, and that of accounts payable to total assets ratio is 7.1%. This suggests that listed firms often extended more trade credits to their customers than those they were given by their suppliers. French firms have the highest accounts receivable to assets ratio (25.5%), followed by firms in Morocco (24%) and Italy (23.7%). The Moroccan firms have the highest accounts payable to assets ratio (15.6%), followed by firms in Tunisia (15.1%) and Italy (14%). Both Morocco and Italy are in the top three countries for both accounts receivable and payable, indicating that firms extending more trade credits to customers usually get more trade credits from suppliers.

(2) Financial development

Following Love (2003) and Khurana et al. (2006), we use an index of financial development that is calculated from five standardized indices of market capitalization over

[5] We also use net assets and total sales (or the cost of goods sold) as the deflator. Our results remain qualitatively similar.

GDP, total value traded over GDP, total value traded over market capitalization, credit going to the private sector over GDP, and the ratio of domestic credit provided by the financial sector to GDP.[6] These five indices are first standardized to have a mean of zero and a standard deviation of one. The average of the first three indices is coded as *STKMKT*, representing a measure of stock market development, and the average of the last two indices is coded as *FININT* representing financial intermediary development. The average of *STKMKT* and *FININT* is *FD*. A higher value of *FD* indicates that a country has a better financial system (a more developed stock market or more financial intermediaries). The data are from the World Bank database over the period 1989–2012, which has a one-year lag for our trade credit and cash data.

The right side of Table 1 reports the percentage mean value of the financial development variables for each of the 72 countries in our study. The three highest values of *FD* are for Hong Kong (1.193), the U.S. (0.666) and Japan (0.627). The bottom three values of *FD* are for Nigeria (-1.493), Argentina (-1.491) and Peru (-1.428). Negative values of *FD* exist due to the standardization of the variable. This data transformation does not affect the statistical significance of the variable in the regression.

3.3 Regression model and control variables

We extend the analysis of Opler et al. (1999) to trade credit receivables and payables and use the following regression model to calculate their influence on cash holdings.

$$\begin{aligned} CASH_{i,t} = {} & \alpha + \beta_1 TRADE\ CREDIT_{i,t} + \beta_2 LIQUID_{i,t} + \beta_3 SIZE_{i,t-1} + \beta_4 LEV_{i,t-1} \\ & + \beta_5 DEBTM_{i,t-1} + \beta_6 M/B_{i,t-1} + \beta_7 CAPEX_{i,t-1} + \beta_8 CASHFL_{i,t-1} \\ & + \beta_9 DIVD_{i,t-1} + INDUSTRY, YEAR \text{ and } COUNTRY \text{ Dummies}_{i,t-1} + \varepsilon_{i,t}. \end{aligned} \quad (1)$$

[6] We use the ratio of domestic credit provided by the financial sector to GDP instead of the ratio of liquid liability to GDP because the number of observations will be reduced by 60% if we use the latter data.

We also include financial development variables and their interaction terms with trade credit variables to examine the effect of financial development on the sensitivity of cash holdings to trade credits.

We use a WLS regression method to address the concern that the uneven distribution of observations across countries could lead the regression results to be driven by a few countries with a large number of observations. The weights in the WLS estimations equal one divided by the number of observations per country, thus weighting each country evenly as firm-year observations receive more (less) weight in countries with fewer (more) firm-year observations.

The dependent variable *CASH* is firm *i*'s cash holding ratio at time *t*. The other independent variables include trade credit variables and several control variables. Based on prior studies (Opler et al., 1999; Dittmar and Mahrt-Smith, 2007), we include the control variables of net working capital ratio (*LIQUID*), firm size (*SIZE*), financial leverage (*LEV*), debt maturity (*DEBTM*), market-to-book ratio (*M/B*), capital expenditure (*CAPEX*), cash flow (*CASHFL*), and a dividend dummy (*DIVD*). Except for the trade credit and net working capital variables, the control variables are calculated at the beginning of the year to mitigate endogeneity problems. The definitions of these variables are discussed below and are summarized in Appendix.

The net working capital ratio (*LIQUID*) is a proxy for liquid assets and is defined as the ratio of net working capital (working capital minus cash and cash equivalents) to total assets. Net working capital can be seen as a substitute for cash holdings, because firms can use their liquid assets when they experience cash shortfalls. There is a negative association between a

firm's cash holdings and its liquid assets. Net trade credit (the sum of accounts and notes receivable minus the sum of accounts and notes payable) is just one component of net working capital. To avoid duplication in measuring trade credit, we also use an alternative liquidity measure, *LIQUID2*, defined as the ratio of net working capital minus net trade credit to total assets.

Firm size (*SIZE*), defined as the natural logarithm of total assets in $U.S. (millions), is known to be negatively associated with cash holdings. Larger firms hold less cash, as they are more likely to be diversified and thus less likely to experience financial distress. They also face fewer borrowing constraints and lower external financing costs (Opler et al., 1999; Dittmar et al., 2003). Leverage (*LEV*, total debt to total assets) also exerts a negative effect on cash holdings, as higher leverage indicates better access to external funds and reduces the free cash flow problem (Opler et al., 1999; Harford et al., 2008). Debt maturity (*DEBTM*, long-term debt to total debt) is related to liquidity risk. We expect debt maturity to be negatively associated with cash holdings, as firms with longer debt maturity do not hold much cash as they have less short-term debt.

We use the market-to-book ratio (*M/B*) to proxy for growth opportunities or investment opportunities. *M/B* is defined as the ratio of the book value of total assets minus the book value of equity plus the market value of equity to the book value of assets. Previous studies have found that firms with more growth opportunities (investment opportunities) hold more cash (Opler et al., 1999; Dittmar et al., 2003).

Findings on the influence of the ratio of capital expenditure to net assets (*CAPEX*) on cash holdings are mixed. Opler et al. (1999) find a positive effect of capital expenditure on

cash holdings, whereas Harford et al. (2008) find a negative relationship. The cash flow ratio (*CASHFL*) is defined as net cash flow from operations divided by net assets. Opler et al. (1999) and Harford et al. (2008) find that firms with larger cash flows are associated with larger cash holdings, whereas Ozkan and Ozkan (2004) identify a negative effect of cash flow on cash holdings. The dividend dummy (*DIVD*) equals one in years in which a firm paid a cash dividend and zero otherwise. Findings on the effect of dividend payouts on cash holdings are also mixed. Opler et al. (1999), Dittmar et al. (2003), and Harford et al. (2008) find a negative relationship, whereas Ozkan and Ozkan (2004) document a positive relationship.

As cash holding policies can vary across industries, we control for industry-specific factors by using industry dummies, which are defined at the two-digit SIC code level. We include year fixed effects because changes in cash holdings can vary across time. We also include country fixed effects to correct for country-level factors that influence firm-level cash holdings.

Table 2 reports the Pearson correlation matrix for the main variables. The correlation coefficients of firm-level variables are calculated with firm-year observations, and the correlation coefficients between the financial development and firm-level variables are calculated with country mean values. We find that accounts receivable are negatively associated with cash holdings, which means that accounts receivable can substitute for cash holdings. The correlation between accounts payable and cash holdings is negative, but statistically insignificant. We show that cash holdings are negatively associated with *LIQUID*, *SIZE*, *LEV*, and *DEBTM*, indicating that net working capital is an alternative source of

liquidity. Small firms hold more cash. Leverage and debt maturity have a negative effect on cash holdings. We also find that the association between *M/B* and cash holdings is positive and significant, suggesting that firms with more growth opportunities hold more cash. The results of the univariate analysis are consistent with the transaction costs and precautionary motives for holding cash.

Insert Table 2 about here
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4. Empirical Results

4.1. Asymmetric effect of trade payables and receivables on cash holdings

Table 3 presents the results of multivariate WLS regressions on the relationship between trade credit and cash holdings. We report four models to show the asymmetric effect of accounts payable and receivable on cash holdings. Model (1) is the basic model, similar to that in prior literature, in which *LIQUID* (net working capital to total assets) is included to proxy for substitute liquidity. To compare the different effects of net trade credit and other elements of net working capital on cash holdings, we separate *LIQUID* into two terms: *LIQUID2* and net trade credit extended (trade receivables minus trade payables) and report the regression results in Models (2) and (3). In Model (4), trade payables and receivables are separated to show the individual effects of payables and receivables on cash holdings. Panel A of Table 3 reports the results of the four regression models, and Panel B reports the results of the tests of equality of the coefficients. The constant term, industry, year, and country dummies are included in all of the regressions, although the results are not reported for brevity. The *p*-values in the panel regressions are based on standard errors corrected for the clustering of firms (Petersen, 2009).

First, in Models (1)–(3) of Table 3, we compare the effects of liquidity assets on cash holdings. The three measures *LIQUID*, *LIQUID2*, and the difference between *LIQUID* and *LIQUID2* are negative and statistically significant. As shown in Models (1) and (2) of Table 3, the coefficient of *LIQUID* in Model (1) is -13.4, whereas that of *LIQUID2* in Model (2) is -7.2. This suggests that the cash substitute ratio of net trade credit is larger than that of other components of net working capital. The result of Model (3) further supports our argument. The coefficient of *LIQUID2* is -11.6 and its absolute magnitude is lower than that of the coefficient of net trade credit extended (*LIQUID – LIQUID2*), which is -16.4. The results of the equality tests reported in Panel B also show that these two coefficients are statistically different, which suggests that the effect of net trade credit is different from that of the other components of net working capital. This implies that it is necessary to separate trade credit terms from net working capital when considering their effect on cash holdings.

As Model (4) of Table 3 shows, the coefficient of *CT_REV* is significantly negative. This indicates that firms treat receivables as cash substitutes and reduce their cash holdings accordingly. As the denominators of the *CT_REV* and *CASH* ratios are the same, the coefficient value of 18.93 means that $100 of trade credit receivable substitutes for $18.93 of cash. The coefficient of *CT_PAY* is 5.025 and is statistically significant, which indicates that firms hold an additional $5.03 of cash for every $100 of trade credit payable. The results of the tests on the equality of the coefficients in Panel B show that the sum of these two coefficients is significantly different from zero. This clearly demonstrates that $1 of receivables is not equivalent to $1 of payables in terms of cash holdings. This asymmetric influence of payables and receivables on cash holdings suggests that past studies may have

drawn biased conclusions by treating net trade credit as just one component of working capital when estimating its influence on cash holdings.

In an unreported regression, we replicate Table 3 using the Fama-MacBeth model. A cross-sectional regression is estimated to eliminate the problem of serial correlation in the residuals of a time-series cross-sectional regression. The results remain unchanged, lending additional support for the asymmetric effect of credit payable and receivable on cash holdings and suggesting that firms with zero net trade credit still need to hold some cash for payables. However, if we treat trade credit terms merely as components of working capital, as is the standard approach in the literature, we might mistakenly conclude that no cash is needed for zero net trade credit, as receivables cover payables. Clearly, it is essential to treat trade credit payable and receivable differently when investigating their respective effects on cash holdings.

Table 3 shows that firm size, financial leverage, debt maturity, and capital expenditure are negatively associated with cash holdings. This indicates that firms that are smaller, have lower financial leverage, have more long-term debt and less capital expenditure have larger cash holdings. The significantly positive coefficient of *CASHFL* indicates that firms with more net cash flow from operations hold more cash (Opler et al., 1999; Dittmar et al., 2003). The positive and significant coefficient on *M/B* suggests that firms with more growth opportunities hold more cash. The coefficient of *DIVIDEND* is significantly positive, which is consistent with the finding of Ozkan and Ozkan (2004) that dividend-paying firms hold more cash to avoid running out of funds to meet their dividend payments.

Insert Table 3 about here

4.2. Financial development and the relation between trade credit and cash holdings

Table 4 reports the results of the WLS regression of the effect of financial development on the relationship between trade credit and cash holdings. The stand-alone coefficients on *CT_REV* and *CT_PAY* are similar to those reported in previous regressions. To test whether the coefficient of trade credit differs across firms located in countries with different levels of financial development, we include the interaction terms between the financial development variable and the trade credit variables in the model. We report the results of three models in which financial development proxies, namely *FD* and its two components *STKMKT* and *FININT* are included separately.

As Model (1) in Table 4 shows, the coefficient of *FD***CT_REV* is negative and significant at 1%. This shows that the substitute ratio of receivables for cash in firms in countries with a higher level of financial development is higher than that in firms in countries with less financial development. We replace *FD* with *STKMKT* and *FINIT* in Models (2) and (3), respectively. The coefficients on both *STKMKT***CT_REV* and *FININT***CT_REV* are negative and statistically significant. This indicates that stock market development and financial intermediary development have a similar effect on the substitute rate of accounts receivable for cash holdings, suggesting that financial development mitigates external financial constraints and increases the substitute ratio of receivables for cash.

The coefficient of *FININT***CT_PAY* is negative but insignificant, and those of *FD***CT_PAY* and *STKMKT***CT_PAY* are positive but insignificant. These results suggest that firms located in countries with greater financial development do not hold less precautionary cash for payables. As we discussed in section 2, the effect of financial development on the

sensitivity of cash to payables depends on the tradeoff between two effects from the agency cost view and precautionary view of cash holding. This finding suggests that these two effects could counteract each other, rendering the total effect insignificant.

The coefficients of *FD*, *STKMKT* and *FININT* are significantly positive. These results to some extent suggest that firms in countries with a higher level of financial development hold more cash. The easier it is to raise external funds, the more cash firms will hold. This is consistent with prior literature (Dittmar et al., 2003). As argued by Dittmar et al. (2003), this finding shows that firms' cash holdings are mainly driven by the agency view rather than accessibility to funds.

Insert Table 4 about here

4.3 Models with controls for legal origin

La Porta et al. (1997, 1998) document that financial development requires legal institutions to support its growth, and differences in the legal environment can explain the development and structure of financial markets across countries. One concern is whether our finding that financial development is positively associated with the substitute ratio of receivables for cash is driven by the legal institution. To address this concern, we examine the robustness of the financial development result by including a country's legal origin and its interaction term with trade credit variables. The legal origin variable, *LAW*, is a dummy that equals one for a country with a legal system based on common law, and zero otherwise.

The Table 5 reports the results. We find that the interaction terms between financial development and accounts receivable are still negative and statistically significant. This suggests that financial development does indeed have an effect after controlling for legal

origin. As the effect of legal origin on the relationship between cash holdings and trade credit, the positive effect of the interaction term between the common law dummy and accounts payable suggests that firms need to hold more cash for accounts payable due to more strict law enforcement in common law countries. Additionally, we find that the coefficients of *LAW* in the three models are all statistically negative, which suggests that firms in common law countries hold less cash. This is consistent with the argument of Dittmar et al. (2003) that strong investor protection reduces agency costs, and thus decreases the cash holding of firms.

Insert Table 5 about here

4.4. Firm-specific characteristics

In this section, we investigate which firms benefit more from financial development when converting their receivables into cash. We consider three firm characteristics, namely firm size, market-to-book ratio, and financial leverage. We include the three-way interactions among financial development, trade credit and these three firm characteristics in our models. Panels A, B and C of Table 6 reports the results for firm size, market-to-book ratio, and financial leverage, respectively.

As Panel A of Table 6 shows, the coefficient of the interaction term between firm size and trade receivables is significantly negative, which suggest that firms can get more cash when factoring receivables or using receivables to secure loans. This is reasonable as larger firms are in a more advantageous position when dealing with financial intermediaries than small firms. The coefficient of the three-way interaction term among firm size, financial development, and trade receivables is significantly negative. This suggests that the effect of financial development on the accounts receivable sensitivity of cash holding is more

pronounced for large firms. The difference in the substitute ratio of receivables for cash between large and small firms is bigger in countries with a high level of financial development. In other words, large firms benefit more from financial development when substituting receivables for cash.

As Panel B of Table 6 shows, the coefficient of the three-way interaction among market-to-book ratio, financial development and receivables is significantly positive, which suggests that the effect of financial development on the accounts receivable sensitivity of cash holding is more pronounced for low market-to-book ratio firms. In other words, firms with low market-to-book ratio benefit more from financial development when substituting receivables for cash. As with large firms, financial intermediaries regard receivables from firms with a low market-to-book ratio as having less credit risk. The significantly negative coefficients of the three-way interactions among financial leverage, financial development and receivables in Panel C of Table 6 show that the effect of financial development on the accounts payable sensitivity of cash holding is more pronounced for firms with higher leverage. This suggests that firms with high financial leverage benefit more from financial development when substituting receivables for cash.

Insert Table 6 about here

4.5 Country by country analysis

In the previous sections, we use WLS estimations to mitigate concern about the different number of observations across countries. However, we still cannot rule out the possibility that our results are mainly driven by a few dominant countries. In this section, we conduct country by country analysis to further address this concern. More specifically, we

estimate the sensitivity of cash to the trade credits for each country in each year from the following equation:

$$CASH_{i,t} = \alpha + \beta_1 CT\_REV_{i,t} + \beta_2 CT\_PAY_{i,t} + \beta_3 LIQUID2_{i,t} + \beta_4 SIZE_{i,t-1} + \beta_5 LEV_{i,t-1} + \beta_6 DEBTM_{i,t-1} + \beta_7 M/B_{i,t-1} + \beta_8 CAPEX_{i,t-1} + \beta_9 CASHFL_{i,t-1} + \beta_{10} DIVD_{i,t-1} + INDUSTRY \text{ and } YEAR \text{ Dummies}_{i,t-1} + \varepsilon_{i,t} \quad (2)$$

We then use equations (3) and (4) to regress financial development on the coefficients β_1 and β_2 estimated from equation (2):

$$\beta_{1j,t} = \alpha + \gamma_1 FD_{i,t-1} + \gamma_2 LAW_{j,t-1} + \gamma_3 SIZE\_avg_{j,t} + \gamma_3 GDP\_r_{j,t-1} + \gamma_4 INFLATION\_r_{j,t-1} + \gamma_5 INTEREST\_gap_{j,t-1} \quad (3)$$

$$\beta_{2j,t} = \alpha + \gamma_1 FD_{i,t-1} + \gamma_2 LAW_{j,t-1} + \gamma_3 SIZE\_avg_{j,t} + \gamma_3 GDP\_r_{j,t-1} + \gamma_4 INFLATION\_r_{j,t-1} + \gamma_5 INTEREST\_gap_{j,t-1} \quad (4)$$

$\beta_{1j,t}$ and $\beta_{2j,t}$ are the sensitivity of cash to the accounts payable and receivable for country *j* in year *t*. *FD* is the financial development variable, and *LAW* is a dummy that equals one for countries with legal systems based on common law and zero otherwise. *SIZE_avg* is the mean firm size of a country in year *t*. *GDP_r* is the real annual growth rate of GDP of a country in year *t*. *Inflation_r* is the change in inflation based on the consumer price index, and *Interest_gap* is the spread between the lending rate and deposit rate of a country in year *t*.

Insert Table 7 about here

The results of the country by country analysis are presented in Table 7. For accounts receivable, the coefficients on *FD*, *STKMKT*, and *FININT* are all negative and statistically significant. However, the coefficients on *FD*, *STKMKT*, and *FININT* are not statistically significant for accounts payable. These results are consistent with our prior findings.

5. Conclusions

Trade credit and cash both comprise a large portion of a firm's assets. The trade credit sensitivity of cash is an important liquidity management issue in corporate financial management. This paper investigates the effect of financial deepening on the relationship between trade credit and cash holdings across 72 countries. We first document an asymmetric effect of trade payables and receivables on cash holdings, finding that firms hold an additional $5.03 of cash for every $100 of credit payable but use $100 of receivables as a substitute for $18.93 of cash. This finding indicates that prior literature may have obtained biased estimates by treating net trade credit as just one component of working capital when estimating its effect on cash holdings.

As a good financial sector provides firms with better financial services and reduces the cost of factoring trade credit receivables or securing receivables for loans, we would expect the trade credit receivables sensitivity of cash to vary across countries with different levels of financial development. We find that firms in countries with higher levels of financial development substitute more receivables for cash but hold no less cash for payables. We also find that our main findings hold even after we control for legal origin. We then examine whether the effect of financial development on the trade credit receivables of cash is homogenous across different types of firm. We find that the effect of financial development on the accounts receivable sensitivity of cash holding is more pronounced for firms with larger size, lower market-to-book ratio and higher leverage.

Our paper extends the literature on trade credit and cash by linking these two important components of firms' assets. Our finding of the asymmetric effect of receivables and

payables on cash suggests that it is better to separate trade credit terms from net working capital when considering their effect on cash holdings. We also complement studies on financial development and corporate liquidity management by demonstrating that financial development helps firms improve their cash management ability.

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Appendix A: Definitions of the variables

Code	Definition
CASH	The ratio of cash and cash equivalents to total assets.
CT_PAY	The accounts payable deflated by total assets.
CT_REV	The accounts receivable deflated by total assets.
LIQUID	The ratio of net working capital (working capital minus cash and cash equivalents) to total assets.
LIQUID2	The ratio of net working capital minus net trade credit to total assets, where net trade credit is defined as accounts receivable minus accounts payable.
SIZE	Firm size, calculated as the natural log of total assets (million US$).
LEV	Financial leverage, calculated as total debt divided by total assets.
DEBTM	The ratio of long-term debt to total debt.
M/B	The ratio of the book value of total assets minus the book value of equity plus the market value of equity to the book value of assets.
CAPEX	Capital expenditure, calculated as capital expenditure divided by total sales.
CASHFL	The ratio of net cash flow from operations to total assets.
DIVD	A dummy that equals one for years in which the firm paid a cash dividend and zero otherwise.
LAW	An indicator variable coded as 1 for countries with legal systems based on common law, 0 otherwise, based on Khurana et al. (2006).
STKMKT	An index to measure stock market development, calculated as an average of standardized three indices, including the ratio of market capitalization over the GDP, the stock traded volume over the GDP and the stock traded volume over market capitalization.
FININT	An index to measure financial intermediary development, calculated as an average of standardized two indices, including the ratio of the credit going to the private sector over the GDP and domestic credit provided by financial sector over the GDP.
FD	An index to measure one country's financial development, calculated as an average of *STKMKT* and *FININT*.

Table 1 Descriptive statistics

The sample consists of 24,914 firms listed in 72 countries/regions, with 213,205 firm-year observations during the period from 1990 to 2013. This table reports the summary statistic of main variables. All the firm level variables except for the dividend dummy variable (DIVD) are country medians. The dividend dummy variable and financial development variables are country means. We report the firm size (SIZE) as the book value of total assets in $U.S. (millions). All of the variables are as defined in the Appendix.

Country	# of	# of	Firm level variables										Financial development		
name	firm-years	firms	CASH	CT_REV	CT_PAY	LIQUID	SIZE	LEV	DEBTM	M/B	CAPEX	CASHFL	DIVD	FD	STKMKT	FININT
Argentina	673	65	0.057	0.134	0.087	0.002	238	0.458	0.340	0.942	0.063	0.084	0.483	-1.491	-1.129	-1.852
Australia	5872	772	0.085	0.118	0.067	0.004	66	0.436	0.325	1.304	0.051	0.059	0.523	-0.261	-0.163	-0.359
Austria	530	53	0.080	0.181	0.086	0.030	452	0.562	0.435	1.138	0.061	0.084	0.747	-0.721	-0.922	-0.520
Bahrain	92	16	0.201	0.069	0.038	-0.001	93	0.141	0.128	1.071	0.059	0.105	0.967	-1.061	-0.907	-1.216
Bangladesh	143	43	0.061	0.100	0.035	0.052	87	0.443	0.178	2.072	0.070	0.091	0.755	-1.070	-0.700	-1.441
Belgium	724	74	0.073	0.196	0.123	-0.010	366	0.597	0.369	1.145	0.050	0.081	0.682	-0.835	-0.753	-0.916
Brazil	1854	208	0.090	0.156	0.050	-0.008	1005	0.554	0.504	1.035	0.074	0.076	0.778	-0.981	-0.736	-1.225
Bulgaria	256	73	0.021	0.160	0.058	0.062	59	0.425	0.292	0.855	0.045	0.030	0.359	-1.162	-1.216	-1.109
Canada	4134	781	0.056	0.096	0.104	0.009	156	0.448	0.420	1.347	0.076	0.070	0.429	-0.073	-0.261	0.116
Chile	1532	127	0.039	0.119	0.047	0.028	401	0.423	0.529	1.149	0.079	0.081	0.886	-0.807	-0.725	-0.890
China	16171	2601	0.147	0.126	0.073	-0.053	251	0.467	0.065	1.567	0.078	0.051	0.187	-0.114	-0.004	-0.225
Colombia	253	30	0.052	0.073	0.027	0.013	565	0.308	0.490	0.828	0.084	0.060	0.783	-1.288	-1.067	-1.509
Croatia	432	91	0.034	0.156	0.099	-0.017	152	0.451	0.334	0.850	0.054	0.038	0.299	-1.062	-1.085	-1.039
Cyprus	250	61	0.038	0.088	0.037	-0.024	166	0.507	0.464	0.703	0.043	0.026	0.408	0.330	-1.137	1.797
Czech	84	9	0.064	0.075	0.036	-0.018	1475	0.349	0.461	1.028	0.113	0.119	0.595	-1.179	-0.909	-1.449
Denmark	1274	94	0.075	0.199	0.082	0.048	178	0.542	0.340	1.129	0.053	0.076	0.664	-0.282	-0.598	0.033
Egypt	772	132	0.120	0.133	0.042	0.004	118	0.410	0.127	1.260	0.053	0.089	0.742	-1.062	-0.804	-1.320
Finland	1222	98	0.079	0.189	0.070	0.037	253	0.553	0.370	1.258	0.039	0.083	0.839	-0.513	-0.186	-0.841
France	4901	476	0.107	0.255	0.126	0.026	265	0.595	0.279	1.164	0.040	0.067	0.681	-0.490	-0.369	-0.610
Germany	4415	477	0.102	0.190	0.078	0.057	236	0.581	0.416	1.176	0.041	0.070	0.581	-0.375	-0.331	-0.418
Greece	1624	234	0.042	0.232	0.091	0.024	168	0.579	0.348	0.927	0.042	0.031	0.644	-0.704	-0.820	-0.588

Hong Kong	7276	786	0.165	0.147	0.066	0.003	163	0.386	0.128	0.967	0.044	0.048	0.592	1.193	2.126	0.261
Hungary	195	20	0.043	0.176	0.103	0.007	116	0.436	0.252	1.184	0.087	0.099	0.451	-1.053	-0.782	-1.324
India	14673	2342	0.032	0.212	0.105	0.081	64	0.578	0.304	0.992	0.055	0.042	0.633	-0.852	-0.363	-1.341
Indonesia	2872	293	0.081	0.138	0.070	0.034	103	0.518	0.288	1.039	0.047	0.065	0.557	-1.255	-0.900	-1.610
Ireland	450	47	0.122	0.133	0.068	0.007	993	0.547	0.450	1.439	0.040	0.077	0.633	-0.415	-0.834	0.004
Israel	1687	277	0.161	0.209	0.085	0.028	71	0.518	0.278	1.164	0.032	0.051	0.430	-0.752	-0.531	-0.973
Italy	1788	184	0.089	0.237	0.140	-0.010	524	0.629	0.351	1.084	0.059	0.056	0.688	-0.559	-0.425	-0.693
Jamaica	86	15	0.160	0.119	0.059	0.040	73	0.343	0.323	1.071	0.032	0.075	0.814	-1.298	-1.008	-1.588
Japan	33292	3025	0.142	0.209	0.119	0.027	369	0.523	0.281	0.967	0.028	0.056	0.879	0.627	-0.199	1.453
Jordan	597	109	0.050	0.159	0.048	0.070	34	0.296	0.081	1.167	0.050	0.052	0.526	-0.573	-0.340	-0.806
Kenya	160	31	0.062	0.144	0.068	0.027	89	0.480	0.447	0.986	0.060	0.085	0.806	-1.405	-1.129	-1.681
Korea (S)	10976	1453	0.099	0.183	0.076	0.003	152	0.484	0.235	0.909	0.049	0.049	0.651	0.125	0.410	-0.160
Kuwait	499	79	0.115	0.123	0.040	0.013	178	0.362	0.228	1.257	0.067	0.076	0.691	-0.800	-0.461	-1.139
Latvia	101	23	0.037	0.116	0.067	0.165	21	0.335	0.308	0.738	0.028	0.058	0.347	-1.032	-1.271	-0.794
Lithuania	106	28	0.023	0.123	0.107	0.002	81	0.487	0.336	0.965	0.034	0.066	0.547	-1.273	-1.215	-1.331
Luxembourg	147	25	0.093	0.121	0.074	0.004	2026	0.557	0.526	1.171	0.060	0.072	0.653	-0.412	-0.571	-0.253
Malaysia	7564	745	0.090	0.180	0.059	0.057	70	0.388	0.206	0.932	0.044	0.052	0.643	-0.333	-0.334	-0.331
Malta	56	12	0.082	0.104	0.058	-0.049	197	0.478	0.291	1.206	0.065	0.070	0.554	-0.524	-1.136	0.088
Mauritius	85	18	0.024	0.128	0.055	-0.088	242	0.540	0.349	0.930	0.065	0.038	0.706	-0.853	-0.993	-0.714
Mexico	927	74	0.056	0.118	0.071	0.044	1055	0.464	0.535	1.095	0.054	0.072	0.570	-1.385	-1.015	-1.756
Morocco	159	34	0.046	0.240	0.156	0.055	282	0.455	0.145	1.585	0.056	0.114	0.849	-0.954	-0.896	-1.012
Netherlands	1170	101	0.069	0.217	0.094	0.043	499	0.583	0.336	1.307	0.039	0.092	0.679	-0.116	-0.084	-0.147
New Zealand	564	66	0.024	0.102	0.071	0.028	129	0.436	0.466	1.371	0.053	0.095	0.816	-0.558	-0.876	-0.240
Nigeria	260	70	0.072	0.153	0.078	-0.049	140	0.596	0.204	1.367	0.073	0.117	0.819	-1.493	-1.145	-1.841
Norway	406	69	0.125	0.140	0.062	-0.022	295	0.586	0.487	1.316	0.066	0.071	0.606	-0.775	-0.507	-1.043
Oman	480	75	0.064	0.138	0.042	0.031	46	0.416	0.286	1.210	0.049	0.093	0.648	-1.303	-1.017	-1.590
Pakistan	1686	205	0.035	0.105	0.052	-0.010	63	0.599	0.275	1.004	0.038	0.066	0.714	-1.039	-0.408	-1.670

Peru	662	79	0.034	0.113	0.051	0.032	188	0.432	0.417	1.114	0.067	0.090	0.630	-1.428	-1.030	-1.826
Philippines	1348	133	0.081	0.110	0.046	-0.014	108	0.441	0.304	0.981	0.074	0.061	0.481	-1.228	-0.917	-1.538
Poland	1921	379	0.055	0.209	0.125	0.061	67	0.459	0.215	1.103	0.037	0.047	0.369	-1.151	-0.903	-1.399
Portugal	404	39	0.046	0.161	0.085	-0.075	561	0.680	0.382	1.037	0.059	0.059	0.700	-0.414	-0.808	-0.020
Qatar	130	19	0.103	0.059	0.022	-0.005	672	0.268	0.417	1.376	0.132	0.066	0.754	-1.037	-0.663	-1.411
Romania	211	61	0.035	0.165	0.079	0.036	65	0.344	0.276	0.818	0.057	0.049	0.422	-1.315	-1.192	-1.438
Russia	1091	229	0.046	0.139	0.063	0.022	588	0.472	0.337	1.021	0.076	0.086	0.463	-1.033	-0.496	-1.569
Saudi Arabia	577	88	0.074	0.081	0.038	0.021	456	0.307	0.277	1.714	0.098	0.093	0.721	-0.850	0.081	-1.781
Singapore	4367	453	0.147	0.179	0.092	0.030	94	0.440	0.153	1.009	0.041	0.050	0.664	-0.358	0.064	-0.781
Slovenia	173	31	0.022	0.157	0.081	-0.022	178	0.451	0.382	0.809	0.064	0.060	0.723	-1.060	-1.163	-0.956
South Africa	1982	203	0.101	0.196	0.130	0.032	290	0.490	0.257	1.276	0.044	0.100	0.750	0.059	-0.014	0.132
Spain	961	105	0.064	0.173	0.105	-0.021	880	0.585	0.384	1.220	0.079	0.077	0.739	0.120	0.019	0.222
Sri Lanka	952	162	0.053	0.122	0.037	0.002	31	0.458	0.317	1.099	0.052	0.065	0.660	-1.369	-1.104	-1.633
Sweden	2536	302	0.090	0.195	0.078	0.042	112	0.530	0.313	1.378	0.034	0.065	0.578	-0.209	-0.068	-0.349
Switzerland	2150	164	0.127	0.174	0.065	0.067	547	0.519	0.439	1.265	0.047	0.088	0.724	0.410	0.567	0.253
Thailand	4220	380	0.058	0.145	0.067	0.034	65	0.450	0.148	1.025	0.045	0.084	0.727	-0.349	-0.473	-0.226
Trinidad and Tobago	74	17	0.059	0.116	0.049	-0.003	94	0.529	0.307	1.229	0.035	0.081	0.784	-1.352	-1.022	-1.683
Tunisia	149	30	0.061	0.195	0.151	0.083	50	0.505	0.221	1.470	0.064	0.066	0.745	-1.118	-1.142	-1.094
Turkey	1834	228	0.066	0.216	0.092	0.082	153	0.456	0.245	1.187	0.046	0.057	0.487	-0.925	-0.354	-1.496
Ukraine	397	131	0.015	0.202	0.087	0.033	159	0.554	0.230	1.109	0.023	0.041	0.388	-1.029	-1.195	-0.864
United Arab Emirates	260	48	0.101	0.122	0.038	0.021	363	0.319	0.182	1.023	0.100	0.065	0.735	-0.925	-0.778	-1.072
U.K.	9338	820	0.087	0.173	0.090	0.006	140	0.500	0.277	1.343	0.041	0.076	0.688	0.190	0.173	0.207
U.S.A.	40545	3619	0.094	0.130	0.061	0.061	298	0.475	0.432	1.468	0.040	0.078	0.378	0.666	0.654	0.677
Vietnam	1453	473	0.078	0.193	0.081	0.046	20	0.538	0.078	0.904	0.031	0.050	0.795	-0.756	-0.966	-0.546

Mean	2961.2	346.0	0.076	0.152	0.075	0.019	178	0.473	0.314	1.144	0.056	0.070	0.634	-0.705	-0.604	-0.806
Median	748	96	0.071	0.146	0.071	0.023	164	0.473	0.311	1.121	0.053	0.070	0.662	-0.842	-0.766	-0.936
S.T.D.	6621.2	682.3	0.039	0.045	0.030	0.039	3	0.096	0.115	0.231	0.020	0.020	0.157	0.573	0.564	0.770

Table 2 Cross country Correlation of country-level financial development and country-level mean of firm-level variables

This table reports the Pearson correlation matrix among main variables. The observations are based on the country-year level. The financial development is country level, whereas other variables are country-level mean of firm-level values. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively. All of the variables are as defined in the Appendix.

Variable	CASH	CT_REV	CT_PAY	LIQUID	SIZE	LEV	DEBTM	M/B	CAPEX	CASHFL	DIVD	FD	STKMKT
CT_REV	-0.072**												
	(0.012)												
CT_PAY	-0.041	0.614***											
	(0.148)	(0.000)											
LIQUID	-0.114***	0.420***	0.122***										
	(0.000)	(0.000)	(0.000)										
SIZE	-0.110***	-0.215***	-0.156***	-0.170***									
	(0.000)	(0.000)	(0.000)	(0.000)									
LEV	-0.129***	0.322***	0.361***	-0.117***	0.020								
	(0.000)	(0.000)	(0.000)	(0.000)	(0.483)								
DEBTM	-0.235***	-0.344***	-0.282***	-0.093***	0.195***	0.241***							
	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)							
M/B	0.149***	0.023	0.035	0.081***	-0.161***	-0.070**	-0.171***						
	(0.000)	(0.423)	(0.216)	(0.005)	(0.000)	(0.014)	(0.000)						
CAPEX	-0.040	-0.279***	-0.161***	-0.248***	-0.010	-0.125***	0.132***	0.137***					
	(0.166)	(0.000)	(0.000)	(0.000)	(0.720)	(0.000)	(0.000)	(0.000)					
CASHFL	-0.026	-0.080***	-0.073**	0.013	0.117***	-0.152***	0.123***	0.008	-0.155***				
	(0.369)	(0.005)	(0.011)	(0.642)	(0.000)	(0.000)	(0.000)	(0.788)	(0.000)				
DIVD	-0.009	0.050*	-0.016	0.058**	0.209***	0.024	0.048*	0.053*	-0.171***	0.366***			
	(0.746)	(0.078)	(0.585)	(0.042)	(0.000)	(0.405)	(0.095)	(0.062)	(0.000)	(0.000)			
FD	0.331***	0.093***	0.128***	-0.048*	-0.113***	0.115***	-0.075***	0.128***	-0.013	-0.150***	-0.039		
	(0.000)	(0.001)	(0.000)	(0.094)	(0.000)	(0.000)	(0.009)	(0.000)	(0.646)	(0.000)	(0.174)		
STKMKT	0.317***	0.108***	0.074**	0.042	-0.076***	-0.029	-0.195***	0.216***	-0.022	-0.096***	-0.017	0.799***	
	(0.000)	(0.000)	(0.010)	(0.138)	(0.008)	(0.315)	(0.000)	(0.000)	(0.432)	(0.001)	(0.560)	(0.000)	
FININT	0.254***	0.057**	0.136***	-0.104***	-0.111***	0.193***	0.036	0.027	-0.003	-0.152***	-0.045	0.890***	0.437***
	(0.000)	(0.048)	(0.000)	(0.000)	(0.000)	(0.000)	(0.212)	(0.351)	(0.928)	(0.000)	(0.112)	(0.000)	(0.000)

Table 3 Trade credit and cash holdings

This table reports the results of the weighted least square (WLS) regression of the association between the trade credit variables and cash holdings. The dependent variable CASH is multiplied by 100, i.e. the percentage of cash and cash equivalents to total assets. The weights in the WLS estimations are equal to a value of 1 divided by the number of observations per country/region. These estimations correct the error structure in all firm-level regressions for heteroskedasticity and for within-period error correlation using the White-Huber estimator. The associated *p*-statistics are reported in parentheses below the estimates. Panel A presents the regression results and Panel B shows the results of the test of equality of the coefficients. The constant term, industry dummies, year dummies, and country dummies are included in the regression but are not reported. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. All of the variables are as defined in the Appendix.

Panel A: pooled cross-country regression

	MODEL1	MODEL2	MODEL3	MODEL4
LIQUID	-13.52***			
	(0.000)			
LIQUID2			-16.54***	-9.438***
			(0.000)	(0.000)
LIQUID – LIQUID2		-7.159***	-11.63***	
		(0.000)	(0.000)	
CT_REV				-18.93***
				(0.000)
CT_PAY				5.025***
				(0.000)
SIZE	-0.346***	-0.228***	-0.357***	-0.385***
	(0.000)	(0.000)	(0.000)	(0.000)
LEV	-19.15***	-17.29***	-18.63***	-15.61***
	(0.000)	(0.000)	(0.000)	(0.000)
DEBTM	-4.325***	-4.376***	-4.653***	-6.938***
	(0.000)	(0.000)	(0.000)	(0.000)
M/B	2.177***	2.247***	2.176***	2.155***
	(0.000)	(0.000)	(0.000)	(0.000)
CAPEX	-1.531***	-0.938***	-1.581***	-1.763***
	(0.000)	(0.000)	(0.000)	(0.000)
CASHFL	1.592***	2.255***	1.420***	1.664***
	(0.000)	(0.000)	(0.000)	(0.000)
DIVD	0.423***	0.064	0.445***	0.513***
	(0.000)	(0.296)	(0.000)	(0.000)
Sample size	213205	213205	213205	213205
Adj-R^2	0.282	0.266	0.283	0.287

Panel B: Test of Equality of the Coefficients (F-statistics)

	F-value	P-value
LIQUID2 = LIQUID – LIQUID2	361.75	0.000
CT_PAY = 1	88.40	0.000
CT_PAY + CT_REV = 0	1329.03	0.000

Table 4 Financial development and the relationship between trade credit and cash holdings

This table reports results of the WLS (weighted least square) regression of financial development on the relationship between trade credit and cash holdings. The weights in the WLS estimations are equal to a value of 1 divided by the number of observations per country/region. These estimations correct the error structure in all firm-level regressions for heteroskedasticity and for within-period error correlation using the White-Huber estimator. The associated *p*-statistics are reported in parentheses below the estimates. The constant term, industry dummies, year dummies, and country dummies are included in the regression but are not reported. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. The definitions of the variables are as presented in the Appendix.

FDT proxy	Model 1 FD	Model 2 STKMKT	Model 3 FININT
FDT proxy * CT_REV	-3.137***	-3.859***	-1.045***
	(0.000)	(0.000)	(0.000)
FDT proxy * CT_PAY	0.115	0.664	-0.261
	(0.829)	(0.187)	(0.522)
FDT proxy	0.866***	0.937***	0.183*
	(0.000)	(0.000)	(0.097)
CT_REV	-21.21***	-21.33***	-19.81***
	(0.000)	(0.000)	(0.000)
CT_PAY	5.297***	5.612***	4.912***
	(0.000)	(0.000)	(0.000)
LIQUID2	-9.528***	-9.502***	-9.492***
	(0.000)	(0.000)	(0.000)
SIZE	-0.392***	-0.390***	-0.386***
	(0.000)	(0.000)	(0.000)
LEV	-15.63***	-15.61***	-15.64***
	(0.000)	(0.000)	(0.000)
DEBTM	-6.931***	-6.927***	-6.936***
	(0.000)	(0.000)	(0.000)
M/B	2.150***	2.144***	2.155***
	(0.000)	(0.000)	(0.000)
CAPEX	-1.783***	-1.784***	-1.770***
	(0.000)	(0.000)	(0.000)
CASHFL	1.756***	1.726***	1.701***
	(0.000)	(0.000)	(0.000)
DIVD	0.522***	0.519***	0.514***
	(0.000)	(0.000)	(0.000)
Sample size	213205	213205	213205
Adj-R^2	0.287	0.287	0.287

Table 5 Models with control for law origin

This table reports results of the WLS (weighted least square) regression of models with control for law origin. The weights in the WLS estimations are equal to a value of 1 divided by the number of observations per country/region. These estimations correct the error structure in all firm-level regressions for heteroskedasticity and for within-period error correlation using the White-Huber estimator. The associated *p*-statistics are reported in parentheses below the estimates. The constant term, industry dummies, year dummies, and country dummies are included in the regression but are not reported. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. The definitions of the variables are as presented in the Appendix.

FDT proxy	MODEL 1 FD	MODEL 2 STKMKT	MODEL 3 FININT
FDT proxy *CT_REV	-3.235***	-3.957***	-1.024***
	(0.000)	(0.000)	(0.000)
FDT proxy * CT_PAY	-0.331	0.327	-0.505
	(0.556)	(0.536)	(0.227)
FDT proxy	0.913***	0.979***	0.168
	(0.000)	(0.000)	(0.139)
LAW* CT_REV	0.555	0.751	-0.204
	(0.278)	(0.140)	(0.686)
LAW* CT_PAY	1.806**	1.456*	1.733**
	(0.018)	(0.056)	(0.019)
LAW	-0.262	-0.246	0.178
	(0.451)	(0.466)	(0.599)
LIQUID2	-9.556***	-9.520***	-9.517***
	(0.000)	(0.000)	(0.000)
CT_REV	-21.41***	-21.57***	-19.74***
	(0.000)	(0.000)	(0.000)
CT_PAY	4.497***	5.010***	4.213***
	(0.000)	(0.000)	(0.000)
SIZE	-0.392***	-0.391***	-0.388***
	(0.000)	(0.000)	(0.000)
LEV	-15.64***	-15.61***	-15.63***
	(0.000)	(0.000)	(0.000)
DEBTM	-6.933***	-6.928***	-6.944***
	(0.000)	(0.000)	(0.000)
M/B	2.148***	2.143***	2.153***
	(0.000)	(0.000)	(0.000)
CAPEX	-1.779***	-1.779***	-1.768***
	(0.000)	(0.000)	(0.000)
CASHFL	1.749***	1.719***	1.696***
	(0.000)	(0.000)	(0.000)
DIVD	0.517***	0.515***	0.513***
	(0.000)	(0.000)	(0.000)
Sample size	213205	213205	213205
Adj-R^2	0.287	0.287	0.287

Table 6 The impact of firm characteristics and financial development

This table reports WLS (weighted least square) regression results with interaction term between firm characteristics, financial development, and trade credit. We generate three firm characteristics dummies and add their interaction terms with financial development and trade credit in our models. The dummies are RKSIZE, RKM/B and RKLEV, which equal to 1 if the firm's total asset, M/B ratio and LEV are above the median of the country, otherwise zero, respectively. Panel A, B and C presents the pooled cross-country regression results of models with interaction terms among the financial development, trade credit variables, and these three dummies, respectively. The weights in the WLS estimations are equal to a value of 1 divided by the number of observations per country/region. These estimations correct the error structure in all firm-level regressions for heteroskedasticity and for within-period error correlation using the White-Huber estimator. The associated *p*-statistics are reported in parentheses below the estimates. The *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. The definitions of the variables are as presented in the Appendix.

Panel A: firm size

	MODEL 1	MODEL 2	MODEL 3
FDT proxy	FD	STKMKT	FININT
RKSIZE * FDT proxy * CT_REV	-6.405***	-3.744***	-4.982***
	(0.000)	(0.000)	(0.000)
RKSIZE * FDT proxy * CT_PAY	3.123***	-0.899	4.137***
	(0.002)	(0.350)	(0.000)
RKSIZE * CT_REV	-2.364***	-0.106	-1.900***
	(0.000)	(0.839)	(0.001)
RKSIZE * CT_PAY	2.842***	-0.095	3.892***
	(0.003)	(0.912)	(0.000)
FDT proxy * CT_REV	-1.020**	-2.673***	0.587*
	(0.018)	(0.000)	(0.071)
FDT proxy * CT_PAY	-0.720	1.660**	-1.695***
	(0.307)	(0.016)	(0.002)
FDT proxy	0.997***	1.019***	0.259**
	(0.000)	(0.000)	(0.019)
CT_REV	-20.44***	-21.40***	-19.19***
	(0.000)	(0.000)	(0.000)
CT_PAY	4.366***	5.936***	3.418***
	(0.000)	(0.000)	(0.000)
SIZE	-0.475***	-0.472***	-0.470***
	(0.000)	(0.000)	(0.000)
LIQUID2	-9.379***	-9.388***	-9.359***
	(0.000)	(0.000)	(0.000)
LEV	-15.59***	-15.58***	-15.62***
	(0.000)	(0.000)	(0.000)
DEBTM	-6.857***	-6.871***	-6.856***
	(0.000)	(0.000)	(0.000)
M/B	2.144***	2.135***	2.153***
	(0.000)	(0.000)	(0.000)
CAPEX	-1.792***	-1.796***	-1.778***
	(0.000)	(0.000)	(0.000)
CASHFL	1.887***	1.866***	1.804***
	(0.000)	(0.000)	(0.000)
DIVD	0.530***	0.531***	0.508***

	(0.000)	(0.000)	(0.000)
Sample size	213205	213205	213205
Adj-R^2	0.288	0.288	0.287

Panel B: M/B ratio

	MODEL 1	MODEL 2	MODEL 3
FDT proxy	FD	STKMKT	FININT
RKM/B * FDT proxy * CT_REV	2.910***	0.003	3.610***
	(0.000)	(0.996)	(0.000)
RKM/B * FDT proxy * CT_PAY	-6.477***	-4.696***	-4.919***
	(0.000)	(0.000)	(0.000)
RKM/B * CT_REV	2.137***	0.139	2.898***
	(0.000)	(0.786)	(0.000)
RKM/B * CT_PAY	-0.368	1.269	0.268
	(0.697)	(0.139)	(0.759)
FDT proxy * CT_REV	-4.831***	-3.979***	-3.117***
	(0.000)	(0.000)	(0.000)
FDT proxy * CT_PAY	3.844***	3.387***	2.540***
	(0.000)	(0.000)	(0.000)
FDT proxy	0.870***	0.937***	0.203*
	(0.000)	(0.000)	(0.065)
CT_REV	-22.43***	-21.41***	-21.45***
	(0.000)	(0.000)	(0.000)
CT_PAY	5.625***	4.959***	4.852***
	(0.000)	(0.000)	(0.000)
SIZE	-0.392***	-0.389***	-0.387***
	(0.000)	(0.000)	(0.000)
LIQUID2	-9.552***	-9.516***	-9.504***
	(0.000)	(0.000)	(0.000)
LEV	-15.73***	-15.72***	-15.74***
	(0.000)	(0.000)	(0.000)
DEBTM	-6.921***	-6.918***	-6.915***
	(0.000)	(0.000)	(0.000)
M/B	2.058***	2.058***	2.067***
	(0.000)	(0.000)	(0.000)
CAPEX	-1.797***	-1.801***	-1.786***
	(0.000)	(0.000)	(0.000)
CASHFL	1.588***	1.538***	1.567***
	(0.000)	(0.000)	(0.000)
DIVD	0.482***	0.469***	0.484***
	(0.000)	(0.000)	(0.000)
Sample size	213205	213205	213205
Adj-R^2	0.287	0.288	0.287

Panel C: financial leverage

	MODEL 1	MODEL 2	MODEL 3
FDT proxy	FD	STKMKT	FININT
RKLEV * FDT proxy * CT_REV	-3.693***	-3.157***	-2.082***
	(0.000)	(0.000)	(0.000)
RKLEV * FDT proxy * CT_PAY	1.964*	2.822***	0.266
	(0.076)	(0.008)	(0.754)
RKLEV * CT_REV	-0.683	0.014	0.253
	(0.244)	(0.978)	(0.644)
RKLEV * CT_PAY	5.524***	5.723***	4.365***
	(0.000)	(0.000)	(0.000)
FDT proxy * CT_REV	-1.052**	-1.978***	0.078
	(0.036)	(0.000)	(0.836)
FDT proxy * CT_PAY	-0.272	-0.737	0.314
	(0.776)	(0.423)	(0.668)
FDT proxy	0.771***	0.877***	0.109
	(0.000)	(0.000)	(0.324)
CT_REV	-20.70***	-21.16***	-19.88***
	(0.000)	(0.000)	(0.000)
CT_PAY	1.633*	1.458*	1.965**
	(0.070)	(0.078)	(0.019)
SIZE	-0.397***	-0.397***	-0.392***
	(0.000)	(0.000)	(0.000)
LIQUID2	-9.295***	-9.278***	-9.259***
	(0.000)	(0.000)	(0.000)
LEV	-16.87***	-16.83***	-16.88***
	(0.000)	(0.000)	(0.000)
DEBTM	-6.927***	-6.927***	-6.930***
	(0.000)	(0.000)	(0.000)
M/B	2.152***	2.144***	2.160***
	(0.000)	(0.000)	(0.000)
CAPEX	-1.797***	-1.799***	-1.786***
	(0.000)	(0.000)	(0.000)
CASHFL	1.880***	1.827***	1.833***
	(0.000)	(0.000)	(0.000)
DIVD	0.525***	0.525***	0.513***
	(0.000)	(0.000)	(0.000)
Sample size	213205	213205	213205
Adj-R^2	0.288	0.288	0.287

Table 7 Country by country analysis

This table reports the country by country regression results of the financial development on relationship between the trade credit and cash holdings. The dependent variable is the coefficients on the trade payables (β_1) and receivables (β_2) estimated from the following regression (1) for each country and each year. We delete the sample whose numbers of observations in the regression (1) are less than 100.

$$CASH_{i,t} = \alpha + \beta_1 CT\_REV_{i,t} + \beta_2 CT\_PAY_{i,t} + \beta_3 LIQUID2_{i,t} + \beta_4 SIZE_{i,t-1} + \beta_5 LEV_{i,t-1} + \beta_6 DEBTM_{i,t-1} + \beta_7 M/B_{i,t-1} + \beta_8 CAPEX_{i,t-1} + \beta_9 CASHFL_{i,t-1} + \beta_{10} DIVD_{i,t-1} + INDUSTRY, and\ YEAR\ Dummies_{i,t-1} + \varepsilon_{i,t}. \quad (1)$$

The SIZE_avg is the mean firm size of a country in the year. GDP_r is the real annual growth rate of GDP. Inflation_r is the change in inflation based on the consumer price index, and Interest_gap is the spread between the lending rate and deposit rate in a country in the year. The definitions of FDT and LAW are presented in the Appendix. The constant term and year dummies are included in the models, but not reported. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Dependent variable	β_1 (CT_REV)			B_2 (CT_PAY)		
	MODEL 1	MODEL 2	MODEL 3	MODEL 4	MODEL 5	MODEL 6
FD	-6.703***			2.457		
	(0.001)			(0.376)		
STKMKT		-4.827**			-1.947	
		(0.039)			(0.549)	
FININT			-3.512***			2.187
			(0.003)			(0.188)
LAW	2.041	2.934	1.219	-1.625	-1.068	-1.178
	(0.341)	(0.189)	(0.572)	(0.591)	(0.732)	(0.697)
SIZE_avg	0.518	0.532	0.488	2.134***	2.160***	2.147***
	(0.154)	(0.148)	(0.181)	(0.000)	(0.000)	(0.000)
GDP_r	-0.242	-0.336*	-0.353*	-0.209	-0.046	-0.207
	(0.225)	(0.098)	(0.066)	(0.457)	(0.871)	(0.441)
Inflation_r	-0.173	-0.259	-0.215	0.006	0.087	-0.006
	(0.643)	(0.491)	(0.565)	(0.991)	(0.869)	(0.991)
Interest_gap	-0.047	0.013	-0.005	-1.021***	-1.095***	-1.014***
	(0.739)	(0.925)	(0.970)	(0.000)	(0.000)	(0.000)
Sample size	355	355	355	355	355	355
Adj-R^2	0.148	0.129	0.141	0.137	0.136	0.140