Firms as liquidity providers: Evidence from the 2007-2008 financial crisis

Emilia Garcia-Appendini[a]
Judit Montoriol-Garriga[b]

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Abstract

We study the effect of the 2007-2008 financial crisis on between-firm liquidity provision. Consistent with a causal effect of a negative shock to bank credit, we find that firms with high pre-crisis liquidity levels increased the trade credit extended to other corporations and subsequently experienced higher performance as compared to ex-ante cash-poor firms. Trade credit taken by constrained firms increased during this period. These findings are consistent with firms providing liquidity insurance to their clients when bank credit is scarce and provide an important precautionary savings motive for accumulating cash reserves.

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[a] Bocconi University, E-mail: emilia.garcia@unibocconi.it
[b] Universitat Autònoma de Barcelona. E-mail: judit.montoriol@uab.es
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1. Introduction

In this paper we analyze how shocks to the banking sector and more broadly to financial markets affect the intra-firm provision of trade credit, a substitute form of credit. The hypotheses we take to the data are based on trade credit theories according to which suppliers may provide liquidity to customers whenever they experience a liquidity shock (Wilner (2000), Cuñat (2007)). Accordingly, when liquidity in the financial markets is scarce firms with more financial slack are in a better position to provide liquidity insurance through an increased amount of trade credit provided to their clients.

The supply-driven nature of the 2007-2008 crisis provides a unique opportunity to study the role of alternative sources of financing in compensating for unavailable credit from banks and financial markets.[1] Contrary to other financial disruptions which have their roots in the real sector, the 2007-2008 crisis is largely attributed to a reversal in the real estate market together with a perceived lack of transparency of the investment portfolios of financial institutions, leading to severe balance sheet problems in the financial sector, and consequently to a lending contraction.[2] The effects of this lending contraction on demand for credit were contained prior to the bankruptcy of Lehman Brothers in September 2008 (Almeida et al. (2012), Duchin, Ozbas, and Sensoy (2010)). This situation allows us to test whether an exogenous and unexpected shock to the supply of bank credit causes an increase in the amount of trade credit extended by firms, as a function of their access to liquidity.

We explore these ideas using a differences-in-differences approach in which we compare the trade credit supplied before and after the beginning of the crisis as a function of firms' liquidity positions (cash reserves). We follow closely the identification strategy

[1] Evidence of a supply shock to credit markets abounds. Ivashina and Scharfstein (2010) document that new bank loans to large borrowers fell by 79% from Q2:2007 to Q4:2008. Similarly, the responses to the Federal Reserve's Senior Loan Officer Opinion Survey on Bank Lending Practices indicate that banks significantly tightened credit standards on Commercial and Industrial loans in ten consecutive quarters (2007:Q3 to 2009:Q4). In addition, credit spreads widened to unprecedented levels at the onset of the crisis and remained quite elevated for an extended period of time. For example, Almeida et al. (2012) report a dramatic increase in spreads on long-term corporate bonds starting in August 2007, both for investment-grade and junk-rated high yield bonds. Similarly, the spread over the fed funds rate on commercial paper increased significantly during the recession according to data from the Federal Reserve. The drop in bank lending and the rise in spreads are indications of the credit supply shock and the tighter credit conditions faced by non-financial firms.

[2] See, for example, Gorton (2009) and Acharya et al. (2009) for discussions on the causes of the crisis.

by Duchin et al. (2010) to address endogeneity concerns. Specifically, we measure firms' financial positions one year prior to the onset of the crisis, we confirm that similar results do not follow the negative demand shock caused by September 11, 2001, and we focus our empirical analysis on the first stage of the financial crisis (roughly from July 2007 to June 2008), where the supply effects dominate.

Consistent with an overall credit contraction, we document a decline in trade credit provision by non-financial firms during the financial crisis. However, firms with high liquidity holdings before the crisis *increase* the amount of trade credit offered to their clients during the crisis. On the other hand, firms that had low cash reserves and were more exposed to the financial crisis reduced considerably the trade credit provided. The increase in accounts receivable by the most liquid firms is consistent with a supply-side effect in which suppliers that are able use their extra liquidity to support their clients during the credit crunch. These findings provide support for the aforementioned theories proposing suppliers as liquidity providers (Cuñat (2007), Wilner (2000)). Empirically, Petersen and Rajan (1997), Boissay and Gropp (2007), and Burkart, Ellingsen and Giannetti (2011) have found evidence consistent with these theories. Our findings complement theirs with two important contributions. First, we provide a clean identification of the causal link between the unexpected negative credit supply shock and the increase in trade credit provided by suppliers with more liquidity slack before the crisis. Second, we analyze a period of aggregate liquidity shortage instead of idiosyncratic liquidity shocks. In this sense, our paper is closely related to Love, Preve and Sarria-Allende (2007) who focus on the impact of financial crises on trade credit flows using firm-level data from several currency crises in emerging economies.

To provide further support to our supply shock interpretation, we perform two complementary tests. First, we follow Rajan and Zingales (1998) and construct industry-level measures of dependence on external finance. Results show that only firms in industries with low dependence on external finance are able to provide additional liquidity to their clients. This finding suggests that firms that rely strongly on the affected financial sector for liquidity are unable to pass on their scarce liquidity to their clients, and supports our interpretation of a causal effect of the supply shock. In a second analysis, we explore whether firms used their lines of credit to increase the trade credit

provided to their clients. We find that our baseline coefficient increases by 50% when we consider the funds available in lines of credit on top of cash reserves to measure a firm's liquidity position. This result suggests that firms with better access to bank credit through pre-existing commitments are using their lines of credit to increase the amount of trade credit provided to their clients. These findings support the idea that liquidity is a key determinant of the *ability* to provide trade credit during the crisis.

One could argue that the observed positive relationship between liquidity and trade credit during the crisis is due to confounding factors. As an example, clients could be delaying payments to suppliers during the crisis, forcing a higher extension of trade credit. To provide further support to our main hypothesis that suppliers are *willingly* providing trade credit during the crisis, we draw on predictions of trade credit theories to identify firms for which trade credit is more valuable. We find that the increase in trade credit provision was the largest within these firms. In particular we find that firms that are growing the most are more likely to offer trade credit to their clients. These results are consistent with theories claiming that trade credit is often used as a tool to boost sales (Fisman and Raturi (2004), Fabbri and Klapper (2009)). We also show that firms with more bargaining power and firms that sell differentiated goods increased more the provision of trade credit during the crisis, which is consistent with the model in Brennan et al. (1988), and empirical findings in Petersen and Rajan (1997) and Burkart, Ellingsen and Giannetti (2011). As a further analysis to rule out these alternative hypotheses, we collect data on a firm's key customers using the Customer Segment File in Compustat. We then match financial information of the customers linked to their suppliers allowing us to examine the determinants of trade credit while controlling for both supply-side and demand-side factors. We show that our core results hold when we directly control in the regression for client's characteristics such as their bargaining power.

In the remainder of the paper we attempt to answer the following related questions: (1) Who receives trade credit? and (2) What are the long run dynamics of trade credit provision? To answer the first question we perform two complementary analyses. First, we use the sample of suppliers matched with their customers to analyze whether suppliers of the most constrained firms increased their accounts receivable the most. Then, we view firms as customers and examine how their debt in trade credit (accounts

payable) changed during the crisis, as a function of their credit constraints. Consistent with a demand effect, we find that credit flowed from liquid suppliers to their most constrained clients.

To answer the second question, we extend our period of analysis to examine the evolution of the trade credit and cash reserves of suppliers during later stages of the crisis. We find that ex-ante liquid suppliers who helped out their clients during 2007-2008 suffered a depletion of their cash reserves. As the crisis became more severe after the bankruptcy of Lehman Brothers in September 2008, these suppliers were forced to reduce the amount of trade credit offered to their clients in order to replenish their cash stocks. This finding highlights the limitations of trade credit to absorb shocks in an extreme scenario of scare institutional credit and market illiquidity (Love et al., 2007). Finally, we find that cash-rich firms which increased liquidity provision during the crisis had in general a better performance during and after the crisis. The subsequent superior performance of liquid suppliers that increased the provision of trade credit during the financial phase of the crisis further supports our main hypothesis that suppliers willingly provided liquidity.

Our findings support the redistribution theory of trade credit, which posits that firms with better access to capital will redistribute the credit they receive to less advantaged firms via trade credit (Meltzer (1960), Petersen and Rajan (1997)). Research by Calomiris, Himmelberg and Wachtel (1995) and Nilsen (2002) showed that during downturns, liquidity in the form of trade credit flows from firms having access to the markets for commercial paper or long-term debt to firms without access to these financial instruments. Our results show that trade credit flows from cash-rich firms to constrained customers during the financial stage of the crisis but not after September 2008. This suggests that the ability of suppliers to provide liquidity insurance to their clients depends on the severity of the downturn. It highlights the importance of establishing and maintaining close trading relationships that can prove valuable in times of financial turmoil.

Our results also contribute to the large and growing literature on the causes and effects of the 2007-2008 financial crises (see for example Gorton (2009), Acharya et al.

(2009), or Brunnermeier (2009)). Our paper fits within a smaller set of papers which study the effects of the crisis on financial policies of non-financial corporations. The general result of this literature is that the credit supply shock has an economically significant impact on corporations. Tong and Wei (2008), for example, find that stock price declines were steeper for firms that were more constrained. Similarly, Campello, Graham, and Harvey (2010) and Almeida et al. (2012) find that constrained firms, or firms vulnerable to refinancing at the peak of the financial crisis, reduce investment spending and bypass attractive investment opportunities. Ivashina and Sharfstein (2010) show that firms draw down credit lines during the crisis, and face difficulties in renewing the lines. Kahle and Stultz (2010) find that firms change their financial policies significantly following the onset of the crisis. Our paper complements this literature by identifying another, to our knowledge still unexplored channel through which firms may partially offset the negative effects of the credit crunch. It highlights the importance to look at other debt instruments, even if informal and not institutionalized like trade credit, to obtain a complete picture of the potential effects of a credit crunch for the real economy. Our results are consistent with Duchin et al. (2010) who find firms with high liquidity holdings do not seem to reduce investment. We show that more liquid firms do not reduce trade credit provision to their clients.

Finally, our paper is also related to research on corporate cash holdings. Under the precautionary saving theory introduced by Keynes (1936), firms hold cash to protect themselves against adverse shocks.[3] Our paper provides further evidence on the precautionary benefits of holding cash when credit tightens and firms are financially constrained or highly dependent on external finance.

The remainder of the paper is organized as follows: In Section 2 we explain our main hypothesis, the empirical strategy, and how we deal with alternative hypotheses. In Section 3 we discuss the data collection process. Section 4 presents the baseline findings and several robustness checks. In Section 5 we analyze various theories of trade credit and how liquidity provision was more important where trade credit is more valuable.

[3] There is a large literature consistent with this theory. See for example Opler, Pinkowitz, Stulz and Williamson (1999), Almeida, Campello and Weisback (2004), Faulkender and Wang (2006) and Acharya, Almeida and Campello (2007).

Section 6 focuses on the recipients of trade credit. Section 7 extends the period analyzed to year 2010. Finally, we conclude in Section 8.

2. Hypotheses and empirical strategy

2.1. Main hypothesis and identification strategy

Are firms ready to support their clients' needs for credit in times when other sources of external finance are scarce? To answer this question we analyze the impact of the financial crisis on inter-firm provision of liquidity. The 2007-2008 crisis provides an ideal scenario to study the role of trade credit as a substitute form of credit when other alternative sources of financing from banks and financial markets are not available. Our main hypothesis is based on trade credit theories that provide insights into why suppliers are willing to offer trade credit when firms experience temporary financial difficulties (Petersen and Rajan, 1997; Wilner, 2000; Cuñat, 2007). According to these theories, suppliers have an equity stake on their clients, i.e. an interest in their survival due to valuable long-term business relationships, and therefore they may be more willing to help their clients as long as they have sufficient liquidity slack to support the additional credit extension.

Our main hypothesis is that a firm's liquidity position is a key determinant of the firm's ability to provide support to its clients during the crisis. To test this hypothesis we employ a differences-in-differences approach in which we compare the trade credit supplied by firms before and after the start of the crisis as a function of their liquidity positions. Inferences may be confounded, however, if the variation in firms' liquidity positions as the crisis unfolds is endogenous to unobserved motives, unrelated to inter-firm liquidity provision, leading firms to change the proportion of trade credit offered to their clients. We design our basic specifications in a way that addresses this fundamental issue. We eliminate the potential endogenous variation in the firms' liquidity positions by measuring these variables during the year previous to the start of the crisis. We then regress firm-level quarterly measures of trade credit offered by firms on an indicator variable for whether the quarter in question is after the onset of the crisis, and on the interaction of this indicator variable with the firm's financial position as measured the

year previous to the start of the crisis. We control for firm fixed effects and time- varying firm characteristics such as investment opportunities that may affect the amounts of trade credit offered. The firm fixed effects subsume the level effect of the financial position of the firms (because the financial position is only measured once per firm), and control for all sources, observed and unobserved, of time-invariant cross-sectional differences in firm behavior.

Thus, our framework is similar to an instrumental variables approach in which the identifying assumption is that the financial positions previous to the crisis are not positively correlated with unobserved firm-specific demand shocks following the onset of the crisis. Our identification strategy is similar to Duchin et al. (2010). More specifically, our identification condition requires that the ex-ante liquidity position of a given firm is uncorrelated with changes in demand for credit experienced by its clients during the crisis.

Our basic specification can be written as follows:

$$AR_{it} = \beta_i + \beta_1 \cdot CRISIS_t + \beta_2 \cdot CRISIS_t \cdot LIQ_{i,t^*} + \beta_3 \cdot X_{it-1} + \varepsilon_{it} \qquad (1)$$

In the above equation, AR_{it} refers to the total amount of accounts receivable divided by sales. By scaling this measure by the flow variable sales, we control for the reduction in economic activity that is commonly associated with crises. LIQ_{it^*} denotes the firms' liquidity positions measured a year previous to the start of the crisis. The indicator variable $CRISIS_t$ takes the value of one during the financial phase of the crisis, specifically from July 1, 2007 to June 30, 2008, and it captures the drop in the supply of bank credit following the onset of the crisis. Our focus shall lie on the coefficient for $CRISIS_t$ and its interaction with the liquidity position of the firm, LIQ_{it^*}. According to our main hypothesis we expect to obtain a positive coefficient on this interaction term.

Our main measure for liquidity before the crisis, LIQ_{it^*}, is given by the firms' cash reserves, scaled by total assets. Because firms hold cash to support the day-to-day operations, we also consider the excess cash holdings of the firms, defined as the difference between the actual cash holdings and the "optimal" cash holdings. We follow

research by Opler et al. (1999) and Dittmar and Mahr-Smith (2007) and define excess cash as the difference between actual and predicted cash in the following model:

$$\begin{aligned}\ln(cash)_{it} = {} & \alpha_o + \alpha_1 (M/B)_{it} + \alpha_2 SIZE_{it} + \alpha_3 NWC_{it} + \alpha_4 CF_{it} + \alpha_5 CAPX_{it} \\ & + \alpha_6 DEBT_{it} + \alpha_7 CF\_Volatility_{it} + \alpha_8 DIV\_Dummy \\ & + Year\_Dummies + \varepsilon_{it}\end{aligned} \quad (2)$$

To complement our results, in Section 4.3 we also analyze whether suppliers used their lines of credit (LOC) to increase the trade credit provided to their clients. We use a sub-sample of firms for which we gathered information on access to lines of credit from the 10-k SEC filings. Because cash and lines of credit are imperfect substitutes (Sufi (2009), Flannery and Lockhart (2009), Lins et al. (2010)), we construct a liquidity measure that adds to the unused portion on all lines of credit to a given firm the cash stock available before the crisis. We measure all liquidity variables at $t^* =$ the end of the second quarter of year 2006, i.e. one year previous to the financial crisis to reduce concerns that the variation in firms' liquidity positions as the crisis unfolds is endogenous to unobserved motives, unrelated to inter-firm liquidity provision, that also lead to changes in the ratio of accounts receivable to sales.

In our models we include controls accounting for the supply of trade credit, X_{it-1}. Vector X_{it} includes size, age, net profit margin, sales growth, total debt, net worth, Tobin's Q, tangible assets and dummies for the different buckets of long term ratings (see Petersen and Rajan (1997), Burkart, Ellingsen and Giannetti (2011)). The last two control variables are intended to capture a firm's debt capacity. Tangibility provides higher recovery values to creditors in case a firm defaults on its debt obligations and thus enhances a firm's ex ante debt capacity. Firms with a long term debt rating have access to public debt markets, which is an indication a firm's debt capacity. Firms with larger debt capacity may be in a better position to increase the provision of trade credit to their clients because they have the ability to do so without resorting to costly external equity or public unsecured debt.

We scale our liquidity measures, tangible assets, net worth, and cash flow, tangible assets, current assets, and total debt by total assets. To avoid simultaneity, we lag all control variables by one quarter.

2.2. Alternative hypothesis

We are mainly concerned with three alternative channels, not related to liquidity provision, that might differently affect accounts receivable of cash-rich firms and cash-poor firms at the time of the crisis: (i) client bargaining power, (ii) collection of receivables, and (iii) growth opportunities.

The first potential confounding factor is that clients of cash-rich suppliers have higher bargaining power, which they exploit during the crisis by either forcing the supplier to increase the trade credit provision or by paying their receivables later. Under this alternative hypothesis we would also observe a positive relationship between suppliers' cash and accounts receivable during the crisis. In order to rule out this confounding effect, in Section 6 we present results for a matched sample of suppliers with their main clients. These specifications allow us to control for clients' characteristics, including bargaining power, and other demand factors.

A related possibility is that cash-rich firms, who have deeper pockets, put less effort onto collecting receivables than cash-poor firms. As before, we would also observe a positive relationship between cash and accounts receivable during the crisis. We view this explanation as compatible with our main hypothesis since both imply that suppliers are financing a larger proportion of their sales to customers because they are able to do so. Indeed our results are likely a combination of the two effects, namely that cash-rich suppliers are willingly extending more credit and also that they are not being as fast collecting receivables when customers pay later.

Finally, another alternative explanation to our findings is the firm's growth opportunity set. Firms may have accumulated cash ex-ante because they plan to undertake real investment projects in the future. As the crisis unexpectedly hits the economy, the real investment opportunities of these firms vanish and thus their best use of the cash accumulated is now to offer trade credit to their clients (Burkart and Ellingsen 2004). Under this explanation cash-rich firms provide more trade credit to their clients during the crisis because the return on their real investment projects has declined more relative to cash-poor firms. To control for this confounding story we include in all

specifications proxies for investment opportunities, such as sales growth and Tobin's Q. We conduct several additional tests to address concerns that our results may be due to other confounding effects. These include: (i) using industry-level measures of dependence on external finance as a more exogenous variation to strengthen identification; (ii) demonstrating that we do not obtain similar results following the negative demand shock to the economy caused by the events of September 11; and (iii) demonstrating that our main results continue to hold when we measure cash as much as four years prior to the onset of the crisis.

3. Data

The data are from Standard and Poor's Compustat quarterly database of publicly traded firms between the third quarter of year 2005 and the fourth quarter of 2010. We use all observations except for firms with negative total assets (*atq*), negative sales (*saleq*), negative cash and marketable securities (*cheq*), cash and marketable securities greater than total assets, and firms not incorporated in the U.S. We also eliminate all financial firms (firms with SIC codes between 6000 and 6999), utilities (firms with SIC codes between 4900 and 4949), and not-for-profit organizations and government enterprises (SIC codes greater than 8000).

As is the standard practice in recent related literature, our data selection criteria approach follows that of Almeida, Campello, and Weisbach (2004). We exclude from the raw data those firms with market capitalization less than $50 million or whose book value of assets is less than $10 million, and those displaying asset or sales growth exceeding 100%. These filters eliminate the smallest firms which have volatile accounting data and firms that have undergone mergers or other significant restructuring. Finally, as we are interested in studying the effects of firm liquidity on amounts of trade credit offered, we limit the sample to firms with non-missing values of accounts receivable *(rectq)*. The resulting sample consists of 31,919 firm-quarters, corresponding to information on 2,249 firms. Table A.1 of the appendix shows summary statistics for some of the key variables in our analysis.

We define the beginning of the financial crisis as July 1, 2007, which is conservative as most studies date the beginning of the crisis during August 2007 (see Duchin et al. 2010). In order to average out any seasonal effects of the data, in our analyses we consider full years of information; thus, our sample starts in the quarter starting on July 1, 2005 and ends in June 30, 2008. As validity checks of the sensitivity of our results to the choice of our sample, we repeat the main estimations on two more samples: from July 1, 2004 to June 30, 2008 and from July 1, 2006 to June 30, 2008. We focus most of our analysis on the first year of the crisis (July 1, 2007– June 30, 2008), when the crisis was mainly financial, because we are interested in studying the effects of the lower supply of credit. As an extension, we examine how the inter-firm financing dynamics change when we consider the following crisis year (from July 1, 2008 to June 30, 2009) with a caveat. During this later period, the financial crisis spilled over to the real sector and our results could be contaminated by the consequent demand effects. Finally, we extend the analysis to the post-recession period, from July 1, 2009 to June 30, 2010, in order to analyze the long-run (or medium-run) implications of trade credit provision in the aftermath of the crisis. We analyze whether firms that extend additional trade credit to their clients are able to expand their market share and sales in the post-recession period, as Petersen and Rajan (1997) suggest.

We complement the Compustat dataset with data on use of lines of credit and data on a firm's key customers. Regarding the lines of credit, we manually gather data from the Securities and Exchange Commissions's 10-k annual filings for a sub-sample of 100 firms. We closely follow Sufi (2009) for the construction of this sub-sample. We first limit the data to firms that have no missing values for the following core financial variables: cash (*cheq*), total assets (*atq*), property, plant and equipment (*ppentq*), long-term debt (*dlltq*), preferred stock liquidating value (*pstklq*), total sales (*saleq*), EBITDA (*oibdpq*), common shares outstanding (*cshoq*), short-term debt (*dlcq*), deferred taxes (*txdcy*),[4] retained earnings (*req*), cost of goods sold (*cogsq*), convertible debt (*dcvtq*), total liabilities (*ltq*), and notes payable (*npq*). We also restrict our sampling framework to those firms with a book leverage ratio between 0 and 1 (*(dlcq+dlltq)/(atq-ltq-*

[4] We convert all year-to-date variables as *txdcy* to quarterly data, by subtracting the previous values in quarters 2, 3, and 4.

pstklq+txdcq)). Finally, because of our interest in trade credit, additionally to the above restrictions imposed by Sufi (2009), we also limit the data to firms having non-missing values for the following ratios: accounts receivable (*rectq*) divided by sales, and accounts payable (*apq*) divided by the cost of goods sold. We select 100 firms of the resulting sample by first determining the firms that are both in our dataset and Sufi's dataset of which there are 121.[5] We randomly select 80 of these firms for inclusion in the sub-sample. By extending Sufi's dataset, we can construct an even longer panel for those firms with line of credit data. This allows us to compare results from the Great Recession with results from the 2001 demand shock. However, this creates a selection bias towards older firms. To compensate for this selection bias, we randomly select 20 additional firms from our full sample that did not appear in the Compustat database until 2000. We perform parametric and non-parametric tests of difference in means for the full Compustat universe vs the augmented sub-sample containing information on the use of lines of credit (untabulated due to space constraints), and find that our augmented sample is more similar to the Compustat universe than the sample based only on Sufi's original data. For this sub-sample of 100 firms we collect data from the ''Liquidity and capital resources'' sections of firms' annual 10-k reports on the number of lines of credit, the credit limits of each of those lines, and any outstanding balances.[6]

Finally, we collect data on the firm's key customers using the Customer Segment File in Compustat for 2005 to 2010.[7] In accordance with SFAS Nos. 14 and 131, public firms have to disclose the identity of any customer whose purchases represent more than 10 percent of the firm's total annual sales. An advantage of using this data is that the analysis is based on actual supplier/customers relationships. The main limitations are that only the largest customers are captured, and that the database only reports the names of the firms, i.e. there is no unique identifier.[8] We use data mining techniques, like

[5] We thank Amir Sufi for making these data available in his website.
[6] We match the annual data on lines of credit to our quarterly dataset from Compustat assuming that the data is constant throughout the quarters of the fiscal year.
[7] Because the key customer data is annual, we use the same convention as above and assume that the key customer data is constant throughout the quarters of the fiscal year.
[8] There is no convention on the customer name that should be reported. For instance, the same customer may be reported with the subsidiary name, the top holder name, the ticker, etc. Furthermore, sometimes abbreviations are used or there are typos. Therefore, in many cases the customer needs to be identified

algorithms that match the number of common characters across names, complemented with manual identification to match the customer's name to the corresponding GVKEY in Compustat. The resulting sample is a panel of 9,368 customer-suppliers pairs. For each customer we match the balance sheet data from Compustat. [9] We winsorize all variables (for the whole sample and for the smaller sub-samples of firms with 10-k data and key customer data) at the 1 and 99% levels.

4. Supplier's liquidity position and trade credit provision

4.1. Baseline results

Table 1 presents the first set of estimates from our base specifications described in equation (1) above. In order to establish the basic patterns in the data, in columns 1 and 2 we estimate two modified versions of our basic specification which include only the crisis dummy (column 1), or the crisis dummy and all firm controls except for the liquidity measures (column 2), plus a constant and firm fixed effects. Consistent with an overall drop in firm liquidity due to the bank-driven supply shock to corporate credit, we find that accounts receivable as a fraction of sales dropped on average by 0.6 to 1 percentage points during the first year following the start of the crisis in July 2007. This finding suggests that on aggregate accounts receivable are procyclical.

In columns 3-7 of Table 1 we test our main hypothesis that liquid firms increased the trade credit provision compared to less liquid firms. We do this by including the interaction of the crisis dummy with two stock liquidity measures (calculated at the end of the quarter that ends before July 1, 2006). Our measure of firm liquidity in column 3 is the firms' cash reserves, scaled by assets. The coefficient for the crisis dummy implies that a zero cash firm reduced accounts receivable to assets ratio by 1.5 percentage points. However, the interaction coefficient for crisis and liquidity is positive and significant. It implies that firms with very high cash reserves are able to offset the overall negative effect of the crisis. This is our main result: cash-rich firms *increased* (or decreased to a

manually and in some cases the name cannot be matched. The procedure we follow to identify the customer firms is similar to that described in Fee and Thomas (2004).

[9] Note that some customers are not included in the final sample because there is no financial information for these firms in Compustat, and therefore we cannot compute the financial position for that client.

lesser extent) the amount of trade credit provided to their clients during the first phase of the financial crisis.

In column 4, we also account for the effect of pre-crisis cash flows on the provision of accounts receivable during the crisis, by adding to equation (1) an interaction of the crisis dummy with pre-crisis cash flow. Cash flow is another proxy for firm liquidity, and it is also a predictor of the access to external liquidity through lines of credit (Sufi (2009)). We find a positive and strongly significant effect of high cash flows on liquidity provision.

In columns 5 and 6 we measure the stock of liquidity as excess cash, calculated as the difference between actual cash holdings and cash predicted from equation (2). As before, the positive coefficients on excess cash implies that firms holding cash in excess of the optimal cash holdings increase the amount of accounts receivable offered as a fraction of sales. In column 6 we find that firms with positive cash flows require lower levels of cash in excess of the optimal holdings to be able to compensate for the overall drop in supply of liquidity to other corporations through trade credit.

Finally, in column 7 of Table 1 we account only for the interaction of the crisis dummy with the cash flow level available during the second quarter of year 2006 (we do not control for cash reserves). As before, the coefficient for cash flow is positive and statistically significant, implying that firms with high capacity of generating cash flows before the crisis were significantly more likely to increase their provision of trade credit to other firms.

Our baseline results presented in this section show how cash-rich firms are able to mitigate the decline in firm liquidity due to the bank-driven supply shock to credit. On average, however, the economic significance of this liquidity compensation is modest: For example, coefficients in column 3 imply that only firms with cash of at least 61% of assets or more are able to completely compensate their clients for the drop in bank liquidity; and that a one standard deviation increase in year-before cash reserves mitigates the decline in accounts receivable by 0.5 percentage points (35% of the decline of a zero-cash firm). Coefficients of column 4 imply that the required amount of cash reserves required to offset the overall negative effect of the crisis for a firm with a mean cash flow

of 0.026 is 46% of assets, which corresponds to the 86th percentile of the cash-to-assets unconditional distribution. In column 5 we observe that a one standard deviation increase in excess cash implies a 0.5% higher ratio of accounts receivable to sales, which almost offsets the overall decrease in trade credit offered due to the crisis. In Section 5 below we will show that in situations where trade credit is predicted by theory to be a key source of funding the economic effect is much stronger.

Regarding the control variables, our results suggest that firms that have better access to financing and more debt capacity offer on average more trade credit: the coefficients for the logarithm of assets and for rating dummies are positive and, in many cases, significant at least with a 90% confidence level. Having controlled for size and debt capacity, we find a negative coefficient for age suggesting that older firms provide less trade credit to their customers compared to younger firms. This is consistent with the results of Burkart, Ellingsen and Giannetti (2011). We also find a negative coefficient for sales growth, consistent with Petersen and Rajan (1997) and suggesting that firms with slow growth may use extension of trade credit to attempt to maintain their sales. Finally, the remaining explanatory financial ratios have a negative and significant coefficient (property plant and equipment, net profit margin, net worth and debt), as in Burkart, Ellingsen and Giannetti (2011).

4.2. External finance dependence

To further strengthen identification of a supply shock, in Table 2 we analyze inter-firm liquidity provision during the crisis as a function of the need for external finance. We follow Rajan and Zingales (1998) and define external finance dependence according to the industrial sector of the firm. External financial dependence (EFD from now on) is defined as the proportion of capital expenditures in excess of cash flows.[10] A positive EFD means that the cash flow generated by the firms in the industry is not

[10] We use Compustat firms between the years 1980 and 1996 and use firms that have been on Compustat for at least 10 years. The reason for this choice is to capture firms' demand for credit and not the amount of credit supplied to them. We sum across all years each firm's total capital expenditures minus cash flows from operations and then divide it by total capital expenditures. Next, we aggregate the firm-level ratios of external financial dependence using the median value for all firms in each two-digit Standard Industrial Classification (SIC) category. The EFD measure is assumed to be constant over time.

sufficient to cover the capital expenditures, and therefore, the firm has to issue debt or equity to finance investments. A negative EFD value indicates that firms have free cash, and therefore less need for external financing. The main advantage of using EFD measure is that it is defined at the industry sector level as opposed to the firm level, which is less endogenous. Rajan and Zingales (1998) point out to technological reasons for why some industries depend more on external finance than others: "To the extent that the initial project scale, the gestation period, the cash harvest period, and the requirement for continuing investment differ substantially between industries, this is indeed plausible." Our hypothesis is that firms in industries with low dependence on external finance are able to provide additional liquidity to their clients in comparison to firms in high external financial dependence industries.

In column 1, we interact the resulting continuous EFD measure with the indicator variable for the crisis, to explore whether inter-firm liquidity provision is smaller among firms that have higher external financial dependence. Consistent with the crisis being rooted in the financial sector, we find that firms with more need of external financing decreased trade credit liquidity provision significantly more than the firms that depend less on external finance. For ease of interpretation, we construct two dummy variables from this continuous measure of external dependence. Industries with low (high) external financial dependence are industries with negative (positive) EFD. In column 2, we interact the High EFD dummy with the crisis variable, and find a negative and significant coefficient. During the financial crisis, firms in industries with high EFD decreased the provision of trade credit by an additional 1.1 percentage point compared to firms in low EFD industries.

In Columns 3 and 4, we divide the sample of firms into two groups with positive and negative EFD. We interact our liquidity measures (cash and excess cash, respectively) with the dummy for the crisis period. This methodology allows us to test the importance of having internal cash across sectors with varying degrees of dependence on external financing. We find that firms with more cash or excess cash are significantly more likely to extend more credit to their clients, but *only* among the firms in industries with low dependence of financing from external sources. Our main interest is to test statistically the equality of the interaction coefficients in the two regressions against the

alternative hypothesis that they are not equal. The last row of the table provides the F-statistic and the p-value associated to this test. We can see that the null hypothesis is rejected for both cash reserves and excess cash, suggesting that the observed differences in high and low EFD industries are statistically significant. This result further strengthens our interpretation of a causal effect of a supply shock.

4.3. Internal and external liquidity: the use of lines of credit

In this section we explore the role of bank lines of credit in trade credit provision. Recent literature on corporate liquidity management provides evidence that the use of revolving lines of credit is generally jointly determined with cash holdings.[11] A firm's liquidity position is composed of internal cash reserves and external cash that can be obtained from drawing down an existing line of credit. Both cash reserves and lines of credit play an important liquidity role given that capital market frictions may prevent firms from obtaining external sources of finance for valuable projects arising in the future.[12]

We analyze a firm's decision to provide trade credit to their clients during the financial crisis as a function of the availability of a line of credit before the onset of the crisis. We hypothesize that firms with access to lines of credit may be in a better position to provide liquidity to their clients during the crisis. To investigate this idea, we employ several measures of internal and external liquidity.

The analysis uses hand-collected data on lines of credit from SEC filings for our subsample of 100 firms from 2005 to 2009. Sufi (2009) and Demiroglu et al. (2009) find that lines of credit are used by a vast majority of publicly traded firms. The descriptive statistics from our sample are consistent with previous studies. Table A.2 of the appendix shows that 77% of the firms in the sample have an outstanding line of credit. While the credit limits are about the same across the years, the amount borrowed under credit

[11] Sufi (2009) shows that the availability of a line of credit depends on the ability of the firm to maintain high cash flows. Firms with high cash flow obtain a line of credit and therefore hold less cash than firms with low cash flow that cannot secure lines of credit and need to hold more cash.

[12] Cash and lines of credit are imperfect substitutes. Cash is held on a firm's balance sheet and is readily available. A line of credit is a commitment credit contract that allows firms to draw down on demand from the credit line up to the pre-specified credit limit provided that no credit line covenant is violated.

commitments in 2008 was substantially larger than in previous years. It seems that some of the cash drawn-down under the lines of credit in 2008 is being returned to the banks by the end of 2009.

We explore whether firms used their existing credit lines to increase the trade credit provided to their clients. Given the substitutability of lines of credit and cash, we use measures of internal and external liquidity in our specifications. We employ the same empirical strategy described above, that is, we measure a firm's internal and external liquidity position a year before the onset of the crisis in order to avoid concerns of potential endogeneity. We use three measures of external liquidity: (1) a LOC dummy which is equal to one for firms with a line of credit and zero otherwise, (2) the LOC limit which is equal to the sum of the limit in any existing lines of credit scaled by total assets, or zero for firms with no line of credit, and (3) unused LOC which is equal to the ratio of the sum of all unused balances in any existing lines of credit to total assets, or zero for firms with no line of credit. The results are presented in Table 3.

In column 1 we replicate the results of column 3 in Table 1 using internal cash reserves to predict the provision of accounts receivable during the crisis for the subsample of 100 firms for which we have information on lines of credit. Once again, we find positive and significant coefficients for the interaction term of the crisis dummy and the measures of internal liquidity, confirming the baseline results for this reduced sample.

Next, we assess the relative importance of internal resources and external resources from lines of credit in trade credit provision. Columns 2 to 4 report the estimation of the model that includes two interaction terms: a measure of internal liquidity and an external liquidity measure, both interacted with the crisis dummy. We use cash reserves as internal liquidity measure in the three specifications. In each specification we use one of the three measures of external liquidity: dummy for LOC, limit over assets and unused amount over assets, respectively.

Cash reserves is positive and significant in all three regressions. In column 2, the dummy for availability of LOC is positive and significant.[13] Firms with an existing line of credit before the crisis increased the ratio of accounts receivables to sales by 7.3 percentage points during the crisis compared to firms without a line of credit. In columns 3 and 4, the coefficients for the interaction term of the crisis with the LOC limit and the unused balances in the LOC, respectively, are positive but insignificant. As this could be due to the negative correlation between the measures of internal and external liquidity, in the last two columns of Table 3 (column 5 and 6) we estimate the model using measures of total liquidity. The first liquidity measure is the sum of cash reserves and the total credit limit on lines of credit, scaled by assets (column 5). The second liquidity measure adds to the cash reserves the unused balances in any existing lines of credit (column 6). We find that during the crisis, the more liquid firms increased their accounts receivable as a proportion of their sales. Comparing the coefficient for cash reserves in column 1 (0.0882) and that on liquidity in column 6 (0.117) we observe that it increases by 50%. It implies that firms with unused funds in their lines of credit provided more credit to their clients during the crisis than what is predicted when we use only cash reserves to measure a firm's liquidity position. This result indicates that firms with better access to bank credit through pre-existing commitments seem to be using their lines of credit to increase the amount of trade credit provided to their clients, supporting the redistribution theory of trade credit.

4.4. The demand shock of 2001 and further robustness checks

One possible concern of our previous results is that they may reflect susceptibility to a demand shock, rather than a supply shock. If the first year of the crisis entails an economy-wide demand shock, our inferences may be confounded for two reasons. First, year-before cash reserves could serve as a proxy for the susceptibility to a demand shock. Second, accounts receivable during the 2007 crisis could grow because clients are not

[13] Once we control for internal liquidity, the coefficients on the external liquidity measures increase in magnitude and significance. This is due to the negative correlation between the two measures of liquidity. We address this issue in specifications 8 and 9.

being able to pay their debts to suppliers, rather than because suppliers are providing liquidity to their clients.

To address this concern, we repeat our base specification for the negative demand shock caused by the events of September 11, 2001. Tong and Wei (2008) explain that 9/11 had both a significant and almost entirely demand-side effect on the economy. If our results are caused by demand, rather than supply effects of the crisis, then we would expect to find results similar to our main results following this significant economy-wide negative demand shock.

We report several estimations for equation (1) following the 9/11 shock in Table 4. We estimate the specifications both in the whole sample and in the smaller sub-sample for which we have 10-k information about the use of lines of credit. Consistently with a negative demand shock, overall accounts receivable fall (or stay constant) after 9/11. However, unlike our main results, we find that year-before cash reserves, if anything, are *negatively* related to accounts receivable. Similarly, the availability of a LOC before the crisis does not lead to a higher provision of credit through accounts receivable. These results suggest that the positive relationship that we found in the 2007-2008 financial crisis between inter-firm credit provision following the supply shock and the pre-crisis liquidity reserves should be stronger in the absence of demand effects.

We also perform several robustness checks for our baseline results. For example, in all our previous estimations, we have scaled our measures of cash by total assets. This raises the concern that our results are driven by a mechanical correlation between the numerator of the dependent variable, accounts receivable, and the denominator of our measure of cash, which includes accounts receivables and cash. We address this concern by repeating the previous estimations using as a denominator for cash (as well as for the other RHS variables) the following two measures: (i) assets net of cash, and (ii) assets net of accounts receivable. Results of these estimations are contained, respectively, in columns 1 and 2 of Table A.4. In Panel A we estimate the coefficients on the whole sample of firms and report estimations corresponding to model (3) of Table 1 using the re-scaled variables. In Panel B, we estimate the coefficients for the sub-sample of firms for which we gathered information on the use of lines of credit, and we report estimations

corresponding to model (5) of Table 3. We find that our main results hold to the rescaling of our variables.

We also analyze whether our results are sensitive to the choice of the sample period used in the estimations, and to the year where we measure our cash variable. We change the estimation sample by adding or deleting four quarters from the starting point of our base sample (currently from the third quarter of 2005 to the second quarter of 2008). In columns 3 to 5 we add four quarters of data, and perform the estimations from the third quarter of 2004 to the second quarter of 2008, and in columns 9 to 11 we delete four quarters and perform the estimations from the third quarter of 2006 to the second quarter of 2008. We also change the identification year (currently at the second quarter of year 2006) and measure cash up to 12 quarters before the start of the quarter, to mitigate concerns that firms could have foreseen the crisis and adjusted their cash reserves accordingly. Columns 3, 6 and 9 contain our base case, i.e. identification performed at the second quarter of 2006; in columns 4, 7 and 10 we measure cash reserves 8 quarters before the start of the crisis, and in columns 5, 8 and 11 we measure cash reserves 12 quarters before the start of the crisis. The coefficient for the interaction of cash and the dummy for the crisis is positive in all cases, albeit with a lower statistical significance. These results show that our findings do not depend on the choice of the sample period or the year chosen to achieve identification.

5. The willingness to provide trade credit.

What are the main reasons that explain the observed increase in the supply of trade credit by the most liquid firms? In this section, we rely on existing trade credit theories to explore the motives leading suppliers to provide liquidity to their clients during the crisis. To test the implications of these theories we exploit cross-sectional supplier, industry and credit customer variation.

5.1. Subsample analysis on theories of trade credit

Theories of trade credit identify certain firms that should be more willing to provide liquidity in the form of accounts receivables to their clients. For example, the redistribution theory of trade credit posits that firms with better access to capital are able to distribute the credit they receive to less advantaged firms via trade credit (Meltzer (1960), Petersen and Rajan (1997), Calomiris, Himmelberg and Wachtel (1995) and Nilsen (2002)). Similarly, Burkart and Ellingsen (2004) argue that unconstrained firms with better access to funds should offer more trade credit.

Other theories claim that suppliers in growing firms may offer trade credit as a means of fostering their sales. This is because trade credit provides a mechanism for clients to certify the quality of the good (Smith (1987), Lee and Stowe (1993) and Long, Malitz and Ravid (1993)), or gives them a competitive edge over other suppliers (Fisman and Raturi (2004), Fabbri and Klapper (2009); see Cuñat and Garcia-Appendini (2011)). These theories predict that less constrained firms are better able to offer credit, and that growth firms should be more willing to provide liquidity to their clients.

Brennan et al. (1988) develop a model with imperfect competition to explain that suppliers offer credit as a means to price discriminate cash clients from credit clients that may have different reservation prices. In this model as well as in Petersen and Rajan (1997) the provision of trade credit is seen as an investment project in which the supplier acquires an implicit equity stake in the firm equal to the present value of the margins he makes on current and future sales of the product to the firm. Suppliers with more market power should be more willing to extend trade credit because they anticipate gaining more rents over the duration of the lending relationship. A similar argument can be found for banking relationships in Petersen and Rajan (1995). These theories predict that firms with more bargaining power should be more willing to provide liquidity to their clients.

Finally, another group of trade credit theories highlight that the nature of the goods produced by the supplier affect the provision of trade credit. For example, suppliers of differentiated goods have a comparative advantage in collateral liquidation with respect to suppliers of standardized goods (Frank and Maksimovic, 1998; Longhofer

and Santos, 2003). In Burkart and Ellingsen (2004) suppliers of differentiated products and services are more likely to offer sales on credit because these goods are more difficult or even impossible to divert for unintended purposes (input liquidity). Additionally, differentiated goods are usually tailored to the needs of the buyer which makes the client-supplier relationship more costly to replace (Cuñat, 2007). All these theories provide an economic mechanism that implies that trade credit provision should be more important for suppliers of differentiated goods.

The above theories suggest that there should be stronger incentives to provide trade credit for suppliers (i) with easier access to financing; (ii) with high growth opportunities; (iii) with high bargaining power, and (iv) selling differentiated goods. To examine these ideas, we classify firms into mutually exclusive sets according to these criteria and re-run regression (1) on the resulting subsamples. Results of regressing equation (1) on subsamples of firms classified according to their access to external financing are in Panel A of Table 5. We use (i) the existence of long-term debt rating and (ii) rating above investment grade (BBB- or higher) to classify firms as having access to capital and debt markets. Consistently with the redistribution theory of trade credit, we find that firms with access to capital markets are more likely to increase their supply of trade credit during the crisis. The coefficients for the interaction of cash with the crisis dummies are more than five times as large (and statistically significant) for the rated or investment grade firms than for firms that do not have a credit rating for debt, or are rated below BBB-. The coefficients in columns 2 and 4 imply that the cash level required for rated firms and investment grade firms to totally compensate for the drop in accounts receivables during the crisis is 17.7 and 15.2%, respectively. A one standard deviation increase in cash mitigates the decline in accounts receivables respectively by 60% and 70% of the drop for a zero cash firm. These results complement the analysis on lines of credit presented in section 4.3 above which show that suppliers with access to bank lines of credit increased trade credit provision during the crisis. These results suggest that firms with access to external sources of financing are much better suited to provide liquidity to their clients and provide support for the redistribution theory of trade credit.

We next analyze whether growth firms provide more liquidity out of their cash reserves to their clients. We identify a firm as a growth firm whenever (i) its market to

book ratio is higher than the median or (ii) its assets grow more than the median.[14,15] Columns 5 to 8 in Panel B of Table 5 contain regressions of equation (1) estimated on subsamples according to the growth opportunities of the firms. We find that firms with higher pre-crisis growth opportunities are more likely to use their cash reserves to provide liquidity to their clients. Cash reserves required to offset the decline in accounts receivables during the crisis are around 34% for growing firms. This is consistent with trade credit being used as a tool to foster sales.

In columns 9 to 12 of Panel C, we use the net profit margin and the degree of competition in the supplier's industry measured by the Herfindahl index to classify firms according to the supplier's market power. Consistent with the bargaining power hypothesis, we find that firms with high net profit margin and in more concentrated industries are more likely to increase the provision of trade credit to their clients during the financial crisis. Coefficients in columns 10 and 12 imply that the cash reserves required to offset the decline in accounts receivable among firms with high bargaining power are 19.3 and 10.7%, respectively. Our results contrast those of Fabbri and Klapper (2009) who find that suppliers with relatively weaker market power are more likely to extend trade credit.

Finally, in Panel D we follow Burkart, Ellingsen and Giannetti (2011), who used the classification by Rauch (1999) to classify industries according to the nature of the product exchanged into three categories: standardized goods, differentiated goods and services. Consistent with the theories of collateral liquidation and costly client replacement, we find that suppliers of differentiated goods with high liquidity are more likely to increase the provision of trade credit to their clients compared to suppliers of standardized goods and services. In fact, the cash required to mitigate the negative effects of the credit crunch is 15.9% of assets for suppliers of differentiated goods. A one standard deviation increase in cash reserves more than mitigates the negative effect of the crisis on accounts receivable.

[14] To classify firms according to the medians of their market to book value and sales growth, we consider the distributions of these variables as of the second quarter of year 2006.

[15] Other usual proxies for the ease of access to finance are size, age, or indices of constraints such as the Kaplan-Zingales or the Whited-Wu indices. We exclude these from the subsample analysis as all these variables also proxy for growth opportunities, and consequently their effect on trade credit offered is ambiguous.

5.2. Analysis of supplier-customer relationships

As we discussed in Section 2.2, one of the main confounding factors is that firms may be forced to provide liquidity to their clients instead of willingly doing so. For instance it could be the case that ex-ante liquid suppliers are matched with customers with high bargaining power in such a way that they can force their suppliers to increase trade credit offered to them to fulfill their increased demand. In order to rule out this hypothesis, in this section we run a set of regressions where we add controls for client's characteristics and explicitly control for client's bargaining power. For this analysis we use the subsample of firms for which we can identify key customers, as described in the data section and summarized in Table A.3. [16, 17] Our unit of analysis is a supplier-customer pair. We analyze the relationship between a supplier's total trade credit provided (accounts receivable to sales on suppliers balance sheet) as a function of the strength of the supplier-customer relationship and several customers' characteristics that proxy for client's bargaining power.[18]

Results of this analysis can be found in Table 6. We start by running the baseline specification (1) using the sample of suppliers matched with their customers. Consistent with our baseline results, we find a positive and significant coefficient on the interaction term of the crisis dummy and supplier's cash reserves and excess cash (columns 1 and 4, respectively).

We then investigate how the nature of the supplier-customer relationship influences the supplier's decision to offer trade credit. We control for client's bargaining power by adding the following client variables in our regressions: the customer market share in the customer product market, the customer's net profit margin as a proxy of its monopoly power in the product market, and the importance of that client to the supplier

[16] We are grateful to an anonymous referee for suggesting this analysis.
[17] Few other papers have analyzed trade credit using supplier-customer pairs. Notable exceptions are Shenoy and Williams (2011) who analyze the determinants of trade credit using this matched supplier-customer data from Compustat, and Klapper, Laeven and Rajan (2012) who analyze a cross section of trade credit contracts in the United States and Europe. Our paper differs from theirs in that our focus is on the financial crisis and supply shocks.
[18] The data set does not disclose the amount of trade credit extended to each customer; we only know the sales amount to each customer.

as measured by the ratio of sales to that customer over total sales.[19] Existing research shows that the volume of trade credit depends on borrower's performance and financial health (Burkart, Ellingsen and Giannetti, 2011). In the regression we also control for clients' creditworthiness by adding the following control variables: assets, sales growth, leverage ratio and a dummy for no debt rating (coefficients not reported). The results can be found in column 2 of Table 6. We find that the interaction coefficient between supplier's cash reserves and crisis dummy remains positive and highly significant after the introduction of client's controls. This finding rules out the client's bargaining power hypothesis and confers additional support to our interpretation of the results that suppliers willingly increased the provision of trade credit to their clients during the crisis. Interestingly, we do not find that the most important clients of the suppliers get more credit. Quite the opposite, credit flows to less important clients and clients with less bargaining power (as measured by their net profit margin).

In column 3 we also control for the client's need for credit by including the client's liquidity (cash) and degree of external finance dependence.[20] We find that clients with more liquidity needs receive more credit from their suppliers: the coefficient for client's cash is negative, while the one for external finance dependence is positive. This is consistent, once again, with the redistribution theories of trade credit. In columns 4 to 6 of Table 6 we repeat the same analysis using excess cash instead of cash. The results are qualitatively similar to those just discussed.

6. Who receives trade credit?

Who benefits from the increased supply of trade credit by the most liquid firms? The ability of a firm to take up more trade credit from its suppliers is a function, on the one hand, of the supplier's ability to provide such credit (supply effect), which according to our findings will be determined by the suppliers' liquidity position. On the other hand,

[19] As an additional measure of client's market power in its product market, we experiment with the Herfindahl index of concentration in the customer product market but find no significant effects. We also control for non-linear effects of the client's bargaining power by interacting these variables with the crisis dummy. We obtain similar results (unreported regressions).

[20] As the external finance dependence of the client is unique for each supplier-customer pair, we interact this variable with the crisis dummy.

the amount taken is also a function of a higher need of customers to take on more trade credit (demand effect).

In this section, we examine which types of firms receive the benefits of an increased provision of trade credit by their suppliers. The redistribution theory of trade credit implies that suppliers with better access to funding use trade credit as a means to distribute credit to constrained firms. Burkart and Ellingsen (2004) show that trade credit is countercyclical for bank constrained firms that do not exhaust their trade credit limits. In a downturn, constrained firms cannot obtain bank credit and therefore they increase trade credit usage; that is, constrained firms substitute the drop in bank credit with trade credit. On the other hand, unconstrained firms in the bank credit market are unaffected by the downturn since they have not exhausted their bank credit limits. Furthermore, these firms may find it more profitable to increase the extension of trade credit in the recession as the return on their real investment opportunities declines.

These theories predict that financially constrained firms should increase trade credit used during the crisis. To the extent that suppliers have the ability and willingness to meet the increased credit demand, we should observe that trade credit taken by constrained firms increases in the crisis. By the same token, suppliers matched to more credit constrained clients should experience a disproportionately large increase in accounts receivable. In order to test these empirical implications, we perform two complementary analyses. First, we use the sample of matched supplier-customers, and analyze the provision of trade credit by more liquid suppliers (supply effect) as a function of its customers' credit constraints (demand effect). Our second analysis concerns debt in accounts payable, both using the whole sample and the subsample of matched supplier-customers. The analysis of accounts payable using the whole sample does not allow us to control for supply effects but has the advantage of using the whole sample instead of a subsample of firms.

6.1. Analysis of accounts receivable using the matched supplier-customer sample

We test the hypothesis that more liquid suppliers increased the provision of trade credit during the crisis to credit constrained firms. This implies that suppliers of financially constrained firms should experience a larger increase in accounts receivable during the crisis. We test this hypothesis in Table 7 using the matched sample of supplier-client pairs. We divide the sample into two groups according to the following measures of client's financial constraints: Kaplan-Zingales (1997) index ($KZind_{it*}$) in columns 1 and 2, the Whited-Wu (2006) index ($WWind_{it*}$) in columns 3 and 4, the dividend payout ratio (an inverse measure of financial constraints) in columns 5 and 6, and a dummy containing a one if the firm does not have a rating for their long term debt in columns 7 and 8. We divide the sample into two groups according to whether the constraint measure is above/below the median. The median is calculated using one observation per customer (instead of the paired sample) in the second quarter of 2006. Although this methodology creates unbalanced samples, we avoid biasing our median estimate because some large firms are customers of several suppliers. We calculate the indices according to the following formulas:

$$KZind_{it} = -1.002 \cdot CF_{it} + 0.283 \cdot Q_{it} + 3.319 \cdot DEBT_{it} - 39.368 \cdot DIV_{it} - 1.315 \cdot CASH_{it}$$

$$WWind_{it} = -0.091 \cdot CF_{it} - 0.062 \cdot DIV\_Dummy + 0.021 \cdot LT\_DEBT_{it} - 0.044 \cdot \log(SIZE)_{it} + 0.102 \cdot Industry\_Salesgr_{it} - 0.035 \cdot Sales\_gr_{it}$$

All regressions in Table 7 include supplier's as well as customer's controls and pairs fixed effects. Using the Whited-Wu index and the payout ratio as measures of constraints, we find that liquid suppliers of financially constrained firms increased more the provision of trade credit during the crisis as compared to liquid suppliers matched to unconstrained customers. However, the differences are rather small and it is only statistically significant for the Whited Wu index (p value = 0.076). The interaction coefficients are insignificant for the constrained and unconstrained groups when using the other two measures, KZ index and rating dummy. Note that the dependent variable in these regressions is the total accounts receivable of the supplier instead of accounts

receivable from each client. This is likely contributing to the weakness of some of these results. Overall, these findings present some evidence for the redistribution theory of trade credit as we find that more liquid suppliers increased trade credit provision to their most constrained clients during the crisis. These results complement those of Table 6 which show how in general suppliers provide more liquidity to firms that are more dependent of external finance.

6.2. Analysis of accounts payable

Although the main focus of this paper is the role of suppliers as liquidity providers, and thus, accounts receivable, for completeness we perform an analysis of debt in accounts payable, i.e. viewing firms as the recipients of trade credit. We shall therefore focus on the demand effects, and analyze whether more constrained firms are more likely to increase their trade credit debt during the crisis.

We follow a similar approach to the previous analysis of accounts receivable. Given that we are interested in estimating the demand for trade credit, we shall use measures of financial constraints (instead of cash) in our difference-in-difference estimations. The resulting model for accounts payable is the following:

$$AP_{it} = \beta_i + \beta_1 \cdot CRISIS_t + \beta_2 \cdot CONST_{i,t^*} \cdot CRISIS_t + \beta_3 \cdot Z_{it-1} + \varepsilon_{it}, \qquad (3)$$

where AP_{it} refers to the total amount of accounts payable divided by the cost of goods sold. When multiplied by 360, this ratio is often interpreted as the number of days a firm takes to pay off their debts to suppliers. As was the case for the receivables ratio, by scaling accounts payable by a flow variable we control for the reduction in economic activity that is commonly associated with crises.

As before, the indicator variable $CRISIS_t$ takes the value of one from July 1, 2007 to June 30, 2008. We interact this variable with the same measures of financial constraints that we used in the previous section, namely the Kaplan-Zingales index, the Whited-Wu index, the dividend payout ratio, and a dummy for not having a long term debt rating. Additionally, for the sub-sample of firms for which we gathered information on the use of LOC from the 10-k SEC filings, we also consider access to LOC, amount of

LOC, and undrawn balances on LOC as additional (inverse) measures of constraints. Sufi (2009) argues that these measures may be superior to the previous ones proposed in the literature to identify financially constrained firms. Similarly than the empirical methodology for accounts receivables, we measure all constraint variables at $t^* =$ the end of the second quarter of year 2006, i.e. one year previous to the financial crisis to reduce concerns that the variation in firms' constraints as the crisis unfolds is endogenous to unobserved motives that lead to changes in the ratio of accounts payable to the cost of goods sold.

In our models we include controls accounting for the demand of trade credit, Z_{it-1}, which includes size, age, sales growth, total debt, current assets and a dummy for no long term debt rating (see Petersen and Rajan (1997), Burkart, Ellingsen and Giannetti (2011)). We scale our constraint measures, current assets, and total debt by total assets. In all specifications we include firm fixed effects.

Table 8 contains the coefficients for equation (3) estimated on the whole sample (columns 1-6) and on the subsample of firms for which we have information on lines of credit (columns 7-13). In order to establish the basic patterns in the data, in columns 1 and 2 we estimate a basic model that includes only the crisis dummy (column 1), or the crisis dummy and all firm controls except for the credit constrained measures (column 2), plus a constant and firm fixed effects. We find that accounts payable as a fraction of cost of goods sold remained about the same during the first year following the start of the crisis in July 2007.

In the remaining columns of Table 8 we test the hypothesis that financially constrained firms increased the trade credit demanded compared to less constrained firms. The effect of the crisis on constrained firms is consistent throughout all the specifications: More constrained firms increased their demand for trade credit during the crisis. This is shown by the positive coefficients for the interaction of the crisis dummy with our measures of constraints (negative for our inverse measures of constraints: the dividend payout ratio, LOC dummy, LOC limit, and undrawn balances on LOC). These coefficients in fact are statistically significant in columns 4 and 7-13, and imply that firms which were in most need of external finance demanded for higher levels of trade

credit debt to compensate for the relatively scarce bank credit. By the same token, firms that had access to external liquidity through a LOC did not demand more trade credit from their suppliers. For example, the coefficients of column 11 imply that during this first stage of the crisis, firms with a LOC could perfectly cover their financing needs for inventories and working capital with their lines of credit, and did not require extra financing from their suppliers. These results highlight the importance of having a lending commitment to mitigate the negative effects of a credit crunch.

In Table 9 we test the same hypothesis using the matched suppliers-customers sample. The unit of observation is a customer-supplier pair. The advantage of using this sample is that we can control for supply effects by adding the interaction term of the crisis dummy with the cash position of the supplier before the crisis. In column 1 we report the baseline specification with no interaction terms. In columns 2-5 we include an interaction term of the crisis dummy with a measure of client's credit constraints. Similarly as in the previous table we find that accounts payable increased more for financially constrained compared to less constrained firms during the crisis.

In column 6 we include the interaction term of the crisis dummy with the cash position of the supplier before the crisis. We find a positive and significant coefficient, supporting our main hypothesis that supplier's liquidity is a key determinant of their ability to support its client's financing needs. In columns 7 to 10 we include two interaction terms: (1) crisis dummy interacted with client's credit constraints to capture demand effects and (2) crisis dummy interacted with supplier's liquidity to capture supply effects. Regarding client's constraints, we find that constrained firms increased their accounts payable more compared to unconstrained firms during the crisis. More importantly, we obtain a positive and significant coefficient for the interaction term with supplier's liquidity. This result provides further support to our main finding that suppliers willingly increased the provision of trade credit to more needy clients during the crisis.

7. Trade credit, liquidity and performance over the crisis episode

7.1. Trade credit provision over the complete crisis episode

In this section we analyze the dynamics of trade credit provision as we consider the complete crisis episode and include quarterly data up to the second quarter of 2010. Considering the whole crisis period has one advantage and several caveats for our analysis. On the one hand, as the financial crisis lengthened and became deeper, we have stronger supply effects, which peaked after the failure of Lehman Brothers in September 2008. With a steeper shortage of institutional credit in this period, inter-firm financing through trade credit could have become more relevant, and our previous results could be reinforced. However, the lengthened crisis period had also strong effects on the demand side. If the demand for credit fell in such a way that the lack of external finance was not binding any more, we would also observe a systematic fall in trade credit financing and consequently in the equilibrium amount of credit provided by suppliers (accounts receivable), independently of how large their cash reserves are. By the same token, the credit crunch made it difficult for many firms to obtain the liquidity needed to pay their debts to suppliers, which would have caused ratios of accounts receivables to sales to increase systematically. Once again, the latter effect should also be uncorrelated with the level of cash reserves of suppliers. Because all of these forces came into play within the extended crisis episode, the overall effect of the second phase of the crisis on the relationship between available liquidity and inter-firm liquidity provision is ambiguous, and the results must be interpreted cautiously.

To analyze how our results change when we consider the whole crisis episode, we run equation (1) over an estimation sample running from the third quarter of 2005 to the second quarter of 2010. We separate the effects of the different phases of the crisis by adding to the specification in equation (1) a dummy containing a one for the period going from the third quarter of 2008 to the second quarter of 2009 (Crisis 2008), and a dummy containing a one for the period going from the third quarter of 2009 to the second quarter of 2010 (Post-Crisis). We also include the interaction of these time dummies with several measures of liquidity. Results of this estimation are contained in Table 10.

Table 10 confirms overall our previous findings, i.e., there is a positive and significant effect of cash on the accounts receivables to sales ratio for the financial stage of the crisis (Crisis 2007 * Cash), which mitigates the negative overall drop in trade credit during this period. However, this positive relationship does not continue to hold during the second part of the crisis. In Column 1 the effect of cash reserves is not significant for the 2008 crisis and becomes negative and significant for the post-crisis period. The results for excess cash (column 2) show the same patterns. These results suggest that ex-ante liquid firms increased trade credit provision only during the financial phase of the crisis, while they lowered it to their original level after the Lehman bankruptcy and decreased it further in the post-crisis. The descriptive statistics in Panel A of Table 11 show that firms in the top tercile of cash over assets in the second quarter of 2006 decreased their cash holdings by 11% on average during the first year of the crisis, which is consistent with the idea that liquid firms used their cash stocks to support their clients. However, starting in the second quarter of 2008, these firms started to accumulate cash again in order to replenish their cash reserves.

We use information gathered from the 10-k filings about the use of lines of credit to analyze the relative roles of internal versus external liquidity in the inter-firm provision of credit. Using this smaller sample, we find a positive relationship between cash reserves and the accounts receivable to sales ratio which extends to the second year of the crisis (Crisis 2008 * Cash in columns 3 and 4). However, this effect becomes insignificant in the post-crisis period. The results are similar when we add information about the use of lines of credit (columns 5 to 8). Our results show a positive and significant relationship between internal liquidity and trade credit extension, but a much weaker relationship between external liquidity and accounts receivable during the 2008 crisis. The insignificant coefficients for the LOC variables interacted with the Crisis 2008 dummy suggest that the primary motivation behind the credit lines drawn-downs at the end of 2008 was cash hoarding. This is consistent with Ivashina and Scharfstein (2010) who argue that the spike in commercial and industrial loans reported in bank balance sheets at the end of 2008 is due to borrowers drawing down their existing credit lines. Table 11 provides further support for this explanation, as it shows that all firms increased their cash holdings in the post-crisis period.

One explanation for the observed results is that firms decided to reverse their decision to provide liquidity to their clients once it became clear, after the Lehman bankruptcy, that the credit supply shock was permanent rather than temporary. To support this explanation, Panel B in Table 11 contains the growth rate of cash-over-assets by percentiles of the increase in accounts receivable from before the crisis to the financial phase of the crisis. Firms that increased accounts receivables the most during the financial phase of the crisis (top tercile), which on average increased accounts receivable over sales by 17%, decreased their cash reserves by 4% during the same period, but subsequently increased them by 17% during 2008-2009 and a further 34% during the year following the crisis. In contrast, firms in the bottom tercile, which on average decreased accounts receivable over sales by 15% in the first year of the crisis, increased their cash reserves by 7% during this period, and subsequently increased it by 13% during 2008-2009 and a further 33% in the post-crisis.

7.2. Trade credit, liquidity and long-run performance

Collectively, all our previous results suggest that firms with spare resources during the financial phase of the crisis willingly provided liquidity insurance to their clients at a time of credit shortage. In this section we analyze whether these firms performed better during and after the crisis. If firms increased receivables to boost their sales or to preserve clients which are expensive to substitute, we should observe a positive correlation between increased trade credit provision and performance for cash-rich firms.

To test this idea, we regress several performance measures on the change in the average quarterly accounts receivable to sales ratio during the 2007-crisis episode relative to the previous year (ΔAR) interacted with the cash ratios as of the second quarter of 2006. Firms that were able to provide liquidity (i.e. firms with high cash stocks) which willingly increased accounts receivable should have improved their performance during the crisis, so we expect a positive coefficient for the interaction term. Because demand effects could have kicked in during later stages of the crisis, we separate the effect of the willing provision of liquidity on performance into the three crisis episodes by interacting this variable with the three dummies corresponding to the 2007-, the 2008-, and the post-

crisis episodes. We also include the interactions of each of the crisis dummies with cash and with ΔAR separately, to have the more saturated model. We include controls for size, age, tangibility, net profit margin, sales growth, net worth, Tobin's Q, total debt, and ratings dummies, as well as firm fixed effects. Results of this analysis are presented in Table 12.

Our hypothesis implies that firms with ex-ante high stocks of cash which increased trade credit provision during the financial phase of the crisis should exhibit better performance during and following the crisis. We therefore focus on the coefficients for the crisis dummies with the interaction term $Cash * \Delta AR$. The results in Table 12 show evidence consistent with an increased performance for firms that willingly increased their extension of trade credit to clients. Liquid firms increasing their accounts receivables to assets ratio during the crisis had better overall performance during and after the crisis. Results are robust to several measures of performance (market share, return on assets, return on sales, EBITDA, and net profit margin). We stress that these results are specific to liquid firms. As shown by the mostly negative coefficients of the crisis dummies interacted with ΔAR, the general evidence is that non-liquid firms that increased their provision of trade credit during 2007-2008 generally performed worse, which is consistent with an unwilling provision of trade credit (for example due to customers paying later). In other words, increasing trade credit per se is not sufficient for a better performance. Firms must be able to sustain trade credit provision with internal liquidity in the form of cash for improved performance. This result stresses the importance of holding cash for precautionary motives, highlights the importance of controlling for demand for accounts receivable as we did in our main specifications, and complements previous results which show how firms holding more cash performed better during the crisis (see for example Duchin, Ozbas and Sensoy, 2010).

8. Conclusions

We study the effect of the financial crisis that began on August 2007 on the inter-firm provision of credit. The crisis represents an unexpected negative shock to the supply of external finance for non-financial corporations, which makes it an ideal scenario to

analyze the role of alternative sources of financing when bank credit is scarce. We focus on the financial phase of the crisis, running from the third quarter of 2007 to the second quarter of 2008, where supply effects dominate. We find that trade credit given to other corporations increases (or falls more slowly) for the firms holding more liquidity. Consistent with a causal effect of the supply shock, our results are stronger when we divide firms by industries according their degree of external finance dependence, and we do not find similar results following the demand shock caused by the events of September 11, 2001. Similarly, having access to external liquidity through lines of credit significantly increases inter-firm liquidity provision.

We also find that trade credit taken by constrained firms increases during this period to compensate for the scarce institutional credit. Our results show that suppliers provide liquidity insurance to their clients whenever they experience a temporary liquidity shock and underscore their role as liquidity providers of last resort (Wilner (2000), Cuñat (2007)). These results are consistent with the redistribution view of trade credit provision (Meltzer (1960), Petersen and Rajan (1997), and Nilsen (2002)). Our analysis after the Lehman bankruptcy in September 2008 highlights the limitations of intra-firm credit to absorb more permanent and severe shocks. This finding is also consistent with the redistribution theory of credit once we take into account the extreme scenario of scare institutional credit and market illiquidity (Love et al., 2007). Our findings provide an important precautionary savings motive for accumulating cash reserves.

As we emerge from the most severe recession since the Great Depression, many are blaming the anemic economic recovery to the lack of bank lending. Economic policies have been directed to restore the solvency of financial institutions in order to reestablish the flow of lending to firms and individuals. The findings of this paper highlight the importance of non-financial firms in offering substitute credit in times of financial stress and points out that policies aimed at enhancing this credit source, like trade credit insurance or guarantees, could prove more effective to foster economic growth.

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Table 1. Cash and trade credit provision during the crisis.

	None		Cash Reserves		Excess Cash		Cash Flow
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crisis 2007	-0.00607**	-0.0102***	-0.0147***	-0.0233***	-0.00788**	-0.0174***	-0.0112***
	[0.00281]	[0.00309]	[0.00395]	[0.00489]	[0.00353]	[0.00426]	[0.00347]
Crisis 2007 * Cash			0.0240*	0.0504***	0.0206*	0.0409***	
			[0.0130]	[0.0143]	[0.0121]	[0.0132]	
Crisis 2007 * Cash flow				0.259***		0.267***	0.159***
				[0.0673]		[0.0672]	[0.0610]
Log of total assets		0.0615***	0.0616***	0.0476***	0.0421***	0.0386***	0.0486***
		[0.00697]	[0.00697]	[0.00699]	[0.00716]	[0.00719]	[0.00699]
Log of age		-0.0416***	-0.0429***	-0.0426***	-0.0412***	-0.0390***	-0.0405***
		[0.0125]	[0.0125]	[0.0123]	[0.0133]	[0.0132]	[0.0123]
PPE over assets		-0.182***	-0.185***	-0.228***	-0.221***	-0.229***	-0.221***
		[0.0383]	[0.0383]	[0.0380]	[0.0388]	[0.0388]	[0.0379]
Net profit margin		-0.0377***	-0.0379***	-0.0368***	-0.0370***	-0.0357***	-0.0366***
		[0.00240]	[0.00241]	[0.00248]	[0.00248]	[0.00249]	[0.00248]
Sales growth		-0.174***	-0.174***	-0.167***	-0.168***	-0.167***	-0.167***
		[0.00531]	[0.00531]	[0.00535]	[0.00551]	[0.00550]	[0.00535]
Net worth over assets		-0.131***	-0.128***	-0.161***	-0.131***	-0.136***	-0.162***
		[0.0196]	[0.0196]	[0.0196]	[0.0201]	[0.0201]	[0.0196]
Debt over assets		-0.268***	-0.266***	-0.238***	-0.219***	-0.221***	-0.240***
		[0.0263]	[0.0264]	[0.0264]	[0.0271]	[0.0270]	[0.0264]
Tobin's Q		-0.00840***	-0.00797***	-0.00756***	-0.00801***	-0.00806***	-0.00835***
		[0.00217]	[0.00218]	[0.00219]	[0.00220]	[0.00219]	[0.00218]
Rating AAA		0.0482	0.0424	0.0619	0.0659	0.0732	0.0702
		[0.167]	[0.167]	[0.163]	[0.162]	[0.162]	[0.163]
Rating AA		0.0586	0.0552	0.0594	0.0683	0.0685	0.0656
		[0.0696]	[0.0696]	[0.0680]	[0.0680]	[0.0678]	[0.0680]
Rating A		0.0529*	0.0511*	0.0494*	0.0576*	0.0562*	0.0534*
		[0.0295]	[0.0295]	[0.0288]	[0.0295]	[0.0294]	[0.0288]
Rating BBB		0.0388*	0.0382*	0.0370*	0.0444**	0.0431**	0.0387**
		[0.0199]	[0.0200]	[0.0196]	[0.0201]	[0.0201]	[0.0196]
Rating BB		0.0382**	0.0383**	0.0366**	0.0465***	0.0462***	0.0369**
		[0.0157]	[0.0157]	[0.0154]	[0.0160]	[0.0160]	[0.0155]
Rating B		0.0392***	0.0399***	0.0379**	0.0498***	0.0505***	0.0367**
		[0.0152]	[0.0152]	[0.0149]	[0.0159]	[0.0159]	[0.0149]
Rating CCC		0.101***	0.102***	0.0939***	0.102***	0.104***	0.0921***
		[0.0306]	[0.0306]	[0.0303]	[0.0336]	[0.0335]	[0.0303]
Rating CC		0.204**	0.208**	0.187*	0.120	0.120	0.182*
		[0.102]	[0.102]	[0.0998]	[0.114]	[0.114]	[0.0998]
Rating D		0.0719	0.0761	0.0585	0.0790	0.0736	0.0531
		[0.0661]	[0.0662]	[0.0647]	[0.0692]	[0.0691]	[0.0647]
Constant	0.614***	0.495***	0.496***	0.598***	0.611***	0.631***	0.586***
	[0.00156]	[0.0548]	[0.0548]	[0.0549]	[0.0564]	[0.0566]	[0.0548]
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.000	0.063	0.063	0.060	0.060	0.060	0.060
Observations	24,733	24,733	24,733	23,769	22,234	22,225	23,769
Number of Firms	2,250	2,250	2,250	2,160	1,999	1,997	2,160

This table presents estimates from panel regressions explaining firm-level quarterly trade credit provided for quarters with an end date from July 1, 2005 to June 30, 2008. The dependent variable is accounts receivable over sales. The top row indicates the cash measure (Cash) that is interacted with the crisis dummy: Cash Reserves in columns 3 and 4, Excess Cash in columns 5 and 6, Cash Flow in column 7. Cash reserves is the ratio of cash to total assets. Excess Cash is the residual cash to total assets and is defined relative to the model of optimal cash holdings as presented in Dittmar and Mahrt-Smith (2007), estimated over the period 1995-2004. Cash Flow is the ratio of operating income before depreciation to assets. Cash Reserves, Excess Cash, and Cash Flow are measured at the end of the last fiscal quarter ending before July 1, 2006. Crisis 2007 is an indicator that equals to one from the third quarter of 2007 to the second quarter of 2008. All specifications control for firms' characteristics which include: size, age, tangibility, net profit margin, sales growth, net worth, total debt, tobin's Q and dummies for rating (ommited category is no rating). All specifications include firm fixed effects. ***, **, or * indicates significance at the 1%, 5%, or 10% level, respectively.

Table 2. Trade credit provision and external financial dependence (EFD).

	EFD Continuous	High EFD Dummy	Firms in low EFD industries	Firms in high EFD industries	Firms in low EFD industries	Firms in high EFD industries
	(1)	(2)	(3)	(4)	(5)	(6)
Crisis 2007	-0.0102***	-0.00471	-0.0148***	-0.0157***	-0.00649	-0.0111**
	[0.00324]	[0.00478]	[0.00552]	[0.00536]	[0.00445]	[0.00499]
Crisis 2007 * EFD	-0.0214**					
	[0.0104]					
Crisis 2007 * High EFD		-0.0110*				
		[0.00576]				
Crisis 2007 * Cash			0.0606***	-0.00370		
			[0.0179]	[0.0177]		
Crisis 2007 * Excess Cash					0.0647***	-0.00387
					[0.0155]	[0.0170]
Log of total assets	0.0579***	0.0574***	0.0331***	0.0794***	0.00821	0.0599***
	[0.00713]	[0.00712]	[0.00965]	[0.00958]	[0.00897]	[0.0103]
Log of age	-0.0425***	-0.0425***	0.0195	-0.0563***	0.0167	-0.0496***
	[0.0128]	[0.0128]	[0.0177]	[0.0169]	[0.0184]	[0.0180]
PPE over assets	-0.159***	-0.160***	0.185***	-0.319***	0.111*	-0.332***
	[0.0394]	[0.0394]	[0.0650]	[0.0481]	[0.0594]	[0.0505]
Net profit margin	-0.0360***	-0.0360***	-0.0685***	-0.0335***	-0.0689***	-0.0344***
	[0.00244]	[0.00244]	[0.00509]	[0.00286]	[0.00550]	[0.00299]
Sales growth	-0.179***	-0.179***	-0.173***	-0.178***	-0.144***	-0.182***
	[0.00538]	[0.00538]	[0.00802]	[0.00692]	[0.00756]	[0.00744]
Net worth over assets	-0.155***	-0.154***	0.192***	-0.280***	0.133***	-0.256***
	[0.0199]	[0.0199]	[0.0287]	[0.0260]	[0.0268]	[0.0276]
Debt over assets	-0.279***	-0.279***	-0.0537	-0.345***	0.0765**	-0.350***
	[0.0269]	[0.0269]	[0.0373]	[0.0358]	[0.0351]	[0.0381]
Tobin's Q	-0.00831***	-0.00824***	-0.00129	-0.0113***	-0.000537	-0.0110***
	[0.00221]	[0.00221]	[0.00273]	[0.00318]	[0.00249]	[0.00333]
Constant	0.529***	0.532***	0.307***	0.515***	0.475***	0.615***
	[0.0558]	[0.0558]	[0.0747]	[0.0767]	[0.0707]	[0.0814]
Rating dummies	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.061	0.061	0.082	0.069	0.068	0.068
Observations	25,396	25,396	9,563	15,170	8,756	13,478
Number of Firms	2,517	2,517	876	1,374	791	1,208
F statistic			5.727		7.233	
p-value			0.0167		0.0072	

This table presents results for External Finance Dependence (EFD). EFD is the industry-median proportion of investment not financed by cash flow from operations. In column 1 EFD is measured as a continuous index. In column 2 EFD is a dummy variable that takes value 1 for industries that are highly dependent on external finance. In columns 3-4 and 5-6 we split the firms into two groups according to the degree of external finance dependence of a firm's industry (low and high EFD). The top row indicates the cash measure (Cash) that is interacted with the crisis dummy: Cash Reserves in columns 3 and 4, Excess Cash in columns 5 and 6. Cash reserves and excess cash are measured at the end of the last fiscal quarter ending before July 1, 2006. The dependent variable is accounts receivable over sales. Crisis 2007 is an indicator that equals to one from the third quarter of 2007 to the second quarter of 2008. All specifications control for firms' characteristics and include firm fixed effects. The last row of the table provides the F-statistic and the p-value associated to the test of equality of the interaction coefficients of the each pair of regressions.***, **, or * indicates that the coefficient is significant at the 1%, 5%, or 10% level, respectively.

Table 3. Trade credit provision and lines of credit (LOC).

	Cash Reserves	Cash Reserves, LOC Dummy	Cash Reserves, LOC Limit	Cash Reserves, Unused LOC	Liquidity 1 (Cash + LOC Limit)	Liquidity 2 (Cash + Unused LOC)
	(1)	(2)	(3)	(4)	(5)	(6)
Crisis 2007	-0.0255*	-0.101**	-0.0583**	-0.0575**	-0.0545***	-0.0440**
	[0.0151]	[0.0405]	[0.0258]	[0.0259]	[0.0206]	[0.0200]
Crisis 2007 * Cash	0.0882*	0.175***	0.140**	0.136**		
	[0.0469]	[0.0637]	[0.0573]	[0.0564]		
Crisis 2007 * LOC		0.0734**	0.171	0.206		
		[0.0365]	[0.109]	[0.136]		
Crisis 2007 * Liquidity					0.128***	0.117**
					[0.0468]	[0.0534]
Log of total assets	0.0971***	0.0943***	0.0929***	0.0931***	0.0883***	0.0907***
	[0.0260]	[0.0260]	[0.0261]	[0.0261]	[0.0261]	[0.0261]
Log of age	-0.0674	-0.0609	-0.0723	-0.0702	-0.0702	-0.0687
	[0.0452]	[0.0453]	[0.0453]	[0.0453]	[0.0451]	[0.0452]
PPE over assets	0.324**	0.302*	0.313**	0.313**	0.326**	0.306*
	[0.158]	[0.158]	[0.158]	[0.158]	[0.158]	[0.159]
Net profit margin	-0.0530**	-0.0511**	-0.0527**	-0.0523**	-0.0520**	-0.0525**
	[0.0235]	[0.0234]	[0.0234]	[0.0235]	[0.0233]	[0.0234]
Sales growth	-0.106***	-0.106***	-0.106***	-0.106***	-0.104***	-0.106***
	[0.0202]	[0.0202]	[0.0202]	[0.0202]	[0.0202]	[0.0202]
Net worth over assets	-0.110*	-0.0969	-0.115*	-0.114*	-0.114*	-0.113*
	[0.0602]	[0.0605]	[0.0602]	[0.0602]	[0.0601]	[0.0602]
Debt over assets	-0.0448	-0.0182	-0.0707	-0.0642	-0.0743	-0.0647
	[0.106]	[0.107]	[0.107]	[0.107]	[0.105]	[0.106]
Tobin's Q	-0.000108	0.000362	-0.000569	-0.000858	-0.00102	-0.000913
	[0.00726]	[0.00725]	[0.00726]	[0.00727]	[0.00725]	[0.00726]
Rating dummies	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,171	1,171	1,171	1,171	1,171	1,171
R-squared	0.050	0.053	0.052	0.052	0.053	0.051
Number of Firms	100	100	100	100	100	100

This table presents estimates for a subsample of 100 firms for which we hand collected information on lines of credit (LOC) for quarters with an end date from July 1, 2005 to June 30, 2008. The dependent variable is accounts receivable over sales. The top row indicates the measure that is interacted with the crisis dummy in each regression (Cash, LOC or Liquidity measures). Columns 5 to 7 include two interaction terms with the crisis dummy: cash reserves and a LOC measure. All interacting variables are measured at the end of the last fiscal quarter ending before July 1, 2006. LOC Limit is the total amount in lines of credit, scaled by assets. Unused LOC is the unused amount in lines of credit, scaled by assets. Liquidity 1 is the ratio of cash reserves plus total amount in lines of credit, scaled by assets. Liquidity 2 is the ratio of cash reserves plus unused amount in lines of credit, scaled by assets. All other variables are defined in table 1. All specifications include firm fixed effects. ***, **, or * indicates that the coefficient is significant at the 1%, 5%, or 10% level, respectively.

Table 4. Estimations over the demand crisis following September 11, 2001.

	Cash Reserves		Excess Cash		Cash Reserves, LOC Dummy	Cash Reserves, LOC Limit	Cash Reserves, Unused LOC	Liquidity (Cash + Unused LOC)
	WS	10k	WS	10k	10k	10k	10k	10k
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Crisis 2001	-0.0163***	0.0132	-0.0191***	-0.0112	-0.0571	0.0241	0.0147	0.0150
	[0.00396]	[0.0222]	[0.00386]	[0.0174]	[0.0507]	[0.0353]	[0.0311]	[0.0278]
Crisis 2001 * Cash	-0.0425***	0.0104	-0.0365***	0.0546	0.0938	-0.00845	0.00817	-0.000942
	[0.0135]	[0.0791]	[0.0136]	[0.0658]	[0.0957]	[0.0922]	[0.0858]	[0.0813]
Crisis 2001 * LOC					0.0751	-0.0495	-0.0116	
					[0.0486]	[0.124]	[0.170]	
Log of total assets	0.0786***	-0.00993	0.0779***	0.0200	-0.00501	-0.0102	-0.00976	-0.0104
	[0.00711]	[0.0519]	[0.00765]	[0.0450]	[0.0520]	[0.0519]	[0.0520]	[0.0518]
Log of age	-0.0410***	-0.0651	-0.0477***	-0.0262	-0.0814	-0.0605	-0.0649	-0.0638
	[0.0106]	[0.0757]	[0.0114]	[0.0638]	[0.0764]	[0.0766]	[0.0758]	[0.0757]
PPE over assets	0.1000**	0.220	0.118***	0.368	0.189	0.239	0.223	0.225
	[0.0406]	[0.298]	[0.0434]	[0.256]	[0.298]	[0.301]	[0.300]	[0.300]
Net profit margin	-0.0710***	-0.131***	-0.0728***	-0.124***	-0.131***	-0.131***	-0.131***	-0.131***
	[0.00378]	[0.0124]	[0.00403]	[0.0103]	[0.0124]	[0.0124]	[0.0124]	[0.0124]
Sales growth	-0.234***	-0.379***	-0.226***	-0.333***	-0.377***	-0.380***	-0.379***	-0.379***
	[0.00573]	[0.0266]	[0.00617]	[0.0241]	[0.0266]	[0.0266]	[0.0266]	[0.0266]
Net worth over assets	0.00274	0.753***	0.0274	0.588***	0.726***	0.759***	0.754***	0.750***
	[0.0201]	[0.148]	[0.0218]	[0.137]	[0.149]	[0.149]	[0.148]	[0.147]
Debt over assets	-0.0210	0.838***	0.00621	0.590***	0.798***	0.842***	0.839***	0.837***
	[0.0278]	[0.229]	[0.0301]	[0.198]	[0.230]	[0.229]	[0.229]	[0.228]
Tobin's Q	0.00424***	0.0104	0.00467***	0.0109	0.00976	0.0106	0.0104	0.0101
	[0.00144]	[0.00986]	[0.00153]	[0.00820]	[0.00986]	[0.00987]	[0.00987]	[0.00975]
Rating dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.086	0.177	0.084	0.213	0.179	0.177	0.177	0.177
Observations	26,710	1,642	22,464	1,365	1,642	1,642	1,642	1,642
Number of Firms	3,002	238	2,499	194	238	238	238	238

This table presents robustness tests using the demand crisis following September 11, 2001. The estimation sample consists of quarterly data from the last quarter of year 2000 and the third quarter of 2002. The dependent variable is accounts receivable over sales. Columns 1 and 3 are estimated using all firms. Columns 2 and 4-8 use the subsample of firms for which we have information on lines of credit. The top row indicates the cash measure (Cash) and line of credit measure (LOC) that is interacted with the crisis dummies in each regression: Cash Reserves in columns 1, 2 and 5-7, Excess Cash in columns 3 and 4, Cash reserves and LOC dummy in column 5, Cash reserves and LOC limit in column 6, Cash reserves and unused LOC in column 7, Cash + Unused balance in LOC in column 8. Cash and LOC variables are measured at the third quarter of year 2000. Crisis 2001 is an indicator that equals to one from the fourth quarter of 2001 to the third quarter of 2002. All other variables are defined in table 1. All specifications control for firms' characteristics which include: size, age, tangibility, net profit margin, sales growth, net worth, Tobin's Q, total debt, and rating dummies. All specifications include firm fixed effects. ***, **, or * indicates that the coefficient is significant at the 1%, 5%, or 10% level, respectively.

Table 5. Liquidity provision and trade credit theories.

	Panel A. Trade credit provision and access to capital markets.				*Panel B. Trade credit provision and growth opportunities.*			
	Unrated	Rated	Junk	Inv. Grade	Low M/B	High M/B	Low growth	High growth
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Crisis 2007	-0.0131**	-0.0230***	-0.0678	-0.0210***	-0.00666	-0.0167**	-0.0101*	-0.0186***
	[0.00590]	[0.00432]	[0.0566]	[0.00436]	[0.00450]	[0.00687]	[0.00589]	[0.00524]
Crisis 2007 * Cash	0.0167	0.130***	-0.314	0.138***	-0.0895***	0.0490***	-0.00322	0.0573***
	[0.0164]	[0.0292]	[0.379]	[0.0287]	[0.0256]	[0.0178]	[0.0192]	[0.0173]
Log of total assets	0.0608***	0.0678***	-0.0398	0.0660***	0.0343***	0.0810***	0.0730***	0.0461***
	[0.00921]	[0.00884]	[0.106]	[0.00890]	[0.00938]	[0.00977]	[0.0116]	[0.00878]
Log of age	-0.0497***	-0.0446***	-0.0942**	-0.0497***	-0.0236*	-0.0686***	-0.0436**	-0.0311
	[0.0173]	[0.0130]	[0.0430]	[0.0186]	[0.0140]	[0.0213]	[0.0170]	[0.0191]
PPE over assets	-0.264***	-0.0105	0.276	-0.0367	-0.240***	-0.132**	-0.286***	-0.0945**
	[0.0523]	[0.0454]	[0.349]	[0.0456]	[0.0479]	[0.0574]	[0.0604]	[0.0481]
Net profit margin	-0.0373***	-0.0875***	0.0996	-0.0996***	-0.0227***	-0.0398***	-0.0452***	-0.00246
	[0.00275]	[0.0171]	[0.0900]	[0.0176]	[0.00665]	[0.00288]	[0.00287]	[0.00538]
Sales growth	-0.178***	-0.162***	-0.526***	-0.150***	-0.181***	-0.171***	-0.183***	-0.161***
	[0.00676]	[0.00769]	[0.0723]	[0.00761]	[0.00689]	[0.00772]	[0.00781]	[0.00713]
Net worth over assets	-0.116***	-0.237***	-0.0854	-0.272***	-0.191***	-0.102***	-0.227***	-0.0413
	[0.0242]	[0.0327]	[0.160]	[0.0345]	[0.0284]	[0.0269]	[0.0300]	[0.0253]
Debt over assets	-0.282***	-0.235***	0.134	-0.270***	-0.260***	-0.253***	-0.460***	-0.0507
	[0.0338]	[0.0371]	[0.209]	[0.0382]	[0.0369]	[0.0365]	[0.0397]	[0.0345]
Tobin's Q	-0.00960***	0.00396	-0.111	0.00482			-0.0189***	0.00187
	[0.00261]	[0.00451]	[0.0744]	[0.00441]			[0.00354]	[0.00266]
Rating dummies	No	No	No	No	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.062	0.078	0.288	0.075	0.079	0.058	0.081	0.052
Observations	16,500	8,233	202	8,031	11,296	13,437	12,271	12,462
Number of Firms	1,511	739	20	719	1,027	1,223	1,124	1,126
F statistic	5.957		1.567		15.51		5.415	
p-value	0.0147		0.211		0.0000		0.0200	

Table 5 (continued)

	Panel C. Trade credit provision and supplier's bargaining power.				*Panel D. Trade credit provision and nature of supplied good.*	
	Low net profit margin	High net profit margin	Competitive market	Concentrated market	Standard goods and services	Differentiated goods
	(9)	(10)	(11)	(12)	(13)	(14)
Crisis 2007	-0.0194***	-0.00473	-0.0201***	-0.0141***	-0.0140**	-0.00929*
	[0.00575]	[0.00535]	[0.00769]	[0.00385]	[0.00561]	[0.00554]
Crisis 2007 * Cash	-0.0326	0.0441***	0.0114	0.0732***	-0.0243	0.0585***
	[0.0217]	[0.0155]	[0.0205]	[0.0172]	[0.0181]	[0.0174]
Log of total assets	0.121***	0.00132	0.103***	0.00271	0.0877***	0.0151
	[0.0114]	[0.00828]	[0.0112]	[0.00806]	[0.0106]	[0.0101]
Log of age	-0.0676***	-0.0188	-0.0609***	-0.0157	-0.0274*	-0.00937
	[0.0169]	[0.0196]	[0.0202]	[0.0147]	[0.0162]	[0.0189]
PPE over assets	-0.258***	-0.107**	-0.229***	-0.162***	-0.288***	-0.00463
	[0.0604]	[0.0467]	[0.0661]	[0.0404]	[0.0579]	[0.0671]
Net profit margin	-0.0314***	-0.123***	-0.0324***	-0.0960***	-0.0225***	-0.129***
	[0.00283]	[0.00832]	[0.00313]	[0.00555]	[0.00293]	[0.00736]
Sales growth	-0.152***	-0.207***	-0.182***	-0.171***	-0.139***	-0.225***
	[0.00799]	[0.00681]	[0.00884]	[0.00577]	[0.00722]	[0.00846]
Net worth over assets	-0.236***	0.0477*	-0.195***	-0.0605***	-0.114***	-0.00904
	[0.0284]	[0.0268]	[0.0331]	[0.0211]	[0.0281]	[0.0281]
Debt over assets	-0.429***	-0.0282	-0.387***	-0.0774**	-0.374***	0.0519
	[0.0402]	[0.0341]	[0.0426]	[0.0305]	[0.0377]	[0.0383]
Tobin's Q	-0.0182***	-0.00234	-0.00445	-0.0121***	-0.0104***	-0.00329
	[0.00395]	[0.00238]	[0.00332]	[0.00272]	[0.00305]	[0.00292]
Rating dummies	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.062	0.094	0.060	0.092	0.054	0.109
Observations	12,280	12,453	11,783	12,950	13,310	9,050
Number of Firms	1,109	1,141	1,081	1,169	1,224	809
F statistic	8.412		4.611		8.957	
p-value	0.0037		0.0318		0.0028	

This table presents subsample estimates from panel regressions explaining firm-level quarterly trade credit provided for quarters with an end date from July 1, 2005 to June 30, 2008. The dependent variable is accounts receivable over sales. Each pair of columns contain coefficients estimated over mutually exclusive subsamples, constructed according to the following criteria: Firms have no long term debt rating vs. firms are rated (col. 1 and 2); firm LT debt is unrated or rated below BBB- vs. firms have a rating of BBB- or higher (col. 3 and 4); firms have lower/higher than median M/B value (col. 5 and 6), firms have lower/higher than median asset growth (col. 7 and 8); firms have lower/higher than median net profit margin (col. 9 and 10); firms in industries with low/high HHI (co. 11 and 12) and firms selling differentiated goods/standard goods or services (col. 13 and 14). Cash is total cash reserves scaled by total assets, and it is measured at the end of the last fiscal quarter ending before July 1, 2006. Crisis 2007 is an indicator that equals to one from the third quarter of 2007 to the second quarter of 2008. All specifications control for firms' characteristics which include: size, age, tangibility, net profit margin, sales growth, net worth, and total debt. All specifications include firm fixed effects. The last row of the table provides the F-statistic and the p-value associated to the test of equality of the interaction coefficients of the each pair of regressions. ***, **, or * indicates that the coefficient is significant at the 1%, 5%, or 10% level, respectively.

Table 6. Trade credit provision and client's characteristics. Matched suppliers-customers sample.

	Cash			Excess cash		
	(1)	(2)	(3)	(4)	(5)	(6)
Crisis 2007	-0.00935	-0.00957	-0.0138*	-0.00701	-0.00780	-0.0127**
	[0.00716]	[0.00716]	[0.00727]	[0.00628]	[0.00627]	[0.00644]
Crisis 2007 * Cash	0.0693***	0.0665***	0.0580***	0.0726***	0.0700***	0.0625***
	[0.0200]	[0.0199]	[0.0201]	[0.0188]	[0.0187]	[0.0189]
Log of total assets	-0.0149	-0.0179	-0.0168	-0.00740	-0.0103	-0.00900
	[0.0132]	[0.0132]	[0.0133]	[0.0133]	[0.0133]	[0.0134]
Log of age	0.0528***	0.0517**	0.0476**	0.0553***	0.0541***	0.0499**
	[0.0201]	[0.0201]	[0.0201]	[0.0199]	[0.0199]	[0.0198]
PPE over assets	-0.161**	-0.177**	-0.189**	-0.181**	-0.198**	-0.212***
	[0.0753]	[0.0755]	[0.0759]	[0.0790]	[0.0791]	[0.0795]
Net profit margin	0.00685	0.00558	0.00575	0.00866*	0.00668	0.00675
	[0.00439]	[0.00439]	[0.00437]	[0.00452]	[0.00452]	[0.00449]
Sales growth	-0.0951***	-0.0956***	-0.0913***	-0.0911***	-0.0917***	-0.0870***
	[0.00743]	[0.00743]	[0.00746]	[0.00758]	[0.00758]	[0.00761]
Net worth over assets	0.0603*	0.0748**	0.0670**	0.0510	0.0663**	0.0561*
	[0.0308]	[0.0309]	[0.0311]	[0.0314]	[0.0314]	[0.0316]
Debt over assets	0.0458	0.0581	0.0420	0.0144	0.0256	0.00687
	[0.0427]	[0.0427]	[0.0433]	[0.0433]	[0.0433]	[0.0439]
Tobin's Q	0.00814**	0.00859***	0.00899***	0.0104***	0.0113***	0.0117***
	[0.00318]	[0.00318]	[0.00319]	[0.00322]	[0.00322]	[0.00323]
Client's market share		0.119	0.119		0.0930	0.0928
		[0.0739]	[0.0739]		[0.0744]	[0.0743]
Client's net profit margin		-0.00903**	-0.00863**		-0.00923**	-0.00878**
		[0.00433]	[0.00431]		[0.00423]	[0.00421]
Client's importance		-0.198***	-0.208***		-0.231***	-0.241***
		[0.0367]	[0.0367]		[0.0373]	[0.0372]
Client's cash over assets			-0.104*			-0.146**
			[0.0571]			[0.0583]
Client's EFD * Crisis 2007			0.0514***			0.0475**
			[0.0185]			[0.0185]
Rating dummies	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations (pairs)	9,368	9,360	9,252	8,558	8,550	8,444
R-squared	0.757	0.758	0.758	0.767	0.769	0.768

This table presents estimates from panel regressions explaining firm-level quarterly trade credit provided for quarters with an end date from July 1, 2005 to June 30, 2008 using a sample of firms that report their main customers. Each observation represents a supplier-client pair. The dependent variable is the supplier's accounts receivable over sales. Supplier's cash reserves is interacted with the crisis dummy in columns 1 to 3. Excess cash is interacted with the crisis dummy in columns 4 to 6. Cash reserves is the ratio of cash to total assets. Excess Cash is the residual cash to total assets and is defined relative to the model of optimal cash holdings as presented in Dittmar and Mahrt-Smith (2007), estimated over the period 1995-2004. Cash Reserves and Excess Cash are measured at the end of the last fiscal quarter ending before July 1, 2006. Crisis 2007 is an indicator that equals to one from the third quarter of 2007 to the second quarter of 2008. All specifications control for suppliers' characteristics (defined in table 1) and client's characteristics which include: size, sales growth, total debt, a dummy for not having a debt rating and various measures of clients' bargaining power and client's liquidity. All specifications include pairs fixed effects. ***, **, or * indicates that the coefficient is significant at the 1%, 5%, or 10% level, respectively. Standard errors are clustered at the pair level.

Table 7. Trade credit provision and client's credit constraints. Matched suppliers-customers sample.

	Kaplan Zingales		Whited Wu		Payout ratio		No rating dummy	
	Unconstr. clients	Constrained clients	Unconstr. clients	Constrained clients	Unconstr. clients	Constrained clients	Rated clients	Unrated clients
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Crisis 2007	-0.0319*	-0.0137	-0.00844	-0.136	-0.00864	-0.0217	-0.00830	-0.0142
	[0.0186]	[0.0211]	[0.00918]	[0.0823]	[0.0107]	[0.0208]	[0.00974]	[0.0232]
Crisis 2007 * Cash	0.104	0.0589	0.0492	0.260**	0.0342	0.100**	0.0681	0.0507
	[0.0704]	[0.0630]	[0.0340]	[0.121]	[0.0454]	[0.0455]	[0.0414]	[0.0636]
Log of total assets	0.0335	-0.0661	-0.0137	0.0199	-0.0200	0.0217	-0.0242	0.0618
	[0.0365]	[0.0442]	[0.0233]	[0.146]	[0.0248]	[0.0367]	[0.0249]	[0.0518]
Log of age	0.0609	0.241**	0.0629**	0.123	0.0744*	0.136*	0.0649**	-0.00826
	[0.0708]	[0.118]	[0.0265]	[0.305]	[0.0396]	[0.0790]	[0.0257]	[0.121]
PPE over assets	0.0253	-0.426	-0.134	-0.639**	0.0304	-0.826***	-0.231	-0.221
	[0.149]	[0.322]	[0.140]	[0.304]	[0.102]	[0.312]	[0.150]	[0.230]
Net profit margin	-0.0219***	0.0421***	-0.00551	0.0900***	-0.0167*	0.0640***	0.00718	0.0946***
	[0.00781]	[0.0130]	[0.0121]	[0.0317]	[0.00884]	[0.0179]	[0.0211]	[0.0306]
Sales growth	-0.141***	-0.0782***	-0.0830***	-0.0346	-0.0988***	-0.0190	-0.0740***	-0.149***
	[0.0392]	[0.0276]	[0.0163]	[0.0462]	[0.0193]	[0.0220]	[0.0179]	[0.0548]
Net worth over assets	-0.0969	0.159	0.0996*	-0.473	0.129*	-0.0464	0.0623	-0.0504
	[0.114]	[0.103]	[0.0603]	[0.279]	[0.0693]	[0.117]	[0.0661]	[0.149]
Debt over assets	-0.109	0.0533	0.0434	-0.144	0.0743	-0.0747	0.0548	-0.178
	[0.138]	[0.164]	[0.0753]	[0.338]	[0.0866]	[0.142]	[0.0839]	[0.194]
Tobin's Q	0.00798	0.0177	0.00853*	-0.0183	0.00756	0.0139*	0.0134**	0.0155
	[0.00998]	[0.0151]	[0.00513]	[0.0285]	[0.00614]	[0.00833]	[0.00656]	[0.00997]
Client's log of assets	-0.0173	-0.102	-0.0354	-0.0273	-0.0136	-0.112	-0.0333	0.00190
	[0.0334]	[0.0754]	[0.0334]	[0.0778]	[0.0218]	[0.109]	[0.0356]	[0.0255]
Client's sales growth	0.00428	0.0225	-0.00321	0.0315	-0.00845	0.0139	-0.00696	0.0470*
	[0.0235]	[0.0203]	[0.0132]	[0.0272]	[0.0163]	[0.0175]	[0.0136]	[0.0261]
Client's debt over assets	0.0173	-0.00941	0.0207	0.158	0.0620	-0.00333	0.00449	0.00528
	[0.0819]	[0.0734]	[0.0472]	[0.263]	[0.0635]	[0.0792]	[0.0588]	[0.0674]
Rating dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations (pairs)	2,828	1,909	7,234	171	5,392	1,918	6,818	878
R-squared	0.791	0.788	0.787	0.700	0.795	0.750	0.743	0.781
F statistic	0.222		3.154		1.014		0.0514	
p-value	0.638		0.0760		0.314		0.821	

This table presents subsample estimates from panel regressions explaining firm-level quarterly trade credit provided for quarters with an end date from July 1, 2005 to June 30, 2008 using a sample of firms that report their main customers. Each observation represents a supplier-client pair. The dependent variable is the supplier's accounts receivable over sales. Each pair of columns contain coefficients estimated over mutually exclusive subsamples by client's credit constraints. The top row indicates the client's variable used to divide the sample into two groups according to whether the client's credit constraint variable is below or above the median. Supplier's cash reserves is interacted with the crisis dummy in all regressions. Cash is total cash reserves scaled by total assets, and is measured at the end of the last fiscal quarter ending before July 1, 2006. Crisis 2007 is an indicator that equals to one from the third quarter of 2007 to the second quarter of 2008. All specifications control for suppliers' characteristics (defined in table 1) and client's characteristics which include: size, sales growth and total debt. All specifications include pairs fixed effects. The last row of the table provides the F-statistic and the p-value associated to the test of equality of the interaction coefficients of the each pair of regressions. ***, **, or * indicates that the coefficient is significant at the 1%, 5%, or 10% level, respectively. Standard errors are clustered at the pair level.

Table 8. Trade credit taken and credit constraints.

	Panel A. Whole sample						*Panel B. 10-k sample*						
	None		Kaplan Zingales	Whited Wu	Payout Ratio	No Rating Dummy	Kaplan Zingales	Whited Wu	Payout Ratio	No Rating Dummy	LOC Dummy	LOC Limit	Unused LOC
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Crisis 2007	-0.00316	-0.0106*	-0.00881	0.0300*	-0.00366	-0.0182**	-0.0541	0.841***	0.198***	-0.0363	0.668***	0.332***	0.358***
	[0.00520]	[0.00582]	[0.00897]	[0.0177]	[0.00639]	[0.00921]	[0.0918]	[0.151]	[0.0629]	[0.101]	[0.117]	[0.0830]	[0.0851]
Crisis 2007 * Constraint			0.00580	0.115**	-0.0229	0.0118	0.0979*	2.498***	-1.478**	0.249**	-0.647***	-1.330***	-1.829***
			[0.00724]	[0.0546]	[0.0399]	[0.0110]	[0.0591]	[0.500]	[0.679]	[0.117]	[0.126]	[0.422]	[0.535]
Log of total assets		0.0500***	0.0323**	0.0262**	0.0264**	0.0499***	-0.295**	-0.253**	-0.233*	-0.234**	-0.190	-0.177	-0.178
		[0.0126]	[0.0137]	[0.0129]	[0.0128]	[0.0126]	[0.126]	[0.118]	[0.120]	[0.119]	[0.117]	[0.118]	[0.118]
Log of age		0.00652	-0.00333	0.0106	0.0118	0.00496	1.179***	0.210	0.274	0.272	0.180	0.240	0.222
		[0.0212]	[0.0253]	[0.0223]	[0.0212]	[0.0213]	[0.325]	[0.174]	[0.175]	[0.174]	[0.173]	[0.174]	[0.174]
Current assets ratio		-0.120*	-0.0542	-0.143**	-0.138**	-0.120*	-1.966***	-1.802***	-1.675***	-1.656***	-1.673***	-1.822***	-1.853***
		[0.0636]	[0.0697]	[0.0649]	[0.0649]	[0.0636]	[0.674]	[0.625]	[0.631]	[0.625]	[0.618]	[0.627]	[0.627]
Sales growth		-0.146***	-0.129***	-0.141***	-0.143***	-0.146***	-0.210**	-0.192*	-0.189*	-0.195*	-0.188*	-0.196*	-0.198**
		[0.00996]	[0.0112]	[0.0103]	[0.0103]	[0.00996]	[0.107]	[0.101]	[0.102]	[0.101]	[0.100]	[0.101]	[0.101]
Debt over assets		-0.113***	-0.0102	-0.00687	-0.0102	-0.114***	0.266	0.271	0.128	0.130	0.0953	0.294	0.270
		[0.0350]	[0.0396]	[0.0361]	[0.0362]	[0.0350]	[0.394]	[0.351]	[0.354]	[0.352]	[0.346]	[0.357]	[0.354]
Constant	0.645***	0.361***	0.474***	0.485***	0.481***	0.367***	-0.120	2.076**	1.786**	1.782**	1.772**	1.547*	1.612*
	[0.00288]	[0.0984]	[0.107]	[0.102]	[0.0998]	[0.0985]	[1.035]	[0.841]	[0.848]	[0.841]	[0.829]	[0.835]	[0.834]
Rating dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.000	0.011	0.008	0.010	0.010	0.011	0.036	0.045	0.027	0.026	0.046	0.031	0.033
Observations	24,418	24,418	20,471	23,196	23,384	24,418	1,058	1,130	1,130	1,145	1,145	1,145	1,145
Number of Firms	2,249	2,249	1,848	2,118	2,152	2,249	91	98	98	100	100	100	100

This table presents estimates from panel regressions explaining firm-level quarterly trade credit taken for quarters with an end date from July 1, 2005 to June 30, 2008. The dependent variable is accounts payable over cost of goods sold. Columns 1-6 are estimated using all firms. Columns 7-13 use the subsample of 100 firms for which we hand-collected information on lines of credit. The top row indicates the constraint measure of the firm (Constraint) that is interacted with the crisis dummies in the regressions of columns 3 to 13: Kaplan-Zingales index in columns 3 and 7, Whited-Wu index in columns 4 and 8, Dividend Payout Ratio in columns 5 and 9, Dummy for no LT debt rating in columns 6 and 10, Dummy for availability of LOC in column 11, LOC limit in column 12, unused balances in LOC in column 13. Crisis 2007 is an indicator that equals to one from the third quarter of 2007 to the second quarter of 2008. All but the first specification control for firms' characteristics which include: size, age, Tobin's Q, net profit margin, sales growth, current assets, and total debt. All specifications include firm fixed effects. ***, **, or * indicates that the coefficient is significant at the 1%, 5%, or 10% level, respectively.

Table 9. Trade credit taken and credit constraints. Matched suppliers-customers sample.

	None	Kaplan Zingales	Whited Wu	Payout Ratio	No rating dummy	None	Kaplan Zingales	Whited Wu	Payout Ratio	No rating dummy
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Crisis 2007	-0.0193***	-0.0200	0.207***	-0.00458	-0.0247***	-0.0269***	-0.0199	0.214***	-0.0115	-0.0298***
	[0.00521]	[0.0130]	[0.0396]	[0.00712]	[0.00547]	[0.00572]	[0.0141]	[0.0406]	[0.00721]	[0.00561]
Crisis 2007 * Constraint		0.00926	0.485***	-0.172***	0.0436***		-0.000585	0.501***	-0.164***	0.0388**
		[0.0168]	[0.0831]	[0.0630]	[0.0144]		[0.0164]	[0.0838]	[0.0634]	[0.0170]
Crisis 2007 * Supplier's cash						0.142**	0.138*	0.0281	0.124*	0.120
						[0.0679]	[0.0832]	[0.0731]	[0.0675]	[0.0730]
Log of total assets	-0.136***	-0.203***	-0.143***	-0.131***	-0.132***	-0.138***	-0.210***	-0.148***	-0.139***	-0.138***
	[0.0294]	[0.0428]	[0.0301]	[0.0299]	[0.0298]	[0.0291]	[0.0423]	[0.0296]	[0.0292]	[0.0291]
Log of age	0.0259**	0.0505	0.0237**	0.0309***	0.0267**	0.0226**	0.0295	0.0192	0.0241**	0.0202*
	[0.0111]	[0.0501]	[0.0118]	[0.0117]	[0.0114]	[0.0110]	[0.0439]	[0.0118]	[0.0113]	[0.0110]
Current assets	-0.408***	-0.757***	-0.474***	-0.417***	-0.421***	-0.418***	-0.787***	-0.468***	-0.420***	-0.417***
	[0.0693]	[0.115]	[0.0729]	[0.0711]	[0.0694]	[0.0698]	[0.112]	[0.0732]	[0.0715]	[0.0698]
Sales growth	-0.201***	-0.216***	-0.229***	-0.230***	-0.227***	-0.200***	-0.179***	-0.199***	-0.200***	-0.200***
	[0.0183]	[0.0469]	[0.0347]	[0.0346]	[0.0340]	[0.0184]	[0.0249]	[0.0184]	[0.0185]	[0.0183]
Debt over assets	-0.146	-0.0908	-0.122	-0.138	-0.128	-0.145	-0.127	-0.147	-0.160	-0.150
	[0.0962]	[0.128]	[0.102]	[0.102]	[0.0991]	[0.0963]	[0.123]	[0.0984]	[0.0990]	[0.0959]
Constant	2.127***	2.821***	2.217***	2.066***	2.077***	2.160***	2.984***	2.297***	2.172***	2.174***
	[0.309]	[0.447]	[0.315]	[0.312]	[0.309]	[0.304]	[0.441]	[0.313]	[0.307]	[0.305]
Observations (pairs)	16,031	10,510	16,192	16,394	16,553	16,031	10,125	15,705	15,900	16,031
R-squared	0.871	0.882	0.870	0.870	0.870	0.872	0.883	0.872	0.872	0.872

This table presents estimates from panel regressions explaining firm-level quarterly trade credit taken for quarters with an end date from July 1, 2005 to June 30, 2008 using a sample of firms that report their main customers. Each observation represents a supplier-client pair. The dependent variable is accounts payable over cost of goods sold. The top row indicates the constraint measure of the firm (Constraint) that is interacted with the crisis dummy in the regressions: Kaplan-Zingales index in columns 2 and 7, Whited-Wu index in columns 3 and 8, Dividend Payout Ratio in columns 4 and 9, Dummy for no LT debt rating in columns 5 and 10. Columns 6-10 include an interaction term of the recession dummy and supplier's liquidity as measured by their cash to assets ratio. Crisis 2007 is an indicator that equals to one from the third quarter of 2007 to the second quarter of 2008. All specifications control for firms' characteristics which include: size, age, current assets, sales growth, and total debt. All specifications include pairs fixed effects. ***, **, or * indicates that the coefficient is significant at the 1%, 5%, or 10% level, respectively. Standard errors are clustered at the pair level.

Table 10. Cash and liquidity provision over the crisis episode.

	Panel A. Whole sample		*Panel B. 10-k sample*					
	Cash Reserves	Excess Cash	Cash Reserves	Excess Cash	Cash Reserves, LOC Dummy	Cash Reserves, LOC Limit	Cash Reserves, Unused LOC	Liquidity (Cash + Unused LOC)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Crisis 2007	-0.0147***	-0.00840**	-0.0164	-0.00657	-0.0697*	-0.0547**	-0.0500*	-0.0430**
	[0.00410]	[0.00362]	[0.0149]	[0.0133]	[0.0409]	[0.0262]	[0.0265]	[0.0203]
Crisis 2008	-0.0310***	-0.0272***	-0.0341**	-0.0139	0.0240	-0.0299	-0.0275	-0.0572***
	[0.00436]	[0.00393]	[0.0162]	[0.0149]	[0.0411]	[0.0270]	[0.0271]	[0.0211]
Post-crisis	-0.0140***	-0.0163***	-0.0234	-0.0263	-0.0879*	-0.0420	-0.0464	-0.0258
	[0.00471]	[0.00430]	[0.0208]	[0.0190]	[0.0523]	[0.0356]	[0.0353]	[0.0276]
Crisis 2007 * Cash	0.0232*	0.0243*	0.118**	0.117***	0.179***	0.177***	0.167***	0.163***
	[0.0139]	[0.0133]	[0.0474]	[0.0453]	[0.0645]	[0.0582]	[0.0573]	[0.0544]
Crisis 2008 * Cash	-0.00501	-0.0129	0.225***	0.216***	0.159**	0.220***	0.216***	0.215***
	[0.0148]	[0.0142]	[0.0489]	[0.0466]	[0.0649]	[0.0596]	[0.0584]	[0.0554]
Post-crisis * Cash	-0.0593***	-0.0334**	-0.0230	-0.0107	0.0519	0.00751	0.0112	-0.00411
	[0.0155]	[0.0148]	[0.0624]	[0.0594]	[0.0824]	[0.0769]	[0.0751]	[0.0714]
Crisis 2007 * LOC					0.0519	0.194*	0.211	
					[0.0372]	[0.110]	[0.138]	
Crisis 2008 * LOC					-0.0574	-0.0164	-0.0372	
					[0.0370]	[0.113]	[0.139]	
Post-Crisis * LOC					0.0633	0.0995	0.147	
					[0.0472]	[0.149]	[0.180]	
Log of total assets	0.0327***	0.0169***	0.0146	0.0156	0.0157	0.0131	0.0134	0.00629
	[0.00478]	[0.00493]	[0.0187]	[0.0190]	[0.0188]	[0.0188]	[0.0188]	[0.0188]
Log of age	-0.00968	-0.00327	-0.0325	-0.0344	-0.0314	-0.0357	-0.0342	-0.0338
	[0.00870]	[0.00905]	[0.0375]	[0.0379]	[0.0375]	[0.0376]	[0.0375]	[0.0376]
PPE over assets	-0.208***	-0.200***	0.118	0.116	0.123	0.115	0.115	0.0963
	[0.0274]	[0.0278]	[0.112]	[0.113]	[0.112]	[0.112]	[0.112]	[0.113]
Net profit margin	-0.0445***	-0.0456***	-0.187***	-0.186***	-0.188***	-0.187***	-0.187***	-0.184***
	[0.00197]	[0.00202]	[0.0169]	[0.0171]	[0.0170]	[0.0169]	[0.0169]	[0.0168]
Sales growth	-0.176***	-0.175***	-0.108***	-0.109***	-0.110***	-0.109***	-0.108***	-0.107***
	[0.00448]	[0.00465]	[0.0163]	[0.0165]	[0.0163]	[0.0163]	[0.0163]	[0.0163]
Net worth over assets	-0.129***	-0.106***	-0.0741*	-0.0749*	-0.0703	-0.0759*	-0.0757*	-0.0803*
	[0.0138]	[0.0142]	[0.0443]	[0.0448]	[0.0443]	[0.0443]	[0.0443]	[0.0443]
Debt over assets	-0.177***	-0.147***	-0.0465	-0.0512	-0.0412	-0.0550	-0.0524	-0.0715
	[0.0188]	[0.0193]	[0.0715]	[0.0722]	[0.0717]	[0.0727]	[0.0724]	[0.0718]
Tobin's Q	-0.0134***	-0.0121***	0.0109*	0.0107*	0.0122**	0.0107*	0.0105*	0.00816
	[0.00175]	[0.00177]	[0.00618]	[0.00623]	[0.00619]	[0.00619]	[0.00619]	[0.00614]
Rating dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.060	0.060	0.114	0.115	0.119	0.116	0.116	0.111
Observations	38,236	34,325	1,749	1,713	1,749	1,749	1,749	1,749
Number of Firms	2,249	1,998	100	98	100	100	100	100

This table presents estimates from panel regressions explaining firm-level quarterly trade credit provided for quarters with an end date from July 1, 2005 to June 30, 2010. The dependent variable is accounts receivable over sales. Columns 1 and 3 are estimated using all firms. Columns 2 and 4-8 use the subsample of 100 firms for which we hand-collected information on lines of credit. The top row indicates the cash measure (Cash) and line of credit measure (LOC) that is interacted with the crisis dummies in each regression: Cash Reserves in columns 1 and 2, Excess Cash in columns 3 and 4, Cash reserves and LOC dummy in column 5, Cash reserves and LOC limit in column 6, Cash reserves and unused LOC in column 7, Cash + Unused balance in LOC in column 8. Cash and LOC variables are measured at the second quarter of year 2006. Crisis 2007 is an indicator that equals to one from the third quarter of 2007 to the second quarter of 2008. Crisis 2008 is an indicator that equals to one from the third quarter of 2008 to the second quarter of 2009. Post-crisis is an indicator that equals to one from the third quarter of 2009 to the second quarter of 2010.All other variables are defined in tables 1 and 4. All specifications control for firms' characteristics which include: size, age, tangibility, net profit margin, sales growth, net worth, Tobin's Q, total debt, and ratings dummies. All specifications include firm fixed effects. ***, **, or * indicates that the coefficient is significant at the 1%, 5%, or 10% level, respectively.

Table 11. Evolution of cash reserves over the crisis episode.

	Growth of cash-to-assets in Crisis 2007	Growth of cash-to-assets in Crisis 2008	Growth of cash-to-assets in Post-crisis
Panel A. Terciles of cash over assets (as of 2006.q2)			
Bottom tercile (average cash = 2%)	19%	36%	53%
Middle tercile (average cash = 12%)	-2%	17%	35%
Top tercile (average cash = 45%)	-11%	-1%	15%
Panel B. Terciles of growth rate in AR/Sales (in Crisis 2007)			
Bottom tercile (average AR growth = -14.9%)	7%	13%	33%
Middle terciles (average AR growth = -0.1%)	3%	23%	36%
Top tercile (average AR growth = 16.8%)	-4%	17%	34%

This table presents the average growth rate of cash-to-assets ratio for terciles of firms sorted by their cash-to-assets as measured on 2006.q2 (Panel A) and by terciles of the growth rate in accounts raceivable-to-sales (Panel B). The bottom tercile corresponds to firms below the 33rd percentile; Middle tercile to firms between the 33rd and 66th percentile; and top tercile to firms above the 66th percentile. We define four periods of four quarters each as follows: "before the crisis" is from 2006.q3 to 2007.q2, "Crisis 2007" is from 2007.q3 to 2008.q2, "Crisis 2008" is from 2008.q3 to 2009.q2 and "Post-crisis" is from 2009.q3 to 2010.q2. For every firm, we average the cash-to-assets ratio over the four quarters of each period and compute the growth rate between two periods. Then, we compute the average growth rate across firms. The first column presents the average growth rate of cash-to-assets from the period before the crisis to the Crisis 2007 period. The second column presents the average growth rate of cash-to-assets from Crisis 2007 to Crisis 2008.The third column presents the average growth rate of cash-to-assets from Crisis 2008 to Post-crisis period.

Table 12. Trade credit provision, liquidity, and performance over the crisis episode.

	Market Share	ROA	ROS	EBITDA	Net profit margin
	(1)	(2)	(3)	(4)	(5)
Crisis 2007	0.00109**	-0.00334***	-0.0278	-0.00228***	-0.0208*
	[0.000521]	[0.000882]	[0.0182]	[0.000507]	[0.0119]
Crisis 2008	0.00364***	-0.0145***	-0.0684***	-0.00548***	-0.0352***
	[0.000552]	[0.000942]	[0.0194]	[0.000537]	[0.0126]
Post-crisis	0.00350***	-0.00524***	-0.0568**	-0.00373***	-0.0152
	[0.000593]	[0.00117]	[0.0242]	[0.000575]	[0.0136]
Crisis 2007 * Cash	-0.00159	0.00106	0.122**	0.00693***	0.133***
	[0.00179]	[0.00302]	[0.0623]	[0.00175]	[0.0410]
Crisis 2008 * Cash	-0.00122	0.000240	-0.151**	0.0162***	0.110**
	[0.00190]	[0.00321]	[0.0662]	[0.00185]	[0.0434]
Post-crisis * Cash	-0.00234	0.00949**	0.282***	0.0229***	0.176***
	[0.00196]	[0.00397]	[0.0819]	[0.00191]	[0.0449]
Crisis 2007 * Δ AR	-0.00283***	-0.00755***	-0.112***	-0.00526***	-0.0627***
	[0.000880]	[0.00149]	[0.0306]	[0.000899]	[0.0201]
Crisis 2008 * ΔAR	-0.00236**	-0.00518***	-0.102***	-0.00193*	-0.0324
	[0.000970]	[0.00164]	[0.0337]	[0.001000]	[0.0222]
Post-crisis * ΔAR	-0.00220**	-0.00500**	-0.182***	-0.00379***	-0.130***
	[0.00104]	[0.00216]	[0.0446]	[0.00101]	[0.0238]
Crisis 2007 * Δ AR * Cash	0.00390**	0.0125***	0.363***	0.00571*	0.308***
	[0.00188]	[0.00317]	[0.0655]	[0.00313]	[0.0430]
Crisis 2008 * ΔAR * Cash	0.00372*	0.00134	0.267***	-0.0173***	0.230***
	[0.00220]	[0.00372]	[0.0767]	[0.00345]	[0.0504]
Post-crisis * ΔAR * Cash	0.00441	0.00618	0.831***	0.00745**	0.910***
	[0.00330]	[0.00703]	[0.145]	[0.00352]	[0.0755]
Firm controls	Yes	Yes	Yes	Yes	Yes
Firm fixed-effects	Yes	Yes	Yes	Yes	Yes
R-squared	0.029	0.102	0.062	28,035	0.050
Observations	28,966	26,305	26,305	27,973	28,883
Number of Firms	2,044	2,044	2,044	2,034	2,044

This table presents estimates from panel regressions explaining firm-level quarterly performance measures for quarters with an end date from July 1, 2006 to June 30, 2010. Dependent variables are: market share (col 1), return on assets (col 2), return on sales (col 3), earnings before interrest, taxes and depreciation (col 4), and net profit margin (col 5). Crisis 2007 is an indicator that equals to one from the third quarter of 2007 to the second quarter of 2008. Crisis 2008 is an indicator that equals to one from the third quarter of 2008 to the second quarter of 2009. Post-crisis is an indicator that equals to one from the third quarter of 2009 to the second quarter of 2010. Cash is the winsorized ratio of cash over assets during the second quarter of 2006. ΔAR is the change of the average accounts receivable to sales ratio in quarters 2006:3-2007:2 relative to the average ratio during 2007:3-2008:2. All other variables are defined in tables 1 and 4. All specifications control for firms' characteristics which include: size, age, tangibility, sales growth, net worth, Tobin's Q, total debt, and ratings dummies. All specifications include firm fixed effects and a constant. ***, **, or * indicates that the coefficient is significant at the 1%, 5%, or 10% level, respectively.

Table A.1 Descriptive statistics.

	Mean	Median	St. Dev	N. Obs
Accounts receivable / Sales	0.612	0.590	0.419	24,733
Cash	0.199	0.116	0.214	2,250
Excess Cash	0.128	0.052	0.233	1,999
Cash Flow	0.026	0.031	0.046	2,160
Log of assets	6.444	6.338	1.819	24,733
Log of age	2.822	2.773	0.665	24,733
Assets	3,824	566	14,237	24,733
Age (years)	20.7	16.0	13.1	24,733
Property plant and equipment / Assets	0.245	0.172	0.218	24,733
Net profit margin	0.245	0.368	1.184	24,733
Sales growth	0.001	0.027	0.250	24,733
Net worth / Assets	0.377	0.392	0.279	24,733
Debt / Assets	0.197	0.158	0.206	24,733
Q / Assets	2.034	1.605	1.331	24,733
No rating (dummy)	0.665	1	0.472	24,733
Rating AAA	0.002	0	0.045	24,733
Rating AA	0.007	0	0.082	24,733
Rating A	0.052	0	0.222	24,733
Rating BBB	0.091	0	0.287	24,733
Rating BB	0.106	0	0.308	24,733
Rating B	0.070	0	0.255	24,733
Rating CCC	0.006	0	0.075	24,733
Rating CC	0.001	0	0.024	24,733
Rating D	0.001	0	0.030	24,733

This table reports summary statistics for key variables for the main sample of firm-year-quarter observations from July 1, 2005 to June 30, 2008. Cash variables are measured exactly once per firm, at the end of the last fiscal quarter ending before July 1, 2006

Table A.2 Descriptive statistics subsample with information on lines of credit.

Year	Obs	Mean	SD	Median	75%	95%	99%
Panel A. Balance on line of credit (amount drawn)							
2005	77	23.4	63.1	0	8	154	353
2006	79	30.2	65.1	0	19	200	313
2007	78	46.8	102.0	0	54	288	642
2008	77	83.0	181.4	6.1	90	400	1,192
2009	76	38.9	101.2	0	28	257	710
Panel B. Limit on line of credit							
2005	77	333.11	872.3	75	250	1,600	6,800
2006	79	330.79	820.6	100	250	1,600	6,400
2007	78	360.70	834.2	101	300	1,868	6,400
2008	77	352.88	783.6	146	300	1,314	6,000
2009	76	323.55	707.8	99	300	923	5,200
Panel C. Used ratio on line of credit (balance over limit)							
2005	77	0.116	0.188	0.000	0.176	0.578	0.762
2006	79	0.134	0.187	0.000	0.255	0.537	0.700
2007	78	0.159	0.237	0.000	0.277	0.680	0.902
2008	77	0.213	0.257	0.100	0.381	0.750	0.907
2009	76	0.159	0.251	0.000	0.261	0.750	0.888

This table reports summary statistics for a subsample of 100 firms for which we hand-collected data from the SEC's 10-k annual filings on lines of credit. Panel A provides summary statistics on the sum of the balance (used credit or drawn amount) in all lines of credit to a firm. Panel B reports the sum of the total limit (used and unused) in all lines of credit to a firm. Panel C reports summary statistics of used ratio of lines of credit, which is computed as the balance over total limit . Data is annual and covers fiscal years ending in 2005 to 2009.

Table A.3 Descriptive statistics sample of matched suppliers-customers.

Variable	Mean	Median	St. Dev	N. Obs
Supplier variables				
Accounts receivable / Sales	0.642	0.607	0.341	9,368
Accounts payable / Cost of goods sold	0.671	0.490	0.766	9,334
Cash	0.253	0.183	0.236	998
Excess Cash	0.180	0.118	0.255	909
Assets	2,974.1	511.6	10,007.2	9,368
Age (years)	19.368	15.000	12.584	9,368
Property plant and equipment / Assets	0.194	0.136	0.189	9,368
Net profit margin	0.258	0.385	1.044	9,368
Sales growth	-0.005	0.027	0.279	9,368
Net worth / Assets	0.414	0.435	0.283	9,368
Debt / Assets	0.182	0.131	0.201	9,368
Q / Assets	2.101	1.638	1.386	9,368
No rating (dummy)	0.713	1.000	0.452	9,368
Rating AAA	0.003	0.000	0.057	9,368
Rating AA	0.009	0.000	0.094	9,368
Rating A	0.043	0.000	0.204	9,368
Rating BBB	0.073	0.000	0.260	9,368
Rating BB	0.098	0.000	0.297	9,368
Rating B	0.057	0.000	0.232	9,368
Rating CCC	0.002	0.000	0.049	9,368
Rating CC	0.001	0.000	0.029	9,368
Rating D	0.000	0.000	0.021	9,368
Customer variables				
Log of assets	10.095	10.241	1.648	9,368
Log of age	2.499	2.485	0.769	2,588
Sales growth	0.010	0.023	0.202	9,368
Debt / Assets	0.211	0.197	0.148	9,368
No rating (dummy)	0.114	0	0.318	9,368
Market share	0.227	0.163	0.228	9,360
Net profit margin	0.286	0.288	1.143	9,368
Weight (sales to client *i* over total sales)	0.161	0.130	0.149	9,368
External finance dependence	0.110	0.121	0.246	9,260
Cash to assets	0.113	0.068	0.128	9,368
Market to book	1.899	1.700	0.911	6,180
Kaplan Zingales	0.848	0.796	0.509	6,074
Whited Wu	-0.472	-0.501	0.079	8,711
Payout ratio	0.115	0.068	0.264	8,551

This table reports summary statistics for key variables for the sample of matched suppliers-customers from July 1, 2005 to June 30, 2008. Cash variables are measured exactly once per supplier, at the end of the last fiscal quarter ending before July 1, 2006

Table A.4 Robustness checks on sample, cash measurement, and dependent variable denominator.

	Sample: 2005.3 to 2008.2		Sample: 2004.3 to 2008.2			Sample: 2005.3 to 2008.2			Sample: 2006.3 to 2008.2		
	Non-cash assets	Non-receivables assets		Assets			Assets			Assets	
	2006 Q2	2006 Q2	2006 Q2	2005 Q2	2004 Q2	2006 Q2	2005 Q2	2004 Q2	2006 Q2	2005 Q2	2004 Q2
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Panel A. Whole Sample Estimations											
Crisis 2007	-0.0163***	-0.0154***	-0.0160***	-0.0159***	-0.0145***	-0.0147***	-0.0114***	-0.0117***	-0.0162***	-0.0143***	-0.0161***
	[0.00332]	[0.00402]	[0.00387]	[0.00392]	[0.00387]	[0.00395]	[0.00398]	[0.00392]	[0.00411]	[0.00418]	[0.00411]
Crisis 2007 * Cash	0.0123***	0.0219*	0.0304**	0.0273**	0.0177	0.0240*	0.00456	0.00526	0.0283**	0.0104	0.0222*
	[0.00274]	[0.0117]	[0.0127]	[0.0129]	[0.0125]	[0.0130]	[0.0131]	[0.0126]	[0.0136]	[0.0139]	[0.0133]
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.068	0.056	0.062	0.060	0.062	0.063	0.059	0.063	0.061	0.056	0.061
Observations	24,739	24,707	33,264	34,346	34,462	24,733	24,991	24,801	16,093	15,972	15,875
Number of Firms	2,250	2,245	2,256	2,455	2,608	2,250	2,443	2,423	2,242	2,231	2,219
Panel B. 10-k Subsample Estimations											
Crisis 2007	-0.139***	-0.0951**	-0.0849*	-0.0820**	-0.0758*	-0.101**	-0.0998***	-0.111***	-0.123***	-0.175***	-0.125***
	[0.0306]	[0.0404]	[0.0438]	[0.0404]	[0.0418]	[0.0405]	[0.0375]	[0.0386]	[0.0464]	[0.0426]	[0.0441]
Crisis 2007 * Cash	0.0481***	0.141**	0.109	0.105*	0.107	0.175***	0.156***	0.209***	0.224***	0.278***	0.256***
	[0.00907]	[0.0552]	[0.0692]	[0.0622]	[0.0701]	[0.0637]	[0.0573]	[0.0641]	[0.0729]	[0.0651]	[0.0730]
Crisis 2007 * LOC	0.116***	0.0690*	0.0669*	0.0644*	0.0585	0.0734**	0.0752**	0.0796**	0.0857**	0.136***	0.0793**
	[0.0312]	[0.0361]	[0.0396]	[0.0369]	[0.0376]	[0.0365]	[0.0341]	[0.0347]	[0.0419]	[0.0389]	[0.0398]
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.098	0.050	0.051	0.051	0.052	0.053	0.053	0.059	0.049	0.063	0.054
Observations	1,173	1,162	1,554	1,554	1,541	1,171	1,171	1,159	778	778	770
Number of Firms	100	100	100	100	99	100	100	99	100	100	99

This table presents several specifications for validation purposes. The dependent variable is accounts receivable over sales. All specifications control for firms' characteristics which include: size, age, tangibility, net profit margin, sales growth, net worth, Tobin's Q, total debt, rating dummies, as well as for firm fixed effects. Crisis 2007 is an indicator that equals to one from the third quarter of 2007 to the second quarter of 2008. We interact cash reserves with Crisis 2007 in both panels; additionaly, in Panel B we interact Crisis 2007 with a dummy variable LOC which equals one if the firm has a line of credit, zero otherwise. Tangibility, net profit margin, net worth, and total debt are scaled by non-cash assets in column 1; by assets net of accounts receivables in column 2; and by total assets in columns 3-11. The sample consists of quarterly data; we use all firms in Panel A and a sub-sample of firms for which we have information on lines of credit in Panel B. The starting points of the sample are quarters starting on: July 1, 2005 for columns 1, 2, and 6-8; July 1, 2004 for columns 3-5 and July 1, 2006 for columns 9-11. In all columns, the ending points of the sample period is the quarter ending on June 30, 2008. Cash and LOC dummy are measured at the end of the last fiscal quarter ending before July 1 of: year 2006 in columns 1,2,3, 6 and 9; year 2005 in columns 4, 7 and 10; and year 2004 in columns 5, 8 and 11. All specifications include firm fixed effects. ***, **, or * indicates that the coefficient is significant at the 1%, 5%, or 10% level, respectively.