Working Paper Series

No. 21-05

March 2022

Bank Loans, Trade Credit, and Liquidity Shortages of Small Businesses during the Global Financial Crisis

Daisuke Tsuruta

Research Institute of Economic Science

College of Economics, Nihon University

Bank Loans, Trade Credit, and Liquidity Shortages of Small Businesses during the Global Financial Crisis *

Daisuke Tsuruta†
College of Economics, Nihon University

March 18, 2022

*The author is a researcher at the Credit Risk Database (CRD) Association, which has given permission for the use of its data. However, the views expressed in this paper do not necessarily reflect those of the CRD Association. This study was supported by a Grant-in-Aid for Scientific Research (C) #21K01584 from the Japan Society for the Promotion of Science and a Grant-in-Aid for KAKENHI Application by Young Researchers from College of Economics, Nihon University.

†Address.: 1-3-2 Kanda Misaki-cho, Chiyoda-ku, Tokyo 102-8360, Japan.;Tel.: +81-3-3219-3606.; Fax: +81-3-3219-3606.; *E-mail address:* tsuruta.daisuke@nihon-u.ac.jp

Bank Loans, Trade Credit, and Liquidity Shortages of Small Businesses during the Global Financial Crisis

March 18, 2022

Abstract

We investigate how small businesses respond to liquidity shortages during the financial crisis, focusing on heterogeneity between young and mature firms. With the sudden onset of the financial crisis, many small businesses faced declines in cash flows and liquidity shortages. Typically, mature firms have close relationships with banks and suppliers, enabling them to use bank loans or trade payables to overcome such liquidity shortages during crises. However, young firms lack such established relationships with banks and have less access to bank loans or trade payables to overcome liquidity shortages. Using over 4 million firm-year observations of small business in Japan, we show that mature firms use bank loans more than young firms when facing liquidity shortages. This is consistent with previous studies indicating that banks offer liquidity provisions to firms with which they have close lending relationships. In contrast to the situation for loans, we find that neither mature nor young firms increase trade payables during the crisis period. This suggests that mature firms relied on banks, not suppliers, for liquidity provision during the crisis. In addition, these effects remain after the crisis; that is, banks continued to offer credit to mature firms that faced liquidity shortages despite the financial crisis subsiding. Furthermore, we find that mature firms that experienced declines in cash flow during and after the crisis were likely to default and exit. This implies that credit allocation to mature firms is inefficient.

Keyword: small business, bank loan, trade credit, liquidity shortage, firm age

JEL classification:G21; G32; G01; G33

1 Introduction

In this paper, we investigate bank borrowing by small firms in response to liquidity shortages during the global financial crisis in the late 2000s in Japan. Our focus is the heterogeneity between young and mature firms in response to the liquidity shortages. The literature on relationship lending argues that the credit supply for young firms decreases during crises, whereas it does not for mature firms. As Berger and Udell (1998) argue, information gaps between banks and small business borrowers are more significant than is the case for large firms. Small businesses are typically informationally opaque, which results in adverse selection and moral hazard and reduces credit availability for small businesses. To mitigate these issues, banks acquire information on the creditworthiness of small businesses by establishing close relationships with them. This lending technology, referred to as relationship lending, enhances credit availability for mature small businesses, which are likely to have close relationships with banks; see Petersen and Rajan (1994) and Berger and Udell (1995). Particularly during a crisis, mature small businesses enjoy benefits from relationship lending. As Berlin and Mester (1999) and Boot (2000) argue, through intertemporal smoothing of loan interest rates, banks can offer credit to mature small businesses with which they have lending relationships during crises.

Previous empirical studies of relationship lending (for example, Jiangli et al., 2008; Cotugno et al., 2013; Gobbi and Sette, 2014; Dewally and Shao, 2014) show that firms with strong relationships with banks can use bank loans during times of economic distress. Using Italian data, Cotugno et al. (2013) show that a strong lender–borrower relationship mitigates credit rationing for borrowing firms (including small businesses) during a credit crunch period. If small businesses with long-term relationships do not face credit constraints during financial crises, they can increase their bank loans to finance their liquidity shortages. However, because young firms do not have sufficiently established lending relationships with banks, they cannot benefit from intertemporal smoothing of loan interest rates. Therefore, compared with mature firms, young firms may face more

severe credit constraints if confronted with a large and unexpected financial crisis.

Another focus of the literature is trade credit and relationships with suppliers during crises. Trade creditors may act as liquidity providers for small businesses facing severe cash flow shocks if there are long-standing relationships between the two parties. For example, Cunat (2007) shows that if suppliers and customers have close relationships, suppliers offer more trade credit in periods when customers face temporary liquidity shocks, given that it is costly for them to lose existing customers. This result suggests that suppliers are effectively providers of insurance. Empirically, many studies find that small firms increase their trade credit to mitigate financial constraints during a financial crisis; (Nilsen, 2002; Atanasova and Wilson, 2004; Choi and Kim, 2005; Mateut et al., 2006, for example,). In addition, Garcia-Appendini and Montoriol-Garriga (2013) and Fontaine and Zhao (2021) argue that firms with high liquidity offer more trade credit to customers during crises.[1] This implies that mature firms can enjoy the benefits of liquidity provision from suppliers. However, young firms that lack adequate relationships with suppliers may not be able to mitigate financial constraints using trade credit.

In summary, much of the literature argues that because young firms do not have sufficiently established relationships with banks and suppliers, in general, debtors offer less debt to young firms than to mature firms during a liquidity crisis. Moreover, this implies that because banks and trade creditors are stricter in providing liquidity to young firms, these firms are more likely to default compared with mature firms. In contrast to these results, Petersen and Rajan (1995) argue that the supply of bank loans to young firms can be large because banks are motivated by acquiring monopoly rent after the establishment of relationships with such firms. If this is true, it would be possible for young firms to acquire sufficient bank loans during crises. Therefore, our empirical question is whether young and mature small businesses can acquire bank loans and trade credit when they face liquidity shortages during a crisis. Although many empirical studies investigate bank

[1] In contrast, Love and Zaidi (2010) show that firms experiencing severe credit constraints use less trade credit during crises.

loans during crises, the heterogeneous effects of firm age on credit access have not been adequately examined.

Using a large data set on small businesses in Japan, we investigate liquidity management during the global financial crisis from 2008, focusing on the differences between young and mature firms. During the crisis, many small businesses increased their demand for credit in response to reduced cash flows and liquidity shortages. To mitigate this situation, small businesses could seek to access bank loans and/or trade credit. However, if the small businesses are relatively young, they may not be able to access bank loans or trade credit. Moreover, the financial constraints faced by young firms are more severe than for mature firms. Hence, the differences between young and mature firms in their use of bank loans and trade debts are significant. To investigate these issues, we focus on cash flow crises, proxied by falls in earnings before interest, taxes, depreciation, and amortization (EBITDA) (Brown et al., 2021), and liquid assets (Cunat, 2007).

Our estimation results are summarized as follows. First, mature firms increase bank loans in the face of liquidity shortages during the global financial crisis. This suggests that banks offer more loans to the firms with which they are more likely to have close lending relationships. Although young firms also increase bank loans in this situation, the effect is weaker compared with mature firms. This suggests that mature firms enjoy large benefits from liquidity provision from banks during the crisis. Second, we find that neither young nor mature firms increase trade payables when facing liquidity shortages during the crisis. This suggests that trade creditors are not liquidity providers for either type of firm during the crisis. Third, our results indicate that mature firms that experience a reduction in cash flows during and after the crisis are likely to default and exit, but this is not the case for young firms. These results imply that credit is inefficiently allocated to mature firms during and after the crisis.

Our paper makes several contributions. First, small young firms play an important role as an engine of economic growth. As many existing studies argue (for example, Cassar,

2004; Huyghebaert and Van de Gucht, 2007; Robb and Robinson, 2012; Cole and Sokolyk, 2018; Hirsch and Walz, 2019), external debts, such as bank loans and trade credit, are one of the main sources of finance for start-up firms and have significant effects on firm activities. Therefore, research on the financial activities of young firms during the crisis is important for understanding young firms in general.

Second, as Robb and Robinson (2012) argue, empirical studies on the relationship between capital structure and the performance of young firms are important. There are many such studies in the existing literature. For example, Cathcart et al. (2020) show that financial leverage has larger effects on the probability of default for small businesses compared with large firms. Deloof and Vanacker (2018) empirically investigate the financial sources and survival of start-up firms during the crisis. They find that bank debt is an important financial source for start-up firms and show that firms that use less bank debt are more likely to become bankrupt during the crisis. Focusing on Japan, Honjo and Kato (2019) show that start-up firms that rely more on equity are less likely to fail than those relying on bank debts. Naiki and Ogane (2020) find that sounder financial institutions offer less credit to young firms during the global financial crisis. In contrast to these studies that use data on young firms only, we empirically investigate the financing of young firms, but use data on both young and mature firms.

Third, our paper has some implications for the negative effects of a sudden economic crisis, such as the ongoing economic crisis caused by the coronavirus pandemic (COVID-19), which began in 2020. The Japanese evidence suggests that mature firms can use bank loans for financing liquidity shortage during a crisis. However, young firms are not able to access bank loans to the same degree to finance liquidity shortages in the ongoing crisis.

The remainder of the paper is organized as follows. Section 2 describes the data set. We present the estimation strategy and results for the effects of liquidity shortages on bank loans and trade payables in section 3. In section 4, we introduce our empirical

strategy for estimating the effects of liquidity shortages on firm default and discuss these results. Section 5 concludes the paper.

2 Data

We use firm-level data on small businesses from the Credit Risk Database for Small and Medium Enterprises (CRD) established by Credit Guarantee Corporations (CGCs) and financial institutions under the guidance of the Small and Medium Enterprise Agency in Japan.[2] The data collection process targets firms defined as small and medium enterprises under the Small and Medium Enterprise Basic Law.[3]

The CRD uses data on the small business clients of financial institutions with regular member status; members have a duty to provide all of their small business client data in return for the CRD's credit risk scoring service, statistical information, and other benefits. The data include clients' financial statements, firm default, and firm age. Firm age is grouped into five-year categories. For example, firm age between one and five years is categorized as five years and firm age between six and 10 years is categorized as 10 years. If a financial institution ceases transactions with a client firm, subsequent client data are not collected. Therefore, the data on high credit risk firms are more likely to be truncated because banks often cease transactions with risky firms. Furthermore, firm data start to accumulate only after bank transactions begin; therefore, many young firms that have no such transactions may be excluded from the database.

The data cover the period 2004–2014 (inclusive), which includes the years before and after the global financial crisis. The data set includes only firms that have existed for at least two consecutive years in the CRD because of the use of lead variables. Furthermore, because some variables used in the econometric analysis contain outliers, the data are

[2]The data are managed by the CRD Association. See http://www.crd-office.net/CRD/en/index.html (last date accessed: March 2021) for information about the CRD.

[3]According to the *White Paper on Small and Medium Enterprises in Japan*, "[U]nder the Small and Medium Enterprise Basic Law, the term SMEs generally refers to enterprises with capital stock under 300 million yen and/or 300 or fewer regular employees, and sole proprietorships with 300 or fewer employees."

winsorized at their 0.5th and/or 99.5th percentiles. We limit our observations to manufacturing firms. The resulting data set comprises 788,211 firms and 4,304,561 firm-year observations.

The data include information from firm balance sheets and profit and loss statements. In terms of employee numbers, there are four employees in firms within the first quartile, eight at the median, and 20 in the third quartile. The distribution of employees suggests that the CRD data include many micro firms, which are typically more informationally opaque than larger firms. The number of employees at the 99th percentile of firms is 240, which indicates that our sample includes some larger small businesses.

3 Cash Flow Shocks, Bank Borrowing, and Trade Credit

3.1 Estimation Strategy

In this section, we investigate whether firms finance cash flow shocks using bank borrowings and trade credit. To investigate this issue, we estimate the following regression equation:

$$\begin{aligned} y_{i,t+1} &= \beta_1 Liquidity\ Shock_{i,t} + \beta_2 Liquidity\ Shock_{i,t} \times Year_t \\ &+ \beta_3 Age_{i,t} + \beta_4 Liquidity\ Shock_{i,t} \times Age_{i,t} + \beta_5 Age_{i,t} \times Year_t \\ &+ \beta_6 Liquidity\ Shock_{i,t} \times Age_{i,t} \times Year_t \\ &+ X_{i,t} + \epsilon_i + \eta_t + \theta_{i,t} \end{aligned} \tag{1}$$

where $y_{i,t+1}$ is bank borrowings and trade payables (normalized by a firm's total asset) for firm i in year t+1; $Year_t$ is a dummy variable for 2005–2014; $Age_{i,t}$ is a dummy variable if a firm's age is 6–10 years or over 10 years; $X_{i,t}$ is a vector of control variables (size,

leverage, tangibility, sales growth, cash holdings, and current assets in year t); ϵ_i is firm fixed effects for firm i; η_t is year fixed effects for year t; and $\theta_{i,t}$ is the error term for firm i in year t, with year t ranging from 2004 to 2014.

We use three types of proxies of liquidity shocks. First, following Brown et al. (2021), we use cash flows, defined as the ratio of a firm's EBITDA to total assets in year t. Second, we use a negative cash flow (CF) dummy, which equals one if a firm's cash flow is negative in year t. These proxies are mainly generated from the firms' payment and loss statements. Third, following Cunat (2007), we use a liquidity drop dummy, which takes a value of one if a firm's ratio of liquid assets to total assets drops more than 10% in year t. This variable is generated from the firms' balance sheets.

If banks and suppliers offer credit for firms that experience a liquidity shock, the coefficients of $Liquidity\ Shock_{i,t}$ for cash flow are negative, whereas those for the negative CF dummy and liquidity drop are positive. If these effects are larger in the crisis period, the coefficients of $Liquidity\ Shock_{i,t} \times Year_t$ for cash flow are negative and those for the negative CF dummy and liquidity drop are positive. We define the crisis period as the years 2008–2010 (inclusive). In addition, we estimate the heterogeneous effects of liquidity shocks between firms of different ages using the coefficients of $Liquidity\ Shock_{i,t} \times Year_t \times Age_{i,t}$. If banks and suppliers offer more credit to mature firms that experience liquidity shocks during the crisis period, the coefficients for cash flow are negative and those for the negative CF dummy and liquidity drop are positive. The predicted signs of each of the variables are summarized in Table 1.

Size is the natural logarithm of total assets in year t. Leverage is defined as the book value of debt divided by the book value of assets in year t. Tangibility is defined as the ratio of fixed tangible assets to total assets in year t. Sales growth is defined as the annual change in firm sales [ln(1+sales in year t) – ln(1+sales in year t–1)]. Previous studies (e.g., Asker et al., 2015) use Tobin's q and sales growth as proxies of business opportunities. However, Tobin's q data are not available for this study because the small businesses on

which we focus are typically unlisted firms. Therefore, we use only sales growth as a proxy of business opportunities. Cash holdings are values normalized by total assets in year t. Current assets are defined as the ratio of liquid assets minus cash holdings to total assets in year t.

3.2 Estimation Results

3.2.1 Bank borrowings

Table 2 shows the summary statistics for variables used in the econometric analysis. Table 3 provides the estimation results for Equation (1) using bank borrowing as a dependent variable. We use cash flow in column (1), the negative CF dummy in column (2), and the liquidity drop dummy in column (3) as proxies of liquidity shocks.

In column (1), the estimated coefficient of liquidity shocks (proxied by cash flows) is positive and statistically significant at the 1% level. The benchmark of age dummies is firms aged 0–5 years. The result for this noninteractive variable suggests that bank borrowings for firms aged 0–5 years in 2004 are high if a firm's cash flow is high. The estimated coefficient of liquidity shock×over 10 years of age is negative and statistically significant at the 10% level. This suggests that the positive effect of cash flows weakens in the case of mature firms. The estimated coefficients for the dummies for firms aged 6–10 years and firms aged over 10 years are positive and statistically significant at the 1% level. The magnitude of the estimated coefficient for firms over 10 years of age is larger than that for firms in the 6–10 year age range, suggesting that firms use more bank borrowings when they become older.

Focusing on the estimation results for these variables, we see that the estimated coefficients for liquidity shock×year dummies are negative and statistically significant between 2008 and 2011. This suggests that during the global financial crisis, young firms use more bank borrowings if their cash flows drop. This is consistent with the notion that banks offer more loans to firms to finance liquidity shocks. To investigate the heterogeneous

effects of cash flows during the crisis, we estimate the effects of liquidity shock×year dummies×age dummies. The estimated coefficients of liquidity shock×year dummies×6–10 years of age are negative and statistically significant in 2007 and between 2009 and 2014. In addition, those for firms aged over 10 years are negative and statistically significant after 2006. This suggests that mature firms use more bank borrowings during and after the crisis if their cash flows fall. This implies that during liquidity shocks, banks offer more loans to mature firms compared with young firms. This is consistent with the notion that young firms rely less on bank borrowings than do older firms during the crisis.

Column (2) shows the estimation results for the negative CF dummy as a proxy of liquidity shock. The estimated coefficient of liquidity shock is negative and statistically significant at the 1% level, suggesting that firms rely less on bank borrowings if their cash flows are negative. The estimated coefficients of liquidity shock×year dummies are positive and statistically significant between 2008 and 2013. This suggests that young firms use more bank borrowings during the crisis if their cash flows drop to negative values. Focusing on the estimation results for liquidity shock×year dummies×age dummies, we see that the estimated coefficients are positive and statistically significant after 2009 if firm age is 6–10 years. Similarly, the estimated coefficients for firms aged over 10 years are positive and statistically significant in 2006, 2007, and after 2009. These estimation results are consistent with those in column (1).

Column (3) shows the estimation results for the liquidity drop dummy as a proxy of the liquidity shock. The estimated coefficient of the liquidity shock is positive and statistically significant at the 10% level. This suggests that firms borrow more from banks if their liquid assets fall significantly. The estimated coefficients of liquidity shock×year dummies are not statistically significant or negative. In contrast, the estimated coefficients of liquidity shock×year dummies×age dummies are positive and statistically significant in 2006 and after 2009 if firm age is 6–10 years. We obtain similar results in 2006 and after 2008 if firm age is over 10 years. These results are consistent with the estimation results in columns

(1) and (2), suggesting that mature firms use more bank borrowings if they experience a liquidity shock during the crisis compared with young firms.

To compare the magnitude of the estimated coefficients for *Liquidity Shock*$_{i,t}$ in Table 3, Figures 1–3 plot the estimated coefficients for each year and firm age group. We predict that the estimated coefficients of cash flow are negative during the crisis period if banks offer liquidity to small business borrowers. In addition, the magnitude of the coefficients during the crisis period will be larger than that during the noncrisis period. Similarly, we predict that the estimated coefficients of the negative CF dummy and liquidity drop are positive during the crisis period. The coefficients during the crisis period are larger than those during the noncrisis period.

Figure 1 presents a line graph for the estimated coefficients of cash flow for each year and firm age. For all age groups, the estimated coefficients are positive in the precrisis years of 2004 and 2005. The estimated coefficients become negative if firm age is 6 years or over (0–5 years) after 2006 (2008). The magnitude of the coefficients decreases until 2009, suggesting that firms use more bank loans if cash flow decreases during the crisis period. The magnitude is smaller if firm age is younger. Therefore, firms that have weak lending relationships use less bank borrowings if they experience a cash flow shock during the crisis. After 2009, the estimated coefficients of cash flow increase, so the trend is U-shaped for firms aged 0–5 years and 6–10 years.

The trend for mature firms differs from that for young firms. The coefficients are positive before 2005, they become negative after 2006, and then largely decline up to 2009. This suggests that banks offer more liquidity during the crisis compared with the precrisis period if borrowing firms experience cash flow shocks. However, although the cash flow coefficients reduce in size after the crisis, they do not return to positive levels after the crisis, but remain between –0.3 and –0.4. This implies that banks continue to offer liquidity to borrowing firms that experience declining cash flows after the crisis; thus, banks offer liquidity not only for temporary but also for persistent shocks. In

general, firms with low cash flows during the noncrisis period are economically distressed firms. Therefore, similar to the results of Caballero et al. (2008), this implies that banks provide loans in an inefficient manner to mature small businesses after the crisis. Figure 2 illustrates the trend for the negative CF dummy, which is similar to that for cash flows.

The trend for the coefficients of the liquidity drop dummy is shown in Figure 3. For firms aged 6–10 years and those aged over 10 years, the estimated coefficients are negative before 2005. This suggests that before the crisis, firms reduce bank borrowings if they experience a large reduction in liquid assets. For firms aged over 10 years, the coefficients become positive after 2008 and increase until 2010. This is consistent with the notion that banks offer more loans to firms that experience liquidity drops during the crisis. The magnitude of the coefficients for older firms (aged 6–10 years and over 10 years) is larger than that for firms aged 0–5 during the crisis. This suggests that borrowings for mature firms that experience liquidity drops are larger than the borrowings of young firms. This provides support for the notion that banks offer more loans to firms with which they have close relationships. After the crisis period, the coefficients remain positive and increase for the older firm categories (6–10 years and over 10 years of age). In addition, this suggests that banks offer more loans to mature firms that experience persistent liquidity drops.

3.2.2 Trade payables

Table 4 shows the estimation results for Equation (1) using trade payables as a dependent variable. Similar to the results in Table 3, we show the estimation results using cash flows, the negative CF dummy, and the liquidity drop dummy in each column. In column (1), the estimated coefficients of the age dummies are positive and statistically significant. These results suggest that older firms use more trade payables, which is similar to the results for bank borrowings. The estimated coefficient for liquidity shocks (proxied by cash flows) is negative and statistically significant at the 1% level. In contrast to the results for bank borrowings, in 2004 (precrisis), young firms use more trade payables if

their cash flows are low.

The estimated coefficients of liquidity shock×year dummies are positive and statistically significant at the 10% level in 2009, 2011, and 2013; these results are the opposite to those obtained for bank borrowings. This suggests that young firms do not increase trade payables during the crisis if their cash flows decrease. The estimated coefficients of liquidity shock×year dummies×age dummies are not statistically significant if firm age is 6–10 years, indicating that firms in this age group do not increase trade payables if their cash flows decrease during the crisis. In contrast, the estimated coefficients of liquidity shock×year dummies×age dummies are negative and statistically significant between 2008 and 2013 (apart from 2010) if firm age is over 10 years. This indicates that mature firms increase trade payables during the crisis if their cash flows decline, which is consistent with the notion that suppliers provide liquidity to firms during the crisis if they have strong relationships with the firms. Focusing on the magnitude, the estimated coefficients for trade payables are smaller than those for bank borrowings.

However, these results are not robust if we employ other proxies of liquidity shocks. Column (2) shows the estimation results for the negative CF dummy as a proxy of liquidity shocks. Almost all estimated coefficients of liquidity shock×year dummies and liquidity shock×year dummies×age dummies are statistically insignificant. Furthermore, column (3) shows the estimation results for the liquidity drop dummy as a proxy of a liquidity shock. The estimated coefficients of liquidity shock×year dummies×age dummies are negative and statistically significant after 2008 if firm age is over 10 years. This suggests that firms decrease (rather than increase) trade payables during the crisis if they experience a liquidity shock. In sum, these results suggest that suppliers are not liquidity providers for young or mature firms.

Figures 4–6 provide line graphs for the estimated coefficients for each of the liquidity shock proxies by year and firm age, calculated from the estimation results in Table 4. Figure 4 indicates the trend for the estimated coefficients of cash flow, which are negative

in all years and age categories. The coefficient levels increase during the shock for firms aged 0–5 years and 6–10 years, suggesting that these firms use less trade credit during the shock period if they experience cash flow shocks. For firms aged 10 years or over, there is no clear trend in the coefficients.

Figure 5 shows the coefficients for the negative CF dummy. The magnitude of the coefficients is larger for younger firms (aged 0–5 years and 6–10 years) than for firms aged over 10 years, except for 2009. However, as shown in Table 4, the many estimated coefficients of liquidity shock×year dummies and liquidity shock×year dummies×age dummies are not statistically significant. Figure 6 presents a line graph for the liquidity drop coefficients, which have no clear trend. These results are not consistent with the notion that suppliers offer more trade credit to firms that experience liquidity shocks during the financial crisis.

4 Cash Flow Shocks and Firm Default

4.1 Estimation Strategy

In this section, we investigate whether firms are more likely to default if they experience a cash flow shock, using the following regression:

$$\begin{aligned} Pr(D_{i,t+1}=1) &= \gamma_1 Liquidity\ Shock_{i,t} + \gamma_2 Liquidity\ Shock_{i,t} \times Year_t \\ &+ \gamma_3 Age_{i,t} + \gamma_4 Liquidity\ Shock_{i,t} \times Age_{i,t} + \gamma_5 Age_{i,t} \times Year_t \\ &+ \gamma_6 Liquidity\ Shock_{i,t} \times Age_{i,t} \times Year_t \\ &+ X_{i,t} + \iota_i + \kappa_t + \lambda_{i,t} \end{aligned} \tag{2}$$

where the probabilities of default and exit are the dependent variables for firm i in year t+1; $\mathbf{X}_{i,t}$ is a vector of control variables (size, leverage, tangibility, sales growth, cash holdings, and current assets in year t); $Year_t$ is a dummy variable from 2005 to 2014;

$Age_{i,t}$ is a dummy variable if a firm's age is 6–10 years or over 10 years; ι_i is firm fixed effects for firm i; κ_t is year fixed effects for year t; and $\lambda_{i,t}$ is the error term for firm i in year t, with t ranging from 2004 to 2014. Default is a dummy variable that takes a value of one if firms delay loan payments by more than three months, are bankrupt or virtually bankrupt borrowers, and/or are borrowers for which credit guarantee corporations subrogated between years t and t+1. Exit is a dummy variable that takes a value of one if we do not observe the data in years t+1 and t+2, and zero otherwise.

In the previous section, we showed that firms that experience liquidity shocks increase bank loans during the crisis period. If the credit allocation is efficient, the firms are unlikely to default and exit even if they experience liquidity shocks.

4.2 Estimation Results

Table 5 shows the estimation results for Equation (2). Similar to Table 3, as proxies of liquidity shocks, we use cash flows in columns (1) and (4), the negative CF dummy in columns (2) and (5), and the liquidity drop in columns (3) and (6).

In column (1), the coefficient of cash flow is positive and statistically significant at the 1% level. This suggests that cash flow has positive effects on firm default. However, if we exclude the interactive variables of liquidity shock ($Liquidity\ Shock_{i,t} \times Year_t, Liquidity\ Shock_{i,t} \times Age_{i,t}, Liquidity\ Shock_{i,t} \times Age_{i,t} \times Year_t$) from Equation (2), the coefficient of cash flow becomes negative. The coefficients of firm ages 6–10 years and over 10 years are positive and statistically significant at the 1% level, suggesting that mature firms are more likely to default compared with young firms. This trend weakens after the crisis because the estimated coefficients of age over 10 years× year dummies after 2010 are negative and statistically significant. Similar trends are observed after 2012 for firms aged 6–10 years. These results imply that mature firms are less likely to default after the crisis.

The estimated coefficients of liquidity shock and year dummies are negative and sta-

tistically significant after 2007. This suggests that young firms that experience cash flow shocks are more likely to default during and after the crisis. Focusing on the estimated coefficients of liquidity shock×year dummies×age dummies, we see that those of liquidity shock×year dummies×age: over 10 years dummy are all negative and statistically significant at the 1% level after 2008. This suggests that mature firms are more likely to default during and after the crisis if they experience declines in cash flows. Focusing on the estimation results for cash flow using exit as a dependent variable (column (4)), we observe that the estimation results are similar to those in column (1).

Column (2) shows the estimation results for the negative CF dummy as a proxy of liquidity. Almost all estimated coefficients of liquidity shock×year dummies and liquidity shock×year dummies×age dummies are statistically insignificant. Column (5) shows that the estimated coefficients of liquidity shock×year dummies after 2007 are positive and statistically significant. In addition, the estimated coefficients of liquidity shock×year dummies×age: over 10 years dummy after 2005 are positive and statistically significant. This suggests that mature firms are more likely to exit if they experience a negative cash flow shock.

Column (3) shows the estimation results for liquidity drop. The estimated coefficients of liquidity shock×year dummies after 2012 are statistically significant at the 1% or 5% levels. In contrast, the estimated coefficients of liquidity drop×year dummies×age: over 10 years dummy are negative and statistically significant after 2010. This suggests that mature firms are less likely to default if they experience liquidity drops after 2010. However, mature firms are more likely to exit. Focusing on the estimation result for exit in column (6), we see that almost all the estimated coefficients of the liquidity shock×year dummies are statistically insignificant, and those of liquidity shock×year dummies×age: over 10 years dummy are positive and statistically significant, except for 2008. These results suggest that mature firms that experience liquid asset drops are less likely to default, but more likely to exit.

Figures 7 and 8 present line graphs for the estimated coefficients of cash flow by year and age, calculated from the estimation results in Table 5. Figure 7 shows the estimated coefficients using default as a dependent variable. The estimated coefficients of cash flow are positive for firms aged 0–5 years, suggesting that young firms with decreased cash flow are not likely to default. In contrast, the estimated coefficients of cash flow for firms aged 6 years or older are negative after 2008. This result suggests that firms that experienced decreased cash flow during and after the global financial crisis are likely to default. Similar to Figure 7, Figure 8 shows the estimated coefficients of cash flow using exit as the dependent variable. This figure shows that the estimated coefficients are positive for young firms (except for 2009 and 2012). In contrast, the estimated coefficients of cash flow are negative for firms aged 6 years or older during and after the crisis.

In summary, mature firms increase bank borrowings (not trade payables) during and after the crisis. However, these firms are likely to default and exit, so their borrowings induced an inefficient credit allocation during and after the crisis. However, in young firms, these trends are not observed, indicating that this inefficient allocation is an issue only for mature firms.

5 Conclusion

In this paper, we investigate whether banks and trade creditors offer loans to small business borrowers that experience liquidity shocks during the global financial crisis that commenced in 2008. Previous studies indicate that banks and trade creditors can be liquidity providers during the crisis. We obtain the following results. First, banks offer loans to firms that experience liquidity shocks during the crisis, which supports the notion that banks act as liquidity providers during the crisis. This effect is larger if firm age exceeds 10 years, implying that close relationships between banks and mature firms enhance the provision of loans by banks during the crisis. Second, trade creditors do not increase trade payables if firms experience liquidity shocks during the crisis. This result

implies that trade creditors do not act as a liquidity provider during the crisis. Third, after the crisis period, banks continue to offer loans to firms that experienced liquidity shocks. Moreover, these firms are more likely to default and exit, implying that banks offer loans in an inefficient manner.

References

Asker, J., Farre-Mensa, J., Ljungqvist, A., 2015. Corporate investment and stock market listing: A puzzle? Review of Financial Studies 28 (2), 342–390.

Atanasova, C. V., Wilson, N., 2004. Disequilibrium in the uk corporate loan market. Journal of Banking & Finance 28 (3), 595 – 614.

Berger, A. N., Udell, G. F., 1995. Lines of credit and relationship lending in small firm finance. Journal of Business 68 (3), 351–381.

Berger, A. N., Udell, G. F., 1998. The economics of small business finance: The roles of private equity and debt markets in the financial growth cycle. Journal of Banking & Finance 22, 613–673, doi:10.1016/S0378-4266(98)00038-7.

Berlin, M., Mester, L., 1999. Deposits and relationship lending. Review of Financial Studies 12 (3), 579–607.

Boot, A. W. A., 2000. Relationship banking: What do we know? Journal of Financial Intermediation 9 (1), 7–25.

Brown, J. R., Gustafson, M., Ivanov, I., 2021. Weathering cash flow shocks. Journal of Finance 76 (4), 1731–1772.

Caballero, R. J., Hoshi, T., Kashyap, A. K., 2008. Zombie lending and depressed restructuring in japan. American Economic Review 98 (5), 1943–77.

Cassar, G., 2004. The financing of business start-ups. Journal of Business Venturing 19 (2), 261–283.

Cathcart, L., Dufour, A., Rossi, L., Varotto, S., 2020. The differential impact of leverage on the default risk of small and large firms. Journal of Corporate Finance 60, 101541.

Choi, W. G., Kim, Y., 2005. Trade credit and the effect of macro-financial shocks: Evidence from u.s. panel data. Journal of Financial and Quantitative Analysis 40 (4), 897–925.

Cole, R. A., Sokolyk, T., 2018. Debt financing, survival, and growth of start-up firms. Journal of Corporate Finance 50, 609–625.

Cotugno, M., Monferrà, S., Sampagnaro, G., 2013. Relationship lending, hierarchical distance and credit tightening: Evidence from the financial crisis. Journal of Banking & Finance 37 (5), 1372 – 1385.

Cunat, V., 2007. Trade credit: Suppliers as debt collectors and insurance providers. The Review of Financial Studies 20 (2), 491–527.

Deloof, M., Vanacker, T., 2018. The recent financial crisis, start-up financing and survival. Journal of Business Finance & Accounting 45 (7-8), 928–951.

Dewally, M., Shao, Y., 2014. Liquidity crisis, relationship lending and corporate finance. Journal of Banking & Finance 39, 223 – 239.

Fontaine, P., Zhao, S., 2021. Suppliers as financial intermediaries: Trade credit for undervalued firms. Journal of Banking & Finance 124, 106043.

Garcia-Appendini, E., Montoriol-Garriga, J., 2013. Firms as liquidity providers: Evidence from the 2007-008 financial crisis. Journal of Financial Economics 109 (1), 272 – 291.

Gobbi, G., Sette, E., 2014. Do firms benefit from concentrating their borrowing? evidence from the great recession 18 (2), 527.

Hirsch, J., Walz, U., 2019. The financing dynamics of newly founded firms. Journal of Banking & Finance 100, 261–272.

Honjo, Y., Kato, M., 2019. Do initial financial conditions determine the exit routes of start-up firms? Journal of Evolutionary Economics 29 (3), 1119–1147.

Huyghebaert, N., Van de Gucht, L. M., 2007. The determinants of financial structure: New insights from business start-ups. European Financial Management 13 (1), 101–133.

Jiangli, W., Unal, H., Yom, C., 2008. Relationship lending, accounting disclosure, and credit availability during the asian financial crisis. Journal of Money, Credit and Banking 40 (1), 25–55.

Love, I., Zaidi, R., 2010. Trade credit, bank credit and financial crisis. International Review of Finance 10 (1), 125–147.

Mateut, S., Bougheas, S., Mizen, P., 2006. Trade credit, bank lending and monetary policy transmission. European Economic Review 50 (3), 603–629.

Naiki, E., Ogane, Y., 2020. Bank soundness and bank lending to new firms during the global financial crisis. Review of Financial Economics 38 (3), 513–541.

Nilsen, J. H., 2002. Trade credit and the bank lending channel. Journal of Money, Credit and Banking 34(1), 226–253.

Petersen, M., Rajan, R. G., 1994. The benefits of firm-creditor relationships: Evidence from small business data. Journal of Finance 49 (1), 3–37, doi:10.1111/j.1540-6261.1994.tb04418.x.

Petersen, M., Rajan, R. G., 1995. The effect of credit market competition on lending relationships. Quarterly Journal of Economics 110, 407–444.

Robb, A. M., Robinson, D. T., 2012. The Capital Structure Decisions of New Firms. The Review of Financial Studies 27 (1), 153–179.

Table 1: Predicted Signs for Equation (1)

	Proxy of liquidity shock		
	Cash flow	Negative Cash Flow(CF)	Liquidity drop
Liquidity shock	–	+	+
Liquidity shock×Year (crisis period)	–	+	+
Liquidity shock×Year×Age (crisis period)	–	+	+

Note: This table provides predicted signs for $Liquidity\ Shock_{i,t}$, $Liquidity\ Shock_{i,t} \times Year_t$, and $Liquidity\ Shock_{i,t} \times Year_t \times Age_{i,t}$ in Equation (1).

Table 2: Summary Statistics

Variable	N	Mean	SD	Min	p1	p50	p99	Max
Bank borrowings	4,304,561	0.70119	0.60981	0.00000	0.00000	0.61793	3.35654	6.89313
Trade payables	4,304,561	0.11091	0.14103	0.00000	0.00000	0.05729	0.62823	0.85265
Default	4,255,674	0.01335	0.11475	0.00000	0.00000	0.00000	1.00000	1.00000
Exit	3,426,263	0.07460	0.26274	0.00000	0.00000	0.00000	1.00000	1.00000
Cash flow	4,304,561	0.04102	0.13095	-0.80863	-0.39326	0.03899	0.44643	0.81127
Negative CF	4,304,561	0.24599	0.43067	0.00000	0.00000	0.00000	1.00000	1.00000
Liquidity drop	4,304,561	0.08061	0.27223	0.00000	0.00000	0.00000	1.00000	1.00000
Age: 6–10 years	4,304,561	0.11172	0.31502	0.00000	0.00000	0.00000	1.00000	1.00000
Age: over 10 years	4,304,561	0.83014	0.37551	0.00000	0.00000	1.00000	1.00000	1.00000
Size	4,304,561	11.78947	1.61715	0.00000	8.47010	11.68688	15.90118	21.30548
Leverage	4,304,561	0.94390	0.61290	0.00000	0.10450	0.86466	3.62963	8.36439
Tangibility	4,304,561	0.34360	0.27386	0.00000	0.00000	0.29026	0.96691	1.00000
Sales growth	4,304,561	0.04932	0.57532	-2.84393	-1.48563	0.00000	2.31624	5.16444
Cash holdings	4,304,561	0.18726	0.16447	0.00000	0.00242	0.14153	0.71784	1.00000
Current assets	4,304,561	0.36383	0.23660	0.00000	0.00009	0.33983	0.91626	1.00000

Note: This table provides summary statistics for the variables used in the econometric analysis.

Table 3: Estimation Results of the Effects of Liquidity Shocks on Bank Borrowings

	(1)	(2)	(3)
	Bank borrowings	Bank borrowings	Bank borrowings
Proxy of liquidity shock	Cash flow	Negative CF	Liquidity drop
Liquidity shock	0.05382***	-0.03931***	0.01211*
	(0.019)	(0.008)	(0.007)
Age: 6–10 years	0.01547***	0.00794***	0.01059***
	(0.004)	(0.003)	(0.003)
Age: over 10 years	0.05612***	0.04350***	0.04718***
	(0.003)	(0.003)	(0.003)
Liquidity shock×Age: 6–10 years	-0.02906	0.00095	-0.01820**
	(0.026)	(0.009)	(0.009)
Liquidity shock×Age: over 10 years	-0.03593*	0.00539	-0.02517***
	(0.021)	(0.008)	(0.008)
Liquidity shock×Year: 2004	0.00000	0.00000	0.00000
	(0.000)	(0.000)	(0.000)
Liquidity shock×Year: 2005	0.00355	0.00505	-0.01260
	(0.025)	(0.009)	(0.010)
Liquidity shock×Year: 2006	0.01911	-0.00164	-0.01410
	(0.027)	(0.010)	(0.009)
Liquidity shock×Year: 2007	-0.01733	0.00406	0.00083
	(0.026)	(0.010)	(0.009)
Liquidity shock×Year: 2008	-0.11326***	0.05151***	-0.01682*
	(0.026)	(0.010)	(0.009)
Liquidity shock×Year: 2009	-0.13599***	0.06398***	-0.00715
	(0.024)	(0.009)	(0.009)
Liquidity shock×Year: 2010	-0.11522***	0.05231***	-0.00699
	(0.025)	(0.009)	(0.010)
Liquidity shock×Year: 2011	-0.05341**	0.02946***	-0.02212**
	(0.025)	(0.010)	(0.010)
Liquidity shock×Year: 2012	-0.03934	0.02829***	-0.01751*
	(0.025)	(0.010)	(0.009)
Liquidity shock×Year: 2013	-0.02205	0.02451**	-0.01890**
	(0.025)	(0.010)	(0.009)
Liquidity shock×Year: 2014	0.07417**	0.00040	-0.03289***
	(0.033)	(0.012)	(0.012)
Liquidity shock×Year: 2004×Age: 6–10 years	0.00000	0.00000	0.00000
	(0.000)	(0.000)	(0.000)
Liquidity shock×Year: 2005×Age: 6–10 years	0.01919	-0.00673	0.00401
	(0.034)	(0.012)	(0.012)
Liquidity shock×Year: 2006×Age: 6–10 years	-0.04625	0.01060	0.02853**
	(0.036)	(0.012)	(0.012)
Liquidity shock×Year: 2007×Age: 6–10 years	-0.07024**	0.03730***	0.01386
	(0.035)	(0.012)	(0.012)
Liquidity shock×Year: 2008×Age: 6–10 years	-0.04903	0.01883	0.01959
	(0.036)	(0.012)	(0.012)
Liquidity shock×Year: 2009×Age: 6–10 years	-0.12187***	0.03727***	0.02626**
	(0.034)	(0.011)	(0.012)
Liquidity shock×Year: 2010×Age: 6–10 years	-0.12410***	0.04314***	0.02481**
	(0.034)	(0.011)	(0.012)

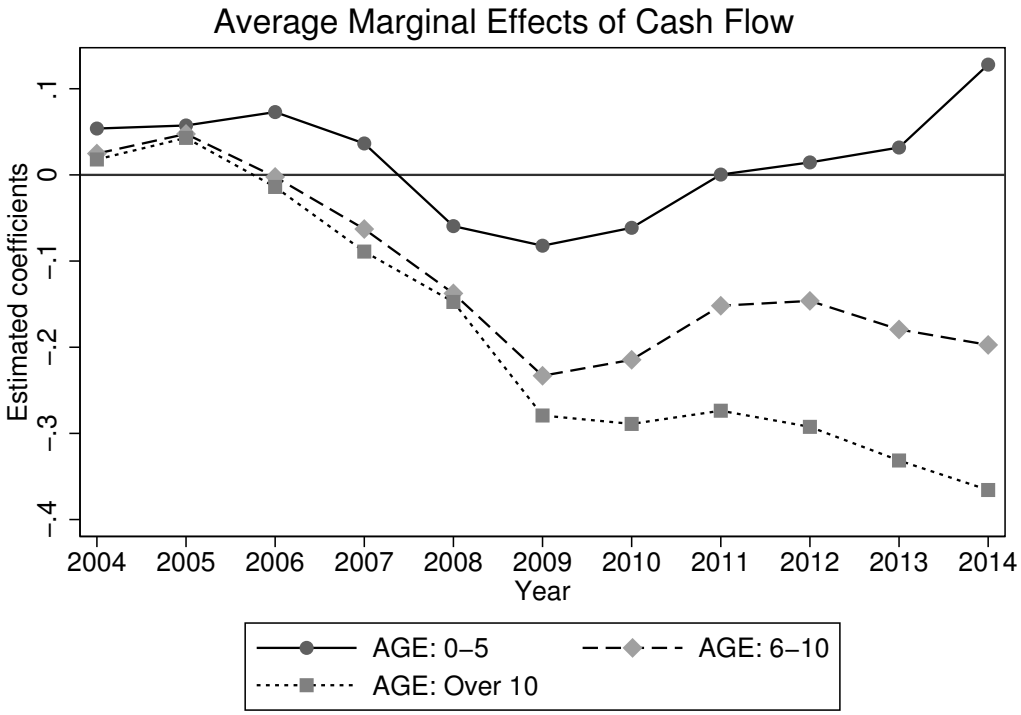
[continued on the next page.]

Liquidity shock×Year: 2011×Age: 6–10 years	-0.12319***	0.05185***	0.03705***
	(0.033)	(0.012)	(0.013)
Liquidity shock×Year: 2012×Age: 6–10 years	-0.13164***	0.05729***	0.02797**
	(0.033)	(0.012)	(0.012)
Liquidity shock×Year: 2013×Age: 6–10 years	-0.18210***	0.06135***	0.03895***
	(0.034)	(0.012)	(0.012)
Liquidity shock×Year: 2014×Age: 6–10 years	-0.29624***	0.09556***	0.05198***
	(0.041)	(0.014)	(0.014)
Liquidity shock×Year: 2004×Age: over 10 years	0.00000	0.00000	0.00000
	(0.000)	(0.000)	(0.000)
Liquidity shock×Year: 2005×Age: over 10 years	0.02152	-0.00209	0.00892
	(0.027)	(0.010)	(0.010)
Liquidity shock×Year: 2006×Age: over 10 years	-0.05097*	0.01891*	0.02006**
	(0.029)	(0.010)	(0.010)
Liquidity shock×Year: 2007×Age: over 10 years	-0.08954***	0.03190***	0.01189
	(0.029)	(0.010)	(0.010)
Liquidity shock×Year: 2008×Age: over 10 years	-0.05208*	0.00988	0.04604***
	(0.029)	(0.010)	(0.010)
Liquidity shock×Year: 2009×Age: over 10 years	-0.16112***	0.01869**	0.03933***
	(0.027)	(0.009)	(0.010)
Liquidity shock×Year: 2010×Age: over 10 years	-0.19166***	0.03569***	0.04462***
	(0.028)	(0.009)	(0.010)
Liquidity shock×Year: 2011×Age: over 10 years	-0.23817***	0.05897***	0.04938***
	(0.027)	(0.010)	(0.010)
Liquidity shock×Year: 2012×Age: over 10 years	-0.27095***	0.07155***	0.04321***
	(0.028)	(0.010)	(0.010)
Liquidity shock×Year: 2013×Age: over 10 years	-0.32729***	0.07681***	0.04093***
	(0.028)	(0.010)	(0.010)
Liquidity shock×Year: 2014×Age: over 10 years	-0.45774***	0.11939***	0.06608***
	(0.035)	(0.012)	(0.012)
Size	0.01482***	0.01417***	0.00847***
	(0.001)	(0.001)	(0.001)
Leverage	0.54877***	0.55539***	0.56700***
	(0.002)	(0.002)	(0.002)
Tangibility	0.00877**	0.00922**	0.01114**
	(0.004)	(0.004)	(0.004)
Sales growth	-0.00772***	-0.01502***	-0.01898***
	(0.000)	(0.000)	(0.000)
Cash holdings	0.00044	-0.01679***	-0.02006***
	(0.004)	(0.004)	(0.005)
Current assets	-0.03533***	-0.04360***	-0.04264***
	(0.004)	(0.004)	(0.005)
Firm fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Year×age fixed effects	Yes	Yes	Yes
Observations	4,304,561	4,304,561	4,304,561
R-squared	0.326	0.323	0.318

[continued on the next page.]

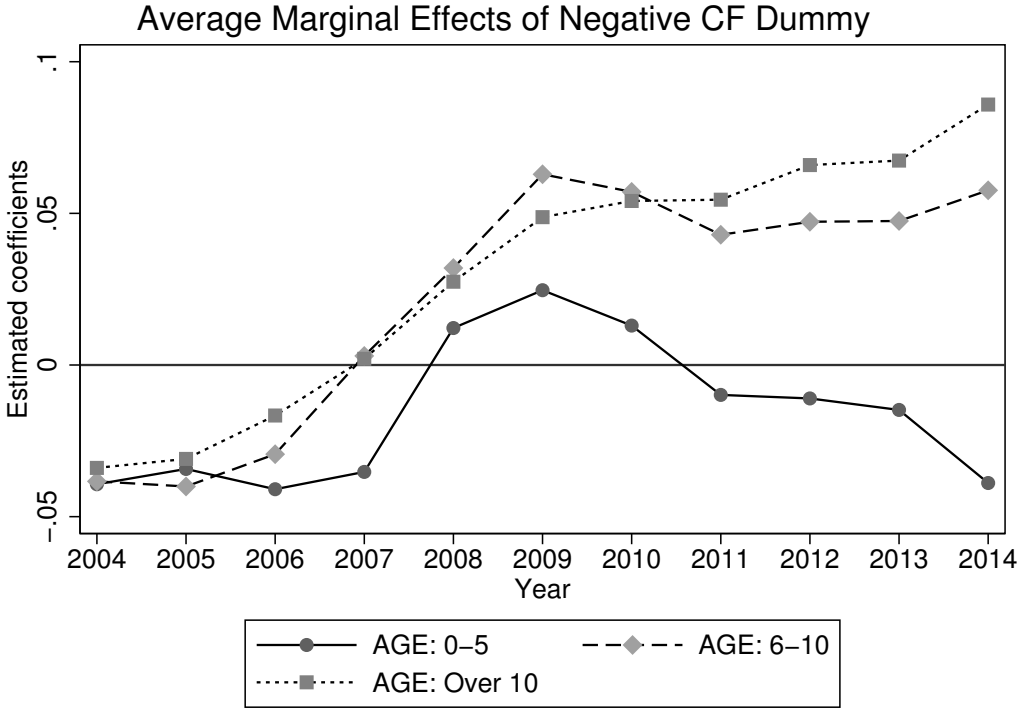
Note: This table presents estimates from the fixed effects regressions with bank borrowings (normalized by a firm's total assets) as the dependent variable. Cash flow is defined as the ratio of a firm's earnings before interest, taxes, depreciation, and amortization (EBITDA) to total assets in year t. The negative CF dummy is defined as a dummy variable that equals one if a firm's cash flow is negative in year t. Liquidity drop is defined as a dummy variable that equals one if a firm's ratio of liquid assets to total assets drops more than 10% in year t. Age is a dummy variable if a firm's age is 6–10 years or over 10 years. Size is the natural logarithm of total assets in year t. Leverage is defined as the book value of debt divided by the book value of assets in year t. Tangibility is defined as the ratio of fixed tangible assets to total assets in year t. Sales growth is defined as the annual change in firm sales [ln(1 + sales in year t) – ln(1 + sales in year t–1)]. Cash holdings are values normalized by total assets in year t. Current assets are defined as the ratio of liquid assets minus cash holdings to total assets in year t. The estimation results for the constant term are omitted. The estimated standard errors are shown in parentheses. The symbols *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Figure 1: Trend of the Estimated Coefficients for Cash Flow on Bank Borrowings



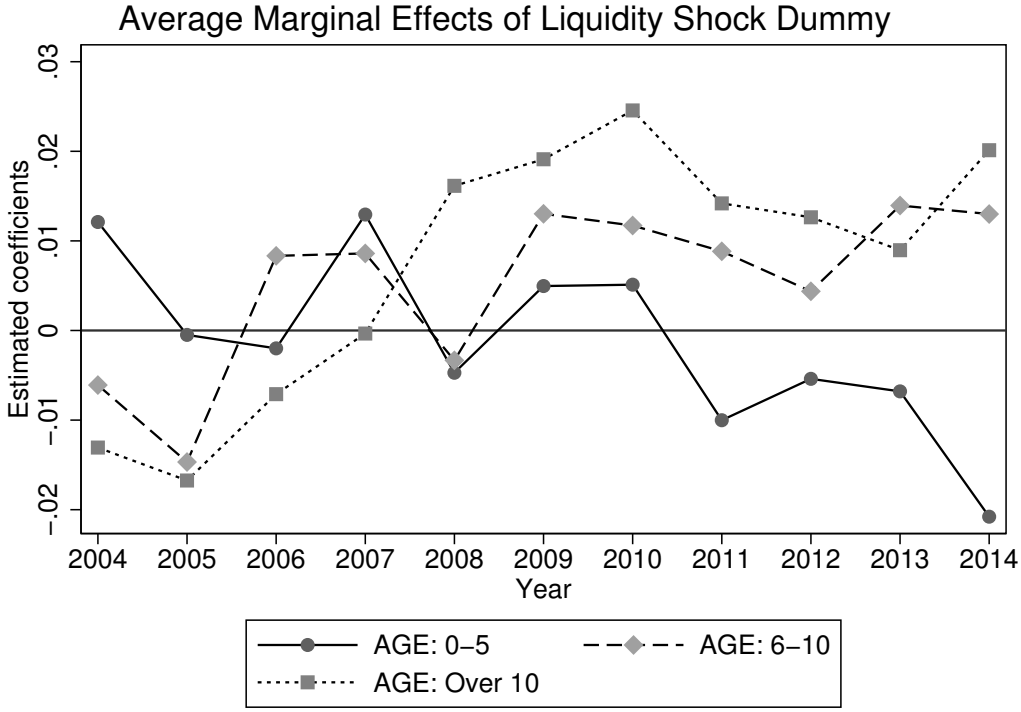
Note: This figure depicts the estimated coefficients of cash flow in Table 3.

Figure 2: Trend of the Estimated Coefficients for the Negative CF Dummy on Bank Borrowings



Note: This figure depicts the estimated coefficients of the negative CF dummy in Table 3.

Figure 3: Trend of the Estimated Coefficients for the Liquidity Drop Dummy on Bank Borrowings



Note: This figure depicts the estimated coefficients of the liquidity drop dummy in Table 3.

Table 4: Estimation Results for the Effects of Liquidity Shocks on Trade Payables

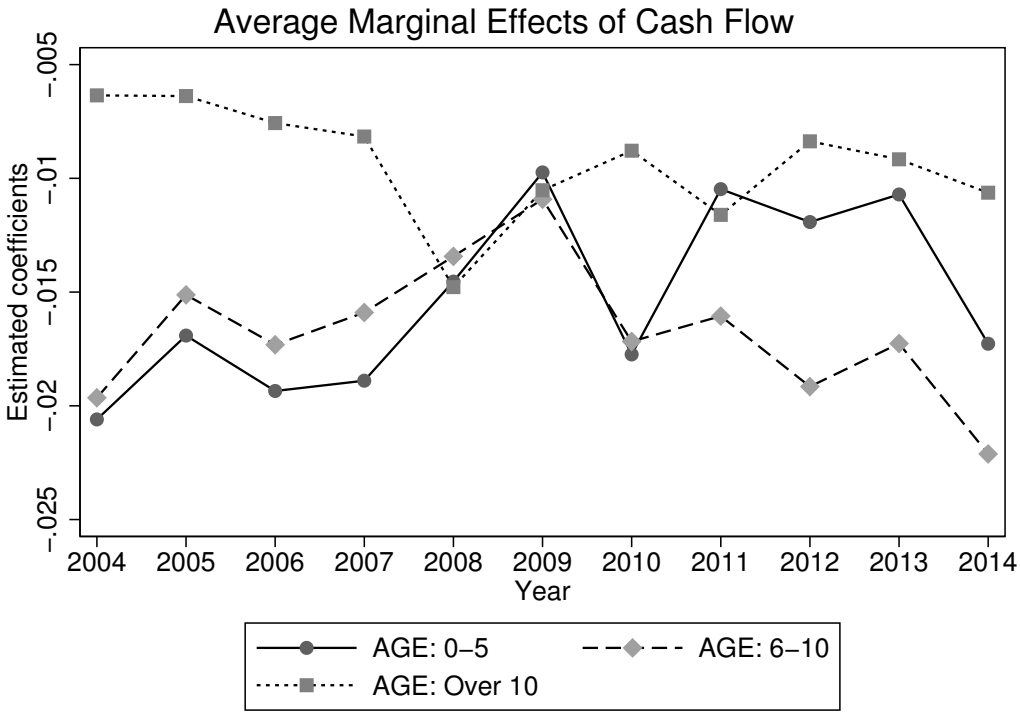
	(1)	(2)	(3)
	Trade payables	Trade payables	Trade payables
	Cash flow	Negative CF	Liquidity drop
Liquidity shock	-0.02060***	0.00163	-0.00725***
	(0.005)	(0.002)	(0.002)
Age: 6–10 years	0.00233**	0.00226**	0.00167
	(0.001)	(0.001)	(0.001)
Age: over 10 years	0.00378***	0.00513***	0.00392***
	(0.001)	(0.001)	(0.001)
Liquidity shock×Age: 6–10 years	0.00095	0.00060	0.00375
	(0.006)	(0.003)	(0.003)
Liquidity shock×Age: over 10 years	0.01425***	-0.00214	0.00357
	(0.005)	(0.002)	(0.002)
Liquidity shock×Year: 2004	0.00000	0.00000	0.00000
	(0.000)	(0.000)	(0.000)
Liquidity shock×Year: 2005	0.00369	0.00255	0.00321
	(0.006)	(0.003)	(0.003)
Liquidity shock×Year: 2006	0.00125	0.00388	0.00488*
	(0.006)	(0.003)	(0.003)
Liquidity shock×Year: 2007	0.00170	0.00549**	0.00458*
	(0.006)	(0.003)	(0.003)
Liquidity shock×Year: 2008	0.00606	0.00220	0.00916***
	(0.006)	(0.003)	(0.003)
Liquidity shock×Year: 2009	0.01086*	-0.00059	0.00735***
	(0.006)	(0.002)	(0.003)
Liquidity shock×Year: 2010	0.00286	0.00404*	0.00832***
	(0.006)	(0.002)	(0.003)
Liquidity shock×Year: 2011	0.01012*	0.00223	0.00774***
	(0.006)	(0.002)	(0.003)
Liquidity shock×Year: 2012	0.00868	0.00309	0.00886***
	(0.006)	(0.003)	(0.003)
Liquidity shock×Year: 2013	0.00989*	0.00178	0.00845***
	(0.006)	(0.003)	(0.003)
Liquidity shock×Year: 2014	0.00333	0.00293	0.01583***
	(0.007)	(0.003)	(0.003)
Liquidity shock×Year: 2004×Age: 6–10 years	0.00000	0.00000	0.00000
	(0.000)	(0.000)	(0.000)
Liquidity shock×Year: 2005×Age: 6–10 years	0.00084	-0.00142	-0.00218
	(0.008)	(0.003)	(0.004)
Liquidity shock×Year: 2006×Age: 6–10 years	0.00108	-0.00270	-0.00449
	(0.008)	(0.003)	(0.003)
Liquidity shock×Year: 2007×Age: 6–10 years	0.00205	-0.00375	-0.00441
	(0.008)	(0.003)	(0.003)
Liquidity shock×Year: 2008×Age: 6–10 years	0.00016	-0.00118	-0.00472
	(0.008)	(0.003)	(0.003)
Liquidity shock×Year: 2009×Age: 6–10 years	-0.00213	0.00073	-0.00466
	(0.007)	(0.003)	(0.003)
Liquidity shock×Year: 2010×Age: 6–10 years	-0.00038	-0.00204	-0.00467
	(0.007)	(0.003)	(0.003)

[continued on the next page.]

Liquidity shock×Year: 2011×Age: 6–10 years	-0.00653	-0.00107	-0.00579*
	(0.007)	(0.003)	(0.003)
Liquidity shock×Year: 2012×Age: 6–10 years	-0.00819	0.00043	-0.00473
	(0.007)	(0.003)	(0.003)
Liquidity shock×Year: 2013×Age: 6–10 years	-0.00751	0.00077	-0.00454
	(0.007)	(0.003)	(0.003)
Liquidity shock×Year: 2014×Age: 6–10 years	-0.00580	0.00233	-0.00834**
	(0.008)	(0.003)	(0.004)
Liquidity shock×Year: 2004×Age: over 10 years	0.00000	0.00000	0.00000
	(0.000)	(0.000)	(0.000)
Liquidity shock×Year: 2005×Age: over 10 years	-0.00372	-0.00216	-0.00019
	(0.007)	(0.003)	(0.003)
Liquidity shock×Year: 2006×Age: over 10 years	-0.00247	-0.00294	-0.00322
	(0.007)	(0.003)	(0.003)
Liquidity shock×Year: 2007×Age: over 10 years	-0.00351	-0.00383	-0.00350
	(0.006)	(0.003)	(0.003)
Liquidity shock×Year: 2008×Age: over 10 years	-0.01449**	0.00160	-0.00699**
	(0.006)	(0.003)	(0.003)
Liquidity shock×Year: 2009×Age: over 10 years	-0.01503**	0.00276	-0.00512*
	(0.006)	(0.002)	(0.003)
Liquidity shock×Year: 2010×Age: over 10 years	-0.00529	-0.00212	-0.00508*
	(0.006)	(0.002)	(0.003)
Liquidity shock×Year: 2011×Age: over 10 years	-0.01538**	0.00015	-0.00533*
	(0.006)	(0.003)	(0.003)
Liquidity shock×Year: 2012×Age: over 10 years	-0.01070*	-0.00148	-0.00641**
	(0.006)	(0.003)	(0.003)
Liquidity shock×Year: 2013×Age: over 10 years	-0.01270**	-0.00050	-0.00683**
	(0.006)	(0.003)	(0.003)
Liquidity shock×Year: 2014×Age: over 10 years	-0.00761	-0.00138	-0.01463***
	(0.007)	(0.003)	(0.003)
Size	-0.01272***	-0.01267***	-0.01287***
	(0.000)	(0.000)	(0.000)
Leverage	0.01661***	0.01707***	0.01733***
	(0.000)	(0.000)	(0.000)
Tangibility	-0.00283***	-0.00305***	-0.00317***
	(0.001)	(0.001)	(0.001)
Sales growth	0.00485***	0.00430***	0.00402***
	(0.000)	(0.000)	(0.000)
Cash holdings	0.00789***	0.00677***	0.00513***
	(0.001)	(0.001)	(0.001)
Current assets	0.04253***	0.04188***	0.04020***
	(0.001)	(0.001)	(0.001)
Firm fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Year×age fixed effects	Yes	Yes	Yes
Observations	4,304,561	4,304,561	4,304,561
R-squared	0.037	0.036	0.036

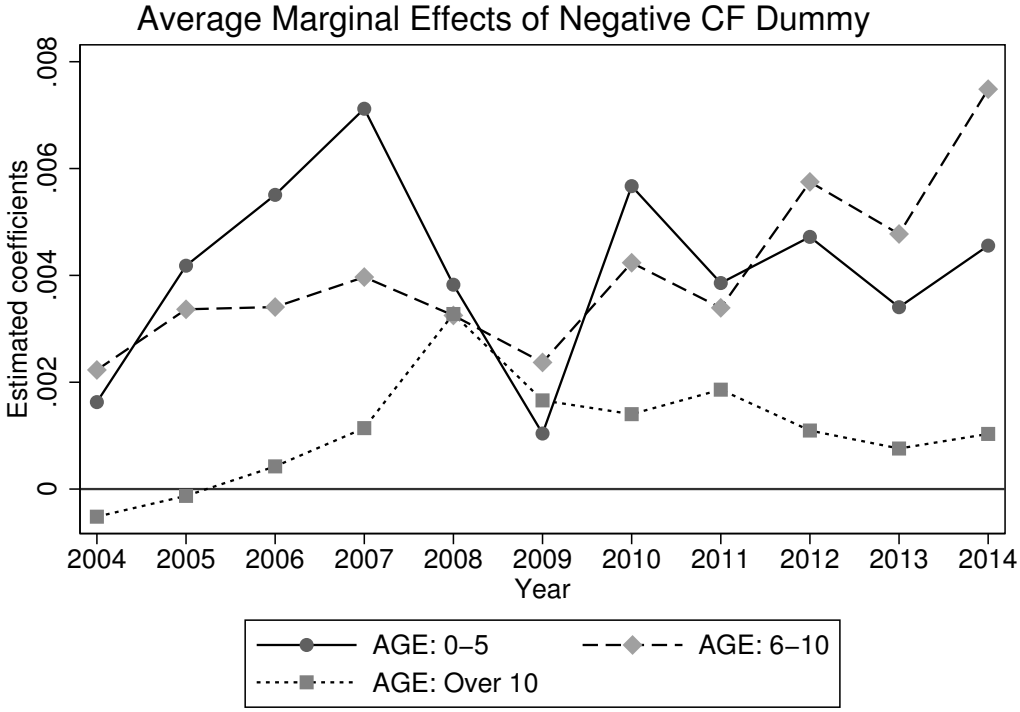
This table presents estimates from the fixed effects regressions with trade payables (normalized by a firm's total assets) as the dependent variable. The definitions of independent variables are the same as those in Table 3. The estimation results for the constant term are omitted. The estimated standard errors are shown in parentheses. The symbols *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Figure 4: Trend of the Estimated Coefficients for Cash Flow on Trade Payables



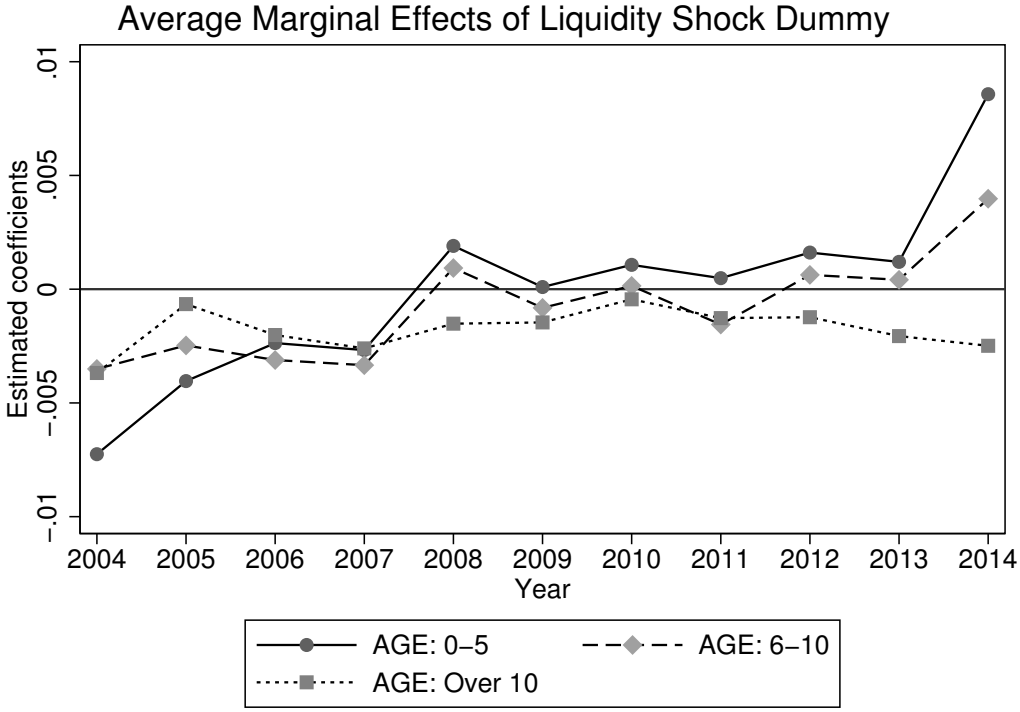
Note: This figure depicts the estimated coefficients of cash flows in Table 4.

Figure 5: Trend of the Estimated Coefficients for the Negative CF Dummy on Trade Payables



Note: This figure depicts the estimated coefficients of the negative CF dummy in Table 4.

Figure 6: Trend of the Estimated Coefficients for the Liquidity Drop Dummy on Trade Payables



Note: This figure depicts the estimated coefficients of the negative CF dummy in Table 4.

Table 5: Estimation Results of the Effects of Liquidity Shocks on Firm Default and Exit

	(1)	(2)	(3)	(4)	(5)	(6)
	Default	Default	Default	Exit	Exit	Exit
Proxy of liquidity shock	Cash flow	Negative CF	Liquidity drop	Cash flow	Negative CF	Liquidity drop
Liquidity shock	0.02644***	-0.00162	-0.00894***	0.06568***	-0.02049***	0.00131
	(0.006)	(0.002)	(0.003)	(0.011)	(0.005)	(0.005)
Age: 6–10 years	0.00397***	0.00359***	0.00290**	0.01959***	0.02036***	0.01998***
	(0.001)	(0.001)	(0.001)	(0.003)	(0.003)	(0.003)
Age: over 10 years	0.01239***	0.01142***	0.01053***	0.05097***	0.05441***	0.05252***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
Liquidity shock×Age: 6–10 years	0.00086	0.00137	0.00527	-0.00099	-0.00860	-0.00874
	(0.007)	(0.003)	(0.004)	(0.014)	(0.006)	(0.007)
Liquidity shock×Age: over 10 years	0.00366	0.00207	0.00786**	0.04557***	-0.01847***	-0.01625***
	(0.006)	(0.003)	(0.003)	(0.012)	(0.005)	(0.005)
Liquidity shock×Year: 2004	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Liquidity shock×Year: 2005	-0.00626	0.00020	0.00711*	-0.01942	0.00248	-0.00608
	(0.007)	(0.003)	(0.004)	(0.014)	(0.006)	(0.007)
Liquidity shock×Year: 2006	-0.00445	-0.00253	-0.00221	-0.03465**	0.00461	-0.01571**
	(0.008)	(0.003)	(0.004)	(0.015)	(0.007)	(0.007)
Liquidity shock×Year: 2007	-0.02356***	0.00428	0.00447	-0.04120***	0.01418**	-0.00680
	(0.007)	(0.003)	(0.004)	(0.014)	(0.006)	(0.007)
Liquidity shock×Year: 2008	-0.01470**	-0.00112	0.00262	-0.04733***	0.01606***	0.00365
	(0.007)	(0.003)	(0.004)	(0.014)	(0.006)	(0.007)
Liquidity shock×Year: 2009	-0.01174*	-0.00163	0.00533	-0.07155***	0.02447***	-0.00482
	(0.007)	(0.003)	(0.004)	(0.014)	(0.006)	(0.007)
Liquidity shock×Year: 2010	-0.01766***	0.00042	0.00428	-0.05147***	0.01618***	-0.00517
	(0.007)	(0.003)	(0.004)	(0.014)	(0.006)	(0.007)
Liquidity shock×Year: 2011	-0.01582**	0.00050	0.00267	-0.05898***	0.02218***	-0.00957
	(0.007)	(0.003)	(0.004)	(0.015)	(0.007)	(0.008)
Liquidity shock×Year: 2012	-0.01733**	0.00056	0.00953***	-0.07615***	0.04628***	-0.00284
	(0.007)	(0.003)	(0.004)	(0.020)	(0.009)	(0.010)
Liquidity shock×Year: 2013	-0.02296***	0.00139	0.01038***			
	(0.007)	(0.003)	(0.004)			
Liquidity shock×Year: 2014	-0.02512***	0.00591	0.01116**			
	(0.008)	(0.004)	(0.004)			
Age: 6–10 years×Year: 2004	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Age: 6–10 years×Year: 2005	0.00307*	0.00185	0.00367**	0.01514***	0.00797**	0.01214***
	(0.002)	(0.002)	(0.001)	(0.003)	(0.003)	(0.003)
Age: 6–10 years×Year: 2006	0.00841***	0.00514***	0.00561***	0.01832***	0.01081***	0.01231***
	(0.002)	(0.002)	(0.002)	(0.004)	(0.003)	(0.003)
Age: 6–10 years×Year: 2007	0.00501***	0.00593***	0.00555***	0.01761***	0.01210***	0.01371***
	(0.002)	(0.002)	(0.002)	(0.004)	(0.004)	(0.003)
Age: 6–10 years×Year: 2008	0.00622***	0.00348*	0.00516***	0.01244***	0.00847**	0.01186***
	(0.002)	(0.002)	(0.002)	(0.004)	(0.004)	(0.003)
Age: 6–10 years×Year: 2009	0.00432**	0.00228	0.00409**	0.00316	0.00082	0.00201
	(0.002)	(0.002)	(0.002)	(0.004)	(0.004)	(0.003)
Age: 6–10 years×Year: 2010	0.00023	-0.00155	-0.00018	-0.01316***	-0.01881***	-0.01565***
	(0.002)	(0.002)	(0.002)	(0.004)	(0.004)	(0.004)
Age: 6–10 years×Year: 2011	-0.00220	-0.00450***	-0.00274*	-0.03568***	-0.03994***	-0.03967***
	(0.002)	(0.002)	(0.002)	(0.004)	(0.004)	(0.004)
Age: 6–10 years×Year: 2012	-0.00626***	-0.00751***	-0.00577***	-0.07972***	-0.07619***	-0.07887***
	(0.002)	(0.002)	(0.002)	(0.005)	(0.005)	(0.005)
Age: 6–10 years×Year: 2013	-0.00713***	-0.00886***	-0.00650***			
	(0.002)	(0.002)	(0.002)			
Age: 6–10 years×Year: 2014	-0.01053***	-0.01164***	-0.00959***			
	(0.002)	(0.002)	(0.002)			

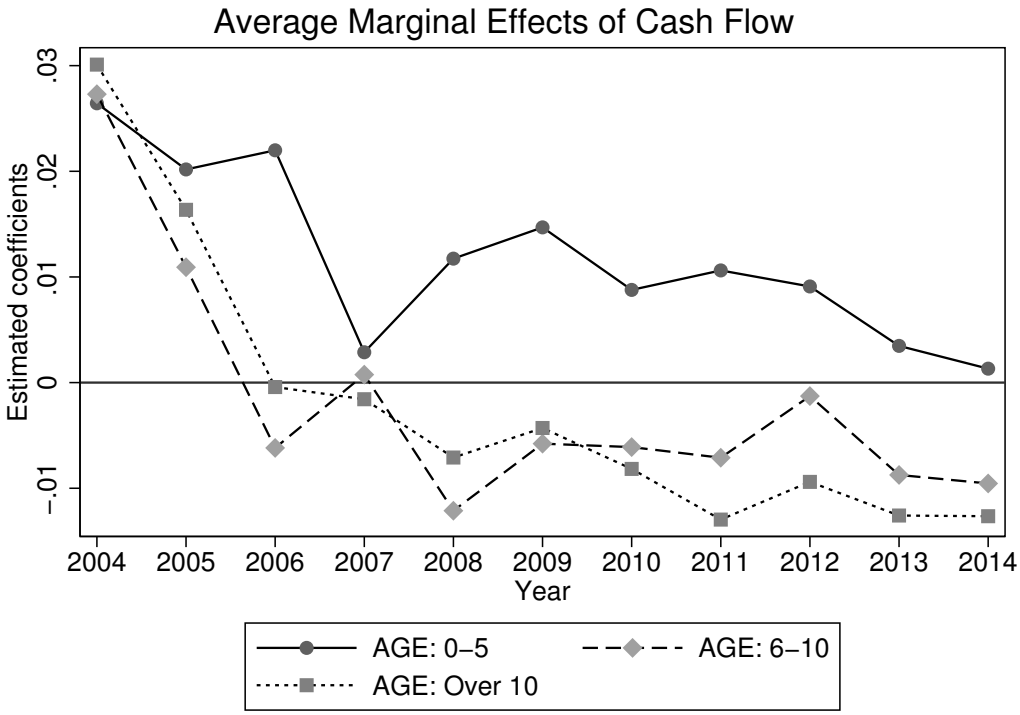
[continued on the next page.]

Age: over 10×Year: 2004	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Age: over 10×Year: 2005	0.00312**	0.00292**	0.00400***	0.01088***	0.00306	0.00670***
	(0.001)	(0.001)	(0.001)	(0.003)	(0.003)	(0.003)
Age: over 10×Year: 2006	0.00541***	0.00326**	0.00405***	0.00965***	0.00018	0.00395
	(0.002)	(0.002)	(0.001)	(0.003)	(0.003)	(0.003)
Age: over 10×Year: 2007	0.00078	0.00179	0.00176	0.00665**	-0.00060	0.00208
	(0.002)	(0.002)	(0.001)	(0.003)	(0.003)	(0.003)
Age: over 10×Year: 2008	-0.00134	-0.00287*	-0.00151	-0.00671**	-0.01482***	-0.00942***
	(0.002)	(0.002)	(0.001)	(0.003)	(0.003)	(0.003)
Age: over 10×Year: 2009	-0.00243	-0.00420***	-0.00168	-0.01993***	-0.02525***	-0.02275***
	(0.002)	(0.002)	(0.001)	(0.003)	(0.003)	(0.003)
Age: over 10×Year: 2010	-0.00733***	-0.00875***	-0.00670***	-0.04563***	-0.05617***	-0.04926***
	(0.002)	(0.002)	(0.001)	(0.003)	(0.003)	(0.003)
Age: over 10×Year: 2011	-0.01202***	-0.01404***	-0.01208***	-0.08501***	-0.09461***	-0.08969***
	(0.002)	(0.002)	(0.002)	(0.004)	(0.004)	(0.004)
Age: over 10×Year: 2012	-0.01704***	-0.01882***	-0.01602***	-0.14584***	-0.14872***	-0.14842***
	(0.002)	(0.002)	(0.002)	(0.005)	(0.005)	(0.005)
Age: over 10×Year: 2013	-0.02273***	-0.02441***	-0.02127***			
	(0.002)	(0.002)	(0.002)			
Age: over 10×Year: 2014	-0.02890***	-0.02982***	-0.02735***			
	(0.002)	(0.002)	(0.002)			
Liquidity shock×Year: 2004	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
×Age: 6–10	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Liquidity shock×Year: 2005	-0.01012	0.00331	-0.00792	-0.03415*	0.02660***	0.00805
×Age: 6–10	(0.009)	(0.004)	(0.005)	(0.019)	(0.008)	(0.009)
Liquidity shock×Year: 2006	-0.02903***	0.00695*	0.00769	-0.04538**	0.02550***	0.02556***
×Age: 6–10	(0.010)	(0.004)	(0.005)	(0.020)	(0.008)	(0.009)
Liquidity shock×Year: 2007	-0.00298	-0.00412	-0.00324	-0.03928**	0.01883**	0.01586*
×Age: 6–10	(0.010)	(0.004)	(0.005)	(0.019)	(0.008)	(0.009)
Liquidity shock×Year: 2008	-0.02472**	0.00620	0.00013	-0.02400	0.01634**	0.00125
×Age: 6–10	(0.010)	(0.004)	(0.005)	(0.019)	(0.008)	(0.009)
Liquidity shock×Year: 2009	-0.02133**	0.00442	0.00018	-0.00855	0.01295*	0.01224
×Age: 6–10	(0.009)	(0.004)	(0.005)	(0.018)	(0.007)	(0.009)
Liquidity shock×Year: 2010	-0.01574*	0.00399	0.00270	-0.01472	0.02254***	0.02235**
×Age: 6–10	(0.009)	(0.004)	(0.005)	(0.018)	(0.008)	(0.009)
Liquidity shock×Year: 2011	-0.01859**	0.00521	0.00031	-0.02277	0.01689**	0.03091***
×Age: 6–10	(0.009)	(0.004)	(0.005)	(0.019)	(0.008)	(0.010)
Liquidity shock×Year: 2012	-0.01124	0.00249	-0.00498	0.01879	-0.00403	0.00938
×Age: 6–10	(0.009)	(0.004)	(0.005)	(0.023)	(0.010)	(0.011)
Liquidity shock×Year: 2013	-0.01308	0.00415	-0.00709			
×Age: 6–10	(0.009)	(0.004)	(0.005)			
Liquidity shock×Year: 2014	-0.01173	0.00181	-0.00950*			
×Age: 6–10	(0.010)	(0.004)	(0.005)			
Liquidity shock×Year: 2004	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
×Age: over 10	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Liquidity shock×Year: 2005	-0.00748	0.00050	-0.00649	-0.06933***	0.02717***	0.01704**
×Age: over 10	(0.008)	(0.003)	(0.004)	(0.016)	(0.007)	(0.008)
Liquidity shock×Year: 2006	-0.02607***	0.00540	0.00173	-0.08123***	0.03504***	0.02386***
×Age: over 10	(0.008)	(0.003)	(0.004)	(0.016)	(0.007)	(0.008)
Liquidity shock×Year: 2007	-0.00810	-0.00314	-0.00522	-0.08153***	0.02624***	0.02132***
×Age: over 10	(0.008)	(0.003)	(0.004)	(0.015)	(0.007)	(0.008)
Liquidity shock×Year: 2008	-0.02248***	0.00409	-0.00100	-0.08220***	0.03067***	0.01167
×Age: over 10	(0.008)	(0.003)	(0.004)	(0.016)	(0.006)	(0.007)
Liquidity shock×Year: 2009	-0.02264***	0.00450	-0.00382	-0.06197***	0.02338***	0.02238***
×Age: over 10	(0.007)	(0.003)	(0.004)	(0.015)	(0.006)	(0.007)
Liquidity shock×Year: 2010	-0.02060***	0.00361	-0.00208	-0.09054***	0.03730***	0.02291***
×Age: over 10	(0.007)	(0.003)	(0.004)	(0.015)	(0.006)	(0.008)
Liquidity shock×Year: 2011	-0.02724***	0.00476	0.00020	-0.08640***	0.03530***	0.03100***
×Age: over 10	(0.007)	(0.003)	(0.004)	(0.016)	(0.007)	(0.008)
Liquidity shock×Year: 2012	-0.02216***	0.00439	-0.00910**	-0.05136**	0.01651*	0.02699***
×Age: over 10	(0.007)	(0.003)	(0.004)	(0.021)	(0.009)	(0.010)
Liquidity shock×Year: 2013	-0.01971***	0.00492	-0.01114***			
×Age: over 10	(0.007)	(0.003)	(0.004)			
Liquidity shock×Year: 2014	-0.01762**	0.00217	-0.01163***			
×Age: over 10	(0.009)	(0.004)	(0.005)			
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,255,674	4,255,674	4,255,674	3,426,263	3,426,263	3,426,263
R-squared	0.017	0.017	0.017	0.060	0.060	0.060

[continued to the next page.]

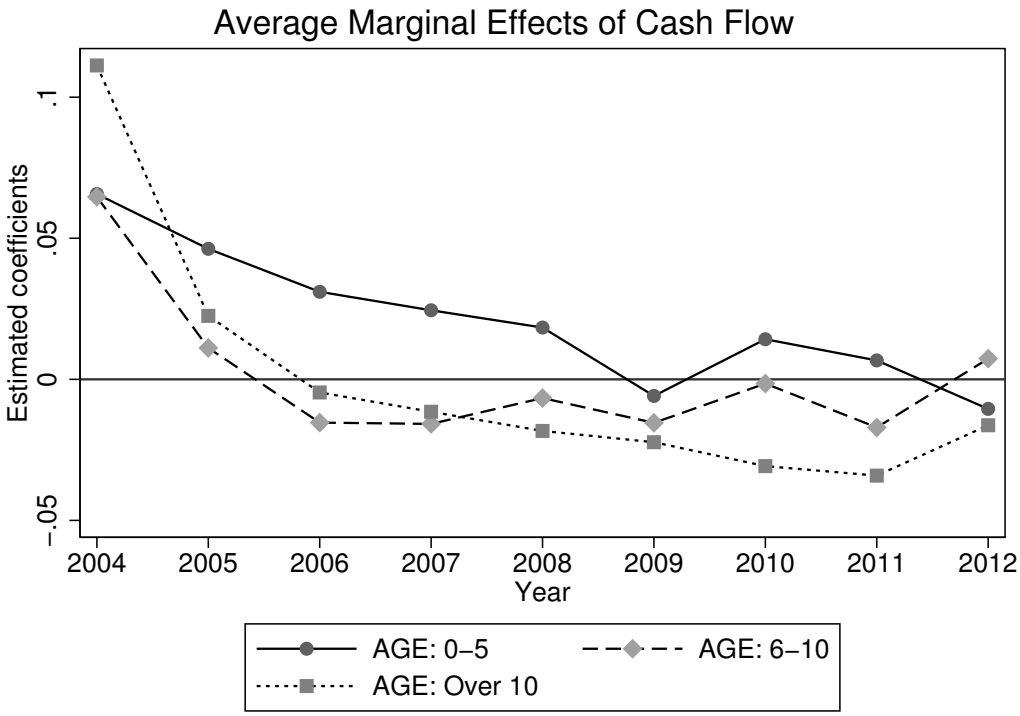
This table presents estimates from the fixed effects regressions with default or exit as the dependent variable. Default is a dummy variable that takes a value of one if firms delay loan payments by more than three months, are bankrupt or virtually bankrupt borrowers, and/or are borrowers for which credit guarantee corporations subrogated between years t and t+1. Exit is a dummy variable that takes a value of one if we do not observe the data in years t+1 and t+2, and zero otherwise. The definitions of independent variables are the same as those in Table 3. The estimation results for the constant terms, size, leverage, tanigibility, sales growth, cash holdings, and current assets are omitted. The estimated standard errors are shown in parentheses. The symbols *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Figure 7: Trend of the Estimated Coefficients for Cash Flow on Default



Note: Note: This figure depicts the estimated coefficients of cash flow on default in Table 5.

Figure 8: Trend of the Estimated Coefficients for Cash Flow on Exit



Note: Note: This figure depicts the estimated coefficients of cash flow on exit in Table 5.

Research Institute of Economic Science
College of Economics, Nihon University

1-3-2 Kandamisaki-cho, Chiyoda-ku, Toyko 101-8360 JAPAN
Phone: 03-3219-3309　Fax: 03-3219-3329
E-mail: keikaken.eco@nihon-u.ac.jp
http://www.eco.nihon-u.ac.jp/research/economic/