SVERIGES RIKSBANK
WORKING PAPER SERIES

320

Curbing Shocks to Corporate Liquidity: The Role of Trade Credit

Niklas Amberg, Tor Jacobson, Erik von Schedvin and Robert Townsend

May 2016

WORKING PAPERS ARE OBTAINABLE FROM

www.riksbank.se/en/research
Sveriges Riksbank • SE-103 37 Stockholm
Fax international: +46 8 21 05 31
Telephone international: +46 8 787 00 00

Curbing Shocks to Corporate Liquidity: The Role of Trade Credit*

Niklas Amberg† Tor Jacobson‡ Erik von Schedvin§ Robert Townsend¶

Sveriges Riksbank Working Paper Series

No. 320

May, 2016

Abstract

Using data on exogenous liquidity losses generated by the fraud and failure of a cash-in-transit firm, we demonstrate a causal impact on firms' trade credit usage. We find that firms manage liquidity shortfalls by increasing the amount of drawn credit from suppliers and decreasing the amount issued to customers. The compounded trade credit adjustments are at least as great, if not greater than corresponding adjustments in cash holdings, suggesting that trade credit positions are economically important sources of reserve liquidity. The underlying mechanism in trade credit adjustments is in part due to shifts in credit durations—both upstream and downstream.

Keywords: Liquidity management; Trade credit; Risk sharing

JEL: D22; G30

*Discussions with and suggestions from Vicente Cuñat and Tore Ellingsen, as well as seminar and conference participants at Sveriges Riksbank, Lund University, and the 2015 Norges Bank Conference on Banking and Financial Intermediation have been very helpful in improving upon earlier drafts. We are also grateful for the generous data support provided by Upplysningscentralen AB. Special thanks to Lars-Henric Andersson at Lindahl law firm in Stockholm, appointed trustee of the Panaxia bankruptcy estate, for sharing his deep insights about this complex event. Townsend gratefully acknowledges research support from Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD and Private Enterprise Development in Low-Income Countries (PEDL). We assume full responsibility for any and all errors in the paper. The opinions expressed in this article are the sole responsibility of the author(s) and should not be interpreted as reflecting the views of Sveriges Riksbank.

†Department of Economics, Stockholm School of Economics. Email: Niklas.Amberg@hhs.se.

‡Research Division, Sveriges Riksbank. Email: Tor.Jacobson@riksbank.se.

§Research Division, Sveriges Riksbank. Email: Erik.vonSchedvin@riksbank.se.

¶Department of Economics, Massachusetts Institute of Technology. Email: RTownsen@mit.edu.

1 Introduction

Do firms use their trade credit positions to handle shortfalls in liquidity? Theoretical and empirical research has shown that corporate cash holdings play a prominent role in firms' liquidity management by ensuring funding of future investments, see, e.g., Almeida, Campello, and Weisbach (2004), and as a buffer against shortfalls in liquidity, see Acharya, Davydenko, and Strebulaev (2012). It is intuitive that firms' choices of buffer liquidity levels hinge on a range of capital structure attributes; bankruptcy risk and cash flow volatility to mention two prime candidates, and obviously also to what extent firms can access outside funding, be it market or bank financing, cf. Sufi (2007). Less recognized is that firms' trade credit positions give rise to sizable financial assets and liabilities on their balance sheets, and thereby provide opportunities for firms to extract liquidity from their suppliers and customers by adjusting these positions; for instance, by postponing payments on their trade credit obligations (accounts payable), or by promoting prompt payments on their trade credit claims (accounts receivable).

It is thus conceivable that adjustment capacity at the trade credit margins—next to cash holdings—can potentially function as an important source of reserve liquidity. This perspective has in part been put forward by Wilner (2000) and Cuñat (2007), who propose that trade credit networks can function as a liquidity insurance mechanism by allocating liquidity from suppliers to constrained counterparties further down the supply chain; that is, firms' ability to exploit their accounts payable to accrue liquidity.[1] Cuñat (2007) argues that suppliers, incentivized by the rents from maintaining long-term relationships, may choose to support downstream counterparties that experience temporary liquidity shocks. The idea is that firms experiencing a liquidity shock can offset the impact by postponing payments on the trade credit claims held by its suppliers, a temporary default if you will; or, alternatively, by increasing the maturity of future trade credit contracts; both measures will generate liquidity, without necessarily affecting the volume of input purchases. Here we go one step further to envision an insurance mechanism, in which upstream and downstream firms are connected to each other as if in an implicit risk sharing arrangement. We suggest that such a liquidity insurance mechanism may operate symmetrically, by also allocating liquidity from unconstrained customers to otherwise constrained counterparties further up the supply chain; that is, firms can manage their accounts receivable to generate liquidity. We should, from the downstream perspective, expect that firms can seek to generate additional liquidity by reducing the amount of issued trade credit to their customers by reversing the measures that apply upstream; i.e., either reducing net days on issued trade credit contracts, or by proactive monitoring and management of

[1] Closely related, Boissay and Gropp (2013) empirically show that firms experiencing late customer payments are more likely to postpone their own payments to suppliers, illustrating that trade credit chains may function as an insurance mechanism against liquidity shocks.

outstanding contracts to avoid overdue customer payments.

More generally one can envision that firms in a risk sharing network are subject to idiosyncratic, firm-specific shocks and to sectoral or macro aggregate shocks. If there were no obstacles to such risk sharing, idiosyncratic shocks would be pooled away, internally, within the network, leaving management of aggregate shocks to group level cash management or to external formal bank relationships. No doubt in practice there are obstacles to and hence more limited risk sharing; obstacles such as limited information and limited commitment. In particular, firms may threaten non-cooperation, e.g., to pull out of the network if they are unwilling to provide the requisite liquidity of the implicit sharing rules. But such a threat might be mitigated by potential loss of established relationships within the current supply chain, given pre-established specificity in inputs, tailored monitoring technologies, and so on. Risk sharing is better, the more specific these relationships are. Nevertheless, threats may not be sufficient, and on some paths of shock realizations firms will file legal claims for recovery or be forced themselves to consider bankruptcy. In sum, we are allowing both an ex ante risk sharing perspective and an ex post contagion perspective, simultaneously. This then is the overall framework we have in mind. Which of these various forces we can plausibly identify in data is the empirical quest of this paper.

The main challenge is to demonstrate that adjustments at trade credit margins can be caused by firms' increased liquidity needs, while ruling out potentially confounding factors, such as changes in demand and supply conditions in the supply-chain. We conduct the empirical analyses on two primary data sets. On the one hand, we use a population-wide data set on Swedish corporate firms. For our purpose, this data set has two distinct advantages. Firstly, for a (small) sub-sample of the firms, we can evaluate the impact of exogenous liquidity shocks imposed by the fraud and failure of a large cash-in-transit firm. Secondly, the data set covers the universe of Swedish firms, which enables an evaluation covering the full spectrum of firms, from very small firms to large ones. On the other hand, we make use of the familiar Compustat data for very large, publicly traded U.S. corporations, which have been used in many previous empirical contributions to this literature. By conducting the empirical analyses—when possible—on two data sets that concern hugely divergent firm-sizes, we hope to achieve results that are general in nature and not size-, nor country-specific.

The empirical setup comprises three steps. Firstly, simply to quantify orders of magnitude, we apply a variance decomposition approach similar to that proposed by Asdrubali, Sorensen, and Yosha (1996). The variance decomposition framework allows us to evaluate the extent to which variations in cash flow shortfalls are associated with shifts in various asset and liability components of firms' balance sheets. Our findings suggest that cash flow shortfalls are indeed associated with drawdowns in cash holdings and reductions in the amounts of issued trade credit to customers, but the amount of drawn trade credit from suppliers also decreases, which is counterintuitive from a liquidity perspective. However, one pressing concern for the interpretation of the variance decomposition estimates is that they may reflect shifts in demand and supply conditions—over and above increased liquidity needs—which points to a quest for causal inference.

Secondly—which brings us to our main contribution—we examine effects of alternative, and arguably exogenous, liquidity shocks. To this end, we make use of Abadie and Imbens (2006) nearest-neighbor matching approach to explore the liquidity shocks that the fraudulent scheme and subsequent bankruptcy event of the Swedish cash-in-transit firm Panaxia imposed on its corporate clients. We can compare the adjustments in cash holdings and trade credit positions in response to these liquidity shocks for the clients—the treated firms—with the adjustments undertaken by a group of control firms. This event thus allows us to establish a plausible exogenous and causal inference for the role of trade credit in firms' liquidity management. Moreover, using data on applications for issuance of injunction to settle overdue trade debt, we can examine the nature of firms' behavior underlying trade credit adjustments: namely, that reserve liquidity is extracted upstream by postponement of trade credit payments to suppliers, and downstream by attempting enforcement of repayment of overdue debt from customers.

The Panaxia event study provides a slightly different picture, as to the relative importance of the liquidity sources that we are interested in. Contrary to the previous variance decomposition results, we find that both trade credit margins play important roles and increases in accounts payable are more pronounced than reductions in accounts receivable, while adjustments in cash-holdings remain important. Moreover, the compounded adjustment from the two trade credit margins—the increase in drawn credit, plus the reduction in outstanding credit—is of a similar magnitude as the adjustment in cash holdings, suggesting that trade credit margins make for important sources of reserve liquidity.

We go on to investigate the underlying mechanism of the adjustments in trade credit positions and find that they in part are due to shifts in trade credit durations—both upstream and downstream. More specifically, the propensity to default on due trade credit increases for firms that are hit by the liquidity shock, which is consistent with the documented increase in accounts payable. Likewise, treated firms also tend to increase efforts to enforce payment of overdue trade credit from their customers, which is consistent with the observed reductions in receivables. Moreover, the complexity of the event gives rise to differential treatments, which can be exploited for identification. Thus, a sub-group of the treated firms were only exposed to the fraudulent scheme undertaken by Panaxia, but did not suffer losses in its subsequent failure. By using this variation in treatment, and also the variation in loss-size across the firms in the sub-group receiving full treatment, we confirm the intuitively appealing notion that larger adjustments in trade credit positions result, when firms are exposed to more liquidity distress.

In our final empirical section, we return to measuring firms' liquidity needs by means of cash flow shortfalls. We do so by regressing cash flow shortfalls on changes in cash holdings, and on changes in trade credit positions, while controlling for demand conditions in the supply-chain, and a host of other potentially important factors. This setup enables a broad characterization of firms' usage of liquidity sources and thereby provides an evaluation of the external validity of our event study results. The conditional model results for both Swedish and U.S. firms align closely with the previous exogenous liquidity shock results; firms subject to shortfalls in cash flow reduce their cash holdings, considerably increase their accounts payable, and moderately reduce their accounts receivable. The compounded adjustments at the trade credit margins are greater than corresponding adjustments in cash holdings. Thus, these results suggest that the observed responses in firms' trade credit margins are general in nature.

This paper aims to contribute to the vast literature on firms' choices of cash holdings, and liquidity management in general. Influential papers include Opler, Pinkowitz, Stulz, and Williamson (1999), Almeida et al. (2004), and Bates, Kahle, and Stulz (2009), which study firms' choices of cash holdings in light of their access to external funding.[2] Our paper is also close to Acharya et al. (2012), who investigate the relationship between firms' cash holdings and their default risks, suggesting a positive one. That is, all else equal, higher default risks incentivize firms to hold more cash, to safeguard against adverse liquidity shocks. We emphasize that firms—in addition to cash holdings and external financing—have trade credit assets and liabilities that can be transformed into liquidity. To better understand how firms handle liquidity shocks, it is therefore important to also account for their trade credit positions.

As noted above, the role of trade credit for firms' liquidity management has partly been put forward by Cuñat (2007), who proposes that trade credit links function as a liquidity insurance mechanism by allocating liquidity from unconstrained suppliers to constrained customers in the form of accounts payable. Cuñat shows empirically that large declines in firms' cash holdings are correlated with increases in their accounts payable. Our paper extends this view by providing causal insights on how liquidity shocks impact on firms' cash and trade credit positions—both upstream and downstream—enabling an evaluation of the relative importance of these liquidity sources.

Another partly related literature considers the role of liquidity provisioning within business groups, see, e.g., Almeida, Kim, and Kim (2015), Gopalan, Nanda, and Seru (2007), Karaivanov, Ruano, Salas, and Townsend (2010), Samphantharak (2009). Gopalan et al. (2007), for example, show that firms be-

[2] See Almeida, Campello, Cunha and Weisbach (2014) for a comprehensive overview of this literature.

longing to business groups engage in risk sharing where inter-group cash transfers is used to support distressed firms within the group. Furthermore, on the household side, Kinnan and Townsend (2012) use data on rural Thai households and show that indirect access to bank financing, through inter-household borrowing, mitigates income risk by reducing the association between income fluctuations and consumption. In analogy, our results suggest that firms engage in risk sharing through informal ties with their suppliers and customers in the supply-chain. However, liquidity provisioning in trade credit networks is nevertheless also associated with costs. Such costs have been highlighted in the financial network literature, arguing that counterparty exposures may cause shock propagation and—in extension—potential systemic failure, see, e.g., Allen and Gale (2000) and Acemoglu, Ozdaglar, and Tahbaz-Salehi (2015). Empirically, from a trade credit perspective, Jacobson and von Schedvin (2015) use Swedish firm data similar to the current data to study firm-failure propagation in trade credit chains. They show that suppliers who are exposed to credit losses due to failing customers, are in turn subject to an elevated risk of failure. Hence, the financial networks of suppliers and customers arising through trade credit have two closely related features; ex-ante risk sharing through liquidity provisioning, on the one hand, and ex-post failure propagation on the other.

The remainder of this paper is structured as follows. The next section details our various data resources, and provides some descriptive statistics. Section 3 presents the variance decomposition analysis and results. In Section 4 we describe the results from the analyses of the liquidity shocks from the fraud and failure event of the cash-in-transit firm Panaxia. Section 5 covers modeling of cash flow shortfalls, and an exploration of cross-sectional heterogeneity. Section 6 concludes.

2 Data and Descriptive Statistics

As described in the previous section, our empirical analysis involves firm-level data from both Sweden and the U.S.. The two data sets concern firms that are widely different in scope and size, yet they separately bring onboard distinct features; but nevertheless, as we will subsequently demonstrate, they often yield strikingly similar results. The Swedish data set covers the entire corporate sector (currently some 330,000 firms in the stock) and is dominated by small- and medium-sized enterprises. Importantly, it allows for an evaluation of the exogenous liquidity shortfalls generated by the Panaxia event. That is, for a small sub-sample of Swedish, mostly retail, firms we are able to consider effects of an exogenous liquidity shock caused by the fraud and failure of a large cash-in-transit firm, for which we believe identification is unambiguous. Furthermore, the U.S. Compustat data cover large public corporations and serve as a useful benchmark that facilitates interpretations of our results in the light of the empirical literature hitherto. In what follows, we provide the details of our data sources.

2.1 Swedish data

The Swedish firm data set is an unbalanced panel consisting of almost 4.7 million yearly observations on the stock of (on average over time) roughly 270,000 Swedish *aktiebolag*, or corporate firms, as recorded between January 1, 1989, and December 31, 2013, hence covering a period of 25 years. *Aktiebolag* are by approximation the Swedish equivalent of corporations in the U.S., or limited liability businesses in the U.K.. Swedish law requires every *aktiebolag* to hold in equity a minimum of SEK 100,000 (approximately USD 15,000) to be eligible for registration at Bolagsverket, the Swedish Companies Registration Office (SCRO). Swedish corporate firms are also required to submit an annual financial statement to the SCRO, covering balance-sheet and income-statement data in accordance with the European Union standards. The financial statements, provided to us by Upplysningscentralen AB (UC), the leading credit bureau in Sweden, constitute the backbone of the panel data set analyzed below. In Sweden, as in many other countries, firms have considerable discretion in choosing a time period for which their financial statements will apply. A large fraction of the firm-year observations in our sample concern fiscal periods starting in the middle of a calendar year. We deal with this by interpolating the financial statements so that their fiscal periods align with calendar years.[3] Firms with total assets and real sales below SEK 100,000 (deflating by means of consumer prices, using year 2010 prices as a basis), financial firms, and utilities are omitted. In order to avoid detrimental effects from outlier observations, all firm-specific variables are winsorized with respect to the 1st and the 99th percentiles. In addition, in order to ensure that the sample is the same across all specifications, we drop firm-years that lack necessary data points for one or several of our specifications.

2.2 The cash-in-transit firm Panaxia, its fraud and failure

The literature to which this paper aims to contribute, is concerned with the effects of liquidity shocks. Empirical contributions—including the current paper—have to this end often made use of shortfalls in

[3] The data set, or similar versions of it, has been used extensively in previous research, c.f. Jacobson, Lindé, and Roszbach (2013), Giordani, Jacobson, Villani, and von Schedvin (2014) and Jacobson and von Schedvin (2015) for more details on the data. In particular, Giordani et al. provides an account of how the financial statements have been transformed to conform to standardized calendar year fiscal periods. The shares of shorter (less than 12 months) and longer (more than 12 months) statements are both around 5 percent. Whereas shorter than the stipulated minimum of 6 months happen, statements covering a longer period than the allowed maximum of 18 months are very rare. Over time, the annual shares of shorter/longer statement periods have come down from about 8 percent to currently around 4 percent. Thus, an overwhelming majority of statements concern a period of 12 months. However, out of the 90 percent of the total number of statements, only 48 percentage points coincide with a calendar year, and hence 42 percentage points refer to other 12 month periods. In these calculations we have allowed for a given calendar year to begin in mid-December the previous year, and end in mid-January the following year.

firms' cash flows as a proxy measure. Not necessarily because this is an ideal measure of events whose impact we want to gauge, but rather because shifts in cash flow can readily be calculated for all firms in the samples employed. However, considerable allowance for potential endogeneity issues is called for; cash flow shortfalls may well reflect adverse shifts in demand conditions in the supply-chain, as well as aging and depreciating capital stocks resulting in declining productivity. In search for a cleaner—or more exogenous, if you will—measure of shocks to liquidity, we will evaluate the case of the Swedish cash-in transit firm Panaxia, its fraudulent behavior and subsequent failure in 2012—with dire consequences for its customers. The triggered losses were non-negligible, taken as shares of customers' total assets, and it can be argued that the surprise element was almost complete, suggesting an exogenous event that is close in nature to the concept of an economic shock. Although it is a matter of a one-time event affecting a relatively small number of firms, we can nevertheless use it to establish causality for the mechanisms gearing firms liquidity positions that we wish to unravel.

Panaxia was one of three leading cash-in-transit firms operating in Sweden. It serviced its customers—mostly, but not exclusively, in the retail sector—by collecting their daily receipts at their premises. Collected receipts were then delivered to a bank depot for counting, and within one to two days, Panaxia credited the firms' bank accounts for the due funds. That is, according to the contracts between Panaxia and its customers, the latter would upon handing over the cash for transportation to the depot hold a claim on the former, until a transfer of funds to the customers' bank accounts had been carried out within a maximum of two days.

In 2009, Panaxia faced financial distress in the form of a drastic contraction in the lending provided by its creditors. This was a consequence of rising operational losses—in turn, the result of an aggressive pricing strategy designed to increase Panaxia's market shares. To counteract the contraction in external financing, Panaxia began to finance its operations by means of withholding its customers' funds for additional days. Over time, this scheme of delayed installments escalated, and in the months prior to the bankruptcy that was finally declared on September 5, 2012, customers could face waiting times as long as 10 to 12 days before Panaxia had transferred the due funds to their bank accounts. Figure 1 shows the average number of bank days over time required by Panaxia to transfer the due funds generated in cash collection to their clients' bank accounts. There is a distinct initial level shift; the number of bank days increased from two in the beginning of 2010, to five days towards the end of that year. From the beginning of 2011 and towards the bankruptcy event, there is a slightly upward-sloping trend such that the average delivery time reached almost six days in the months prior to the failure. The sustainability of this Ponzi scheme hinged on Panaxia's ability to maintain the size of its customer base through competitive pricing.

[Insert Figure 1 about here.]

It is a fair question to ask whether the customers did not understand what was going on, or react to the drastically increased delivery periods. They did, but very few actually ended their contracts with Panaxia.[4] The general credibility of Panaxia can be appreciated by considering the fact that Sveriges Riksbank (the central bank of Sweden), even in early 2012 signed an agreement with Panaxia for purchases of coin collection and distribution services. This agreement was in place up until the arrest of the CEO of Panaxia, shortly before the bankruptcy, although no services were ever purchased by the central bank.

The consequences of Panaxia's failure were severe for its customers. We have acquired the identities of the firms that were exposed to the failure from the bankruptcy trustee and from four banks that were involved in the bankruptcy. At the time of the failure, our records cover 1,270 customers that had outstanding claims on Panaxia from collections of daily proceeds from more than 5,000 collection sites. After omitting firms for which we cannot establish an identity (34); banks and financial firms (12); non-limited liability firms (179) for which we do not have accounting data; pharmacies (137) which were mostly startups in the period 2009–2010 due to a deregulation of the pharmacy-market that took place mid-year 2009; and firms with missing accounting data for the period 2008–2013 (303), we obtained a final sample of 605 firms.[5] The average (median) exposure-to-assets amounted to 3.9 (2.0) percent. Not all of these firms were affected by the bankruptcy; while 489 firms incurred a loss, 116 firms were fully compensated by their banks.[6] However, all of Panaxia's customers were potentially exposed to the fraud leading up to the bankruptcy and suffered from temporary, but recurring liquidity shortfalls. These exposures—the fraud and the failure—constitute an event period, or shock, which we make use of to establish a causal impact of liquidity losses on firms liquidity management.

Furthermore, in the Panaxia analysis, we also make use of a data set provided by UC on applications for issuance of injunctions for settlement of overdue trade credit claims. These data were originally

[4] The bankruptcy trustee describes a setup where the Panaxia's management instructed the customer-support staff to inform customers complaining about the prolonged delivery times that the holdups were simply due to technical problems. Figure A1 shows the number of collected receipts at a monthly frequency for the period 2006–2011. The figure shows a sharp increase in collected receipts from January 2006 to July 2008, and a stable pattern hovering around 120,000 collected receipts in the period from July 2008 to December 2013. Thus, this figure indicates that the number of customers was stable from mid-2008 and onward.

[5] In the final sample, we have also omitted one treated firm that displayed an abnormally large number of overdue payments in 2009. For this treated firm, the number of overdue payments was amongst the largest in the entire population of Swedish firms.

[6] From the bankruptcy trustee we obtained a list of firms with outstanding claims on Panaxia at the time of the bankruptcy. The list contained the names of the customers and the size of the outstanding claims. To be able to match these firms with the accounting data, we obtained the organization numbers from name searches in the Retriever Business data base (the legal names for Swedish corporate firms are unique, which enables an unambiguous matching). This matching resulted in a comprehensive coverage. For one particular case, we only observe the sum of the claims held by a group of 231 franchise firms belonging to the same franchisor (the Reitan Group). For these franchise firms, we backed out the Panaxia-related losses from their yearly accounting statements. Moreover, the four banks provided information on names, organization numbers, and outstanding claims for the firms that they compensated for losses in the Panaxia bankruptcy.

collected by the Swedish Enforcement Agency, which provides legal support to trade creditors (suppliers) for the management of their unsettled trade credit claims. For the period 2008Q1—2013Q1, we observe, at a daily frequency, the universe of submitted applications for issuance of injunctions by all Swedish suppliers. Moreover, for a shorter period 2010Q1–2013Q1, we observe all Swedish corporate customers that are subject to applications for issuance of injunctions, also at a daily frequency. These data enable an evaluation of shifts in trade credit repayment behavior, both upstream and downstream.

2.3 U.S. data

Our sample of American firms consists of all firms that appear in Compustat at some point between January 1, 1989, and December 31, 2013, subject to the following restrictions. Firstly, we exclude all firm-years for which total assets or sales are not strictly positive; cash holdings are larger than total assets; and annual sales or asset growth is larger than 100 percent. Secondly, we exclude financial firms (NAICS codes beginning with 52) and utilities (NAICS codes beginning with 22). Finally, we restrict the sample to firms incorporated in the United States.

As for the Swedish sample, we avoid detrimental effects from outlier observations by winsorizing all firm-specific variables with respect to the 1st and the 99th percentiles. In addition, we drop firm-years that lack necessary data points for one or several of our specifications. This leaves us with a sample of 9,497 firms and a total of 74,235 firm-year observations.

2.4 Descriptive statistics

Table 1 provides descriptive statistics for the variables of the two main data sets underlying this paper. It is quite striking how the firm size distributions differ between the sets; Swedish firms are substantially smaller than the U.S. counterparties. U.S. firms' cash holdings are smaller, possibly reflecting an economy of scale effect in firm cash management. Distributions for accounts payable are similar, with means at 12 and 11 percent for Swedish and U.S. firms, respectively. Likewise, the accounts receivable variables are also close; although Swedish firms on average extend marginally more trade credit to sales than do U.S. firms. Finally, despite the huge differences in firm size across the two data sets, the percentiles of returns on assets are remarkably close, with median values around 7 to 8 percent, although on average Swedish firms are slightly more profitable. Hence, our empirical evaluation will cover the spectrum from small private Swedish firms to large public U.S. firms, enabling findings that are general and not country-, nor size-specific.

[Insert Table 1 about here.]

3 Variance Decomposition

As a starting point for the empirical analysis, we will adopt a variance decomposition framework similar to that of Asdrubali, Sorensen, and Yosha (1996) and quantify the contributions from the components on firms' balance sheets—with a focus on cash holdings and trade credit positions—to manage shortfalls in cash flow.[7]

The framework is constructed as follows. We split a firm's balance sheet into six parts. On the asset side, we consider cash holdings, accounts receivable, and other assets. The component labeled other assets is defined as total assets minus cash holdings and receivables, thus including items such as, e.g., fixed assets and inventories. On the liability side, we have accounts payable, total liabilities (defined as liabilities excluding payables), and equity. According to the inherent logic of the balance sheet identity, a given cash flow outcome in year t must yield adjustments in the six balance sheet components such that the asset and liability balance is preserved. To illustrate this, we will consider the following identity:

$$S \equiv B_1 + B_2 + ... + B_6, \tag{1}$$

where S denotes shortfalls and is taken to be negative cash flow; and B_1, B_2,..., and B_6 correspond to changes in the balance sheets components (suppressing subscripts for brevity).[8] More specifically, a positive S—a loss—in year t equals the sum of: *decreases* in the asset components cash holdings, B_1, accounts receivable, B_2, and other assets, B_3; and *increases* in the liability components accounts payable, B_4, liabilities, B_5, and equity, B_6.[9]

By demeaning the components—$\widetilde{S} = S - \overline{S}$ and $\tilde{B}_i = B_i - \overline{B}_i$—in Eq. (1), and multiplying both sides by $\widetilde{S}$, we obtain:

$$\widetilde{S}^2 \equiv \widetilde{S}\tilde{B}_1 + \widetilde{S}\tilde{B}_2 + ... + \widetilde{S}\tilde{B}_6. \tag{2}$$

Taking expectations and dividing both sides by $Var(\widetilde{S})$ yields:

[7] This variance decomposition approach has been widely used. On the household side, Townsend and Samphantharak (2009) use, based on the household budget identity, a version of the approach to decompose variation in consumption and investment deficits. On the corporate side, Khanna and Yafeh (2005) provide an application towards measurement of risk sharing within business groups.

[8] The variables are defined as follows: $S = -Cash\ flow$; $B_1 = -(Cash_t - Cash_{t-1})$; $B_2 = -(Receivables_t - Receivables_{t-1})$; $B_3 = -(Other\ assets_t - Other\ assets_{t-1})$; $B_4 = Payables_t - Payables_{t-1}$; $B_5 = Liabilities_t - Liabilities_{t-1}$; and $B_6 = Equity_t - Equity_{t-1}$. The $Cash\ flow$-variable is defined as $EBITDA$ minus taxes, interest expenses, and depreciations and amortizations; and changes in equity correspond to the flows of dividend payments, stock issuance and repurchases, shareholder contributions, and other components in the equity section of the balance sheet.

[9] Correspondingly, a negative S—positive cash flow—equals the sum of: *increases* in the asset components cash holdings B_1, accounts receivable B_2, and other assets B_3; and of *decreases* in the liability components accounts payable B_4, liabilities B_5, and equity B_6.

$$(3) \qquad 1 \equiv \frac{\text{Cov}(\widetilde{S}, \tilde{B}_1)}{\text{Var}(\widetilde{S})} + \frac{\text{Cov}(\widetilde{S}, \tilde{B}_2)}{\text{Var}(\widetilde{S})} + ... + \frac{\text{Cov}(\widetilde{S}, \tilde{B}_6)}{\text{Var}(\widetilde{S})}.$$

Hence, the variation in cash flow shortfalls is decomposed into the sum of co-movements between cash flow shortfalls and each of the six balance sheet components. Our estimate of the contribution from component B_i is given by the slope coefficients from regressions of B_i on S, for $i = 1, 2, ..., 5$. The residual variation not explained by the first five components is assigned to the equity component, B_6.[10] The balance sheet components are constructed so that a positive coefficient indicates that the component contributes towards the handling of cash flow shortfalls, and vice versa.

3.1 Results

Our results on decomposition of firm-level cash flow shortfall variation are summarized in Table 2. The table shows estimates for the balance sheet components in Eq. (3), based on the Swedish and U.S. samples. We have constructed the balance sheet components so that positive coefficients for the components on the asset side indicate that cash flow shortfalls are associated with downward adjustments in these variables, e.g., reduced cash holdings; and positive coefficients for the components on the liability side indicate that declines in cash flow are associated with upward adjustments, e.g., increased debt.

Following Townsend and Samphantharak (2009), we start by applying an approach where the contribution of each component is estimated in time series regressions at the firm-level, thus yielding firm-individual estimates for each balance sheet component. Columns (I) and (IV) report quartiles in the empirical distributions of the coefficients for the six balance sheet components, for the Swedish and U.S. firms, respectively. For Swedish firms, on the asset side, the results show that cash flow shortfalls mainly appear to be associated with decreases in cash holdings and in other assets; the medians show a reduction in cash by 17.7 percent and other assets by 14.6 percent. On the liability side, Swedish firms primarily increase equity, 18.9 percent at the median. Looking at the upper quartile draws attention on the asset side to decreases in other assets, while the lower quartile with negative signs reminds us that many balance sheet movements are codetermined in potentially complicated stratetgies. On the liability side the upper quartile is also reflecting increasing liabilities. The effects for accounts receivable and payable are miniscule. Turning to U.S. firms, on the assets side, the estimates show that cash flow shortfalls are associated with reductions in cash, receivables, and in particular other assets. Whereas, on the liability side, cash flow shortfalls are associated increases in equity inflows and, with a negative sign, decreases

[10] Consequently, we can estimate the contribution of the equity component by regressing $(S - B_1 - B_2 - ... - B_5)$ on S.

in payables and liabilities. Judging from the latter, payables and liabilities are not used for handling of cash flow shortfalls for U.S. firms.

[Insert Table 2 about here.]

We proceed to estimate average—across firms and over time—contributions for the balance sheet components on the basis of pooled firm- and year-fixed effects regressions. Columns (II) and (V) report results for the Swedish and the U.S. sample, respectively. For the Swedish firms, cash flow shortfalls are associated with decreases in other assets and increases in equity. The estimates for U.S. firms are slightly different from the Swedish ones. Cash flow shortfalls are associated with decreases in all the asset components; and increases in equity. Counter-intuitively we note significant reductions in accounts payable and liabilities for positive cash flow shortfalls, with negative signs.[11]

Regressing units of cash flow shortfalls on unit changes in the balance sheet components may result in estimates that pre-dominantly reflect regularities of the largest firms in the sample. That is, in terms of units of SEK, or USD, large firms—by simply being large—will tend to record large amounts of cash flow shortfalls and large changes in their balance sheet components, and therefore greatly influence the estimated slope coefficients. One way to control for heterogeneity in firm size is to the scale the variables by firms' total assets. To this end, Columns (III) and (VI) report variance decomposition results where all variables are scaled by assets in year $t-1$. The coefficients for Swedish firms show that cash, receivables and liabilities play more prominent roles, when controlling for the size of the firms. Thus, the cash flow variation is associated with a 36 percent adjustment in cash holdings, 14 percent in accounts receivable, and 5.3 percent in liabilities. Accounts payable has a small—but significant—negative coefficient, suggesting perhaps that, increases in cash flow shortfalls are associated with reductions in payables, which very well could reflect shifts in demand conditions in the supply chain. That is, firms facing declines in demand, reduce their input purchases, which yield a reduction in their account payables. Moreover, the results are overall similar for U.S. firms, with the exceptions that cash holdings exhibit substantially smaller and equity substantially larger effects.

Taken together, the coefficients for our three key objects provide slightly mixed results across the two samples. Swedish firms may rely on cash to manage cash flow shortfalls, or at least that is an interpretation, whereas U.S. firms, on the other hand, appear to rely less on cash in response to cash flow shortfalls. For the two trade credit margins, we see that receivables exhibits positive and payables

[11] For a sub-sample of the U.S. firms we have access to cash flow statements. Using this data yields very similar results: the coefficients (t-values) for $B_1, B_2, \ldots, B_6$ are 0.081 (1.6), 0.057 (3.9), 0.707 (8.3), -0.034 (-2.2), -0.186 (-2.5), and 0.373 (6.0), respectively.

negative associative properties for both the Swedish and U.S. firms. However, it is important to note that causal interpretations of these results are unwarranted. That is, cash flow shortfalls may well reflect shifts in demand and supply conditions in the supply-chain—rather than increased liquidity needs—which could affect the amounts of drawn and issued trade credit in a fashion unrelated to liquidity management. Suppose a firm is experiencing a shortfall in cash flow due to a sudden drop in demand for its output. It is conceivable that in response the firm may want to cut down on input purchases, which will be reflected as a decrease in accounts payable, to match a lower output level. We therefore proceed to the second part of the empirical analysis, where we gauge the impact of a plausibly exogenous liquidity shock on firms' cash and trade credit positions.

4 The Panaxia Event Study

We will now consider the liquidity losses that the fraudulent scheme and subsequent bankruptcy event of Panaxia imposed on its corporate clients. The purpose of the analysis in this section is to quantify the effects from the delays in fund transfers (cf. Figure 1) and from the realized losses in the subsequent Panaxia failure, on the cash and trade credit positions of Panaxia's corporate clients.

4.1 Matching estimators

As noted in our discussion above, cash flow shortfalls are invariably associated with changes in the demand and supply conditions that prevail for firms' operations, and will consequentially contain elements of an endogenous nature. It is therefore warranted to challenge and qualify results obtained for cash flow shortfalls by replacing these with a liquidity shock that is conceivably exogenous with respect to demand and supply conditions in the supply-chain. To this end, we will examine the shifts in cash holdings and trade credit positions for firms that suffered liquidity losses—temporary and permanent—in connection with the fraud and subsequent failure of the Swedish cash-in-transit firm Panaxia in the period 2010–2012.

Panaxia's fraudulent scheme and failure is assumed to have negatively affected its corporate clients—the treated firms. We calculate the average treatment effect for the treated firms (ATT) on the set of variables of interest, using a nearest-neighbor matching estimator proposed by Abadie and Imbens (2006). The treatment period is taken to be 2010–2012; since Panaxia began its practice to postpone payments in early 2010 and then failed about 30 months later in September 2012. The nearest-neighbor matching ensures that we compare outcomes for treated firms with outcomes for otherwise similar control firms. Each treated firm is matched with one control firm, using a set of matching variables comprising firm-specific characteristics and a five-digit industry classifier.[12] We select our matching variables based on covariates that are commonly used as control variables in the literatures on cash holdings and on trade credit. The selected set of matching variables is: cash flow-to-assets; log of assets; sales growth; debt-to-assets; tangible assets-to-assets; inventories-to-assets; log of firm age; cash-to-assets; payables-to-assets; and receivables-to-assets. The matching is performed with respect to the 2009-outcomes of the matching variables. To ensure parallel pre-treatment event trends, we also match on 2008-outcomes of cash-to-assets, payables-to-assets, and receivables-to-sales.

Our aim is to gauge impacts of postponed payments, and subsequent losses, on treated firms. For this purpose, we consider the following difference-in-difference estimator of yearly adjustments in the treatment and post-treatment periods for the outcome variables $Cash/Assets$, $Payables/Assets$, and $Receivables/Sales$:

$$\tau_t^y = (\bar{y}_t^{Treated} - \bar{y}_{t-1}^{Treated}) - (\bar{y}_t^{Control} - \bar{y}_{t-1}^{Control}), \tag{4}$$

where $\bar{y}_{i,t}^{Treated}$ is the mean of an outcome variable for the treated firms in year t and $\bar{y}_{i,t}^{Control}$ is the mean of the same outcome variable for the matched control firms in year t.[13] We calculate the yearly adjustments for the treatment period 2010–2012, and for the post-treatment period 2013. In addition to yearly adjustments, we also calculate difference-in-difference estimators of cumulative adjustments over multiple years for the treatment and post-treatment period:

$$T_t^y = (\bar{y}_t^{Treated} - \bar{y}_{2009}^{Treated}) - (\bar{y}_t^{Control} - \bar{y}_{2009}^{Control}). \tag{5}$$

The estimators of yearly and cumulative adjustments offer causal insights on how liquidity shortfalls affect firms' cash-to-assets, payables-to-assets, and receivables-to-sales. Moreover, we further explore the underlying mechanisms of adjustments in payables and receivables by considering outcome variables related to overdue trade credit payments—both upstream and downstream. To this end, we use data from the Swedish Enforcement Agency on applications for the issuance of an injunction to settlement of outstanding claims. These data provide an opportunity to assess whether the treated firms to a larger extent than the control firms delayed payments to suppliers, i.e., upstream adjustments. In other words, upstream firms submitted an application for issuance of an injunction to recover late payments. Also,

[12] We apply the following matching model specification. Firstly, the Mahalanobis weighting matrix is selected to control for the differences in scale between the matching variables. Secondly, we use matching with replacement, which implies that a given control firm can potentially be matched to multiple treated firms. To ensure correct inference, standard errors are clustered at the firm-level.

[13] Relating payables to assets and receivables to sales is a common convention in the trade credit literature, see, e.g., Petersen and Rajan (1997).

we can assess whether the treated firms to a greater extent than control firms, submitted applications for injunction issuance, i.e., downstream adjustments. In other words, if treated firms tried to recover delayed payments more quickly. Finally, we examine magnitudes in effects, conditional on the size of the liquidity losses incurred; to be discussed in greater detail below.

4.2 Sample compositions for treated and matched control firms

Descriptive statistics for the matching variables are reported in Table 3. The table shows that the treated and matched control firms exhibit characteristics that are quite similar, which warrants the quality of the matching. The only dimension in which the treated and control firms are significantly different in means is receivables-to-sales, whereas debt-to-asset ratios also differ significantly according to the median test. To ensure that our results are not influenced by pre-treatment differences between the treated and control firms, we complement our baseline estimates using the bias-corrected matching estimators proposed by Abadie and Imbens (2011).

[Insert Table 3 about here.]

Furthermore, Figure 2 shows differences in means between treated and control firms for the three key outcome variables in each year during: the pre-treatment period (2007–2009); treatment period (2010–2012); and post-treatment period (2013). The confidence bands in the figure shows that average cash holdings coincided for treated and control firms in the pre-treatment period. However, in the treatment period we see a downward shift for the difference in average cash holdings, i.e., average cash for treated firms is significantly smaller than average cash for controls. A similar treatment shift, but in the other direction, is observed for accounts payable; differences in averages are insignificant in the pre-treatment period, followed by an upward shift during the treatment period. Consistent with the descriptive statistics in Table 3, the figure further shows that treated firms held significantly less accounts receivable on average in all periods. Nevertheless, the figure displays a distinct downward trend in receivables during the treatment period, suggesting that treated firms altered their receivables more than control firms did. Thus, Figure 2 provides initial evidence that treated firms used their cash holdings and trade credit margins to overcome the Panaxia liquidity shock. Moreover, one potential concern is that cash holdings for treated firms may display a downward trend in the pre-treatment period, and thereby compromise identification. We investigate this formally below, and verify that treated and control firms display trends for the outcome variables in the pre-treatment period that are not significantly different.

[Insert Figure 2 about here.]

4.3 Baseline results

We now proceed with a presentation of our baseline results. Table 4 reports estimates of the yearly and cumulative adjustments according to Equations (4) and (5), for our three key outcome variables. Panel A shows results for cash holdings, $Cash/Assets$. The estimates of the yearly adjustments effects, τ_t, in Columns (I) to (IV) show statistically significant reductions in cash holdings in the first two years of the treatment period. The cumulative effect estimates, T_t, show that the yearly declines in cash in 2010-2011 result in persistently lower cash holdings in the final year of the treatment period and in the post-treatment year. Columns (V) to (VIII) report bias-corrected matching estimators, where differences in the matching variable outcomes between treated and control firms are accounted for in the estimation, see Abadie and Imbens (2011). The bias-corrected effects are very similar to the ones reported in Columns (I) to (IV), suggesting that the latter are not confounded by differences in characteristics between the treated and control firms. In addition, Column (IX) shows test results indicating that the treated and control firms have parallel cash holding trends in the pre-treatment period 2007-2009, which is a sufficient condition for a causal interpretation of the average treatment effect results.[14]

[Insert Table 4 about here.]

Results for accounts payable, $Payables/Assets$, are reported in Panel B. The estimates of the yearly adjustments effects, τ_t, reported in Columns (I) to (IV) show an increase in 2011 of 1 percentage point and an enhanced increase of 1.8 percentage points in 2012. These yearly effects result in a cumulative adjustment effects, T_t, of 2.8 percentage points in 2012 and 2.5 percentage points in the post-treatment year. Columns (V) to (VIII) show that the results persist for the bias-corrected estimates and Column (IX) indicates that treated and control firms have parallel pre-treatment trends with respect to accounts payable.

Panel C reports results for accounts receivable, $Receivables/Assets$. The estimates of the yearly adjustment effects point to an initial contraction of 0.2 percentage points in the first year of the treatment period and an enhanced contraction of 0.6 percentage points in 2012. Accordingly, the estimates of the cumulative effects, T_t, show that the downward trend in receivables amounts to an accumulated reduction of 0.9 percentage points in 2012, which persists in the post-treatment year.[15] The bias-corrected estimators reported in Columns (V) to (VIII) show that treatment effects for receivables are somewhat

[14] We apply the test of parallel pre-trends proposed by Mora and Reggio (2015). More specifically, for the period 2007–2013, we estimate the model $E[y_{it}] = \delta + \sum_{t=2008}^{2013} \delta_t I_t + \gamma D_i + \sum_{t=2008}^{2013} \gamma_t I_t D_i$, where I_t is time t year dummies and D is a treatment dummy. The test statistic of pre-treatment trends is a Wald test of the joint significance of γ_{2008} and γ_{2009}.

[15] The negative effect on receivables is in line with the findings in Bakke and Whited (2012). They explore the impact of cash shortfalls triggered by mandatory pension contributions on a wide set of firm characteristics. Consistent with our result, they document that funding violations, causing liquidity shortfalls, are associated with reductions in receivables-to-assets.

enhanced, once we account for the slight differences in the amount of issued trade credit between treated and controls in the pre-treatment period, cf. Table 3. Finally, the test for parallel pre-trends in Column (IX) shows that the identifying assumption is fulfilled.

The point estimates of the cumulative adjustments in 2012, T_{2012}, suggest that the magnitude of upstream adjustments is larger than that of downstream adjustments. One obvious concern in a comparison of relative size for the two effects is that payables are scaled with assets, whereas receivables are scaled with sales. Scaling accounts receivable by assets instead, provides a better ground for such a comparison; and in estimation using receivables-to-assets we obtain a cumulative effect (*t*-value) in 2012, T_{2012}, of -0.010 (-1.8), which is close to the estimate for sales-scaled receivables of -0.009 (-3.2). A statistical test for the difference in absolute adjustment between payables-to-assets and receivables-to-assets, show that adjustments in payables indeed dominate receivables, with a *p*-value of 0.058. Furthermore, to gauge the relative importance of cash versus trade credit margins, we can compare the size of compounded adjustments in net trade credit positions (i.e., $(Payables - Receivables)/Assets$) with the size of adjustments in cash holdings. The estimated cumulative adjustment (*t*-value) in net trade credit in 2012 is 0.037 (3.2). Testing for the difference in absolute adjustment between cash and net trade credit yields a *p*-value of 0.242, indicating that the adjustments at the two trade credit margins are jointly of a similar magnitude as the adjustments in cash holdings.

Although firms clearly make use of both upstream and downstream liquidity extraction—independently or simultaneously—it is conceivable why operating the accounts payable margin may provide a more effective measure to raise liquidity and explain why we find that upstream dominate downstream adjustments. Through upstream adjustments, firms can readily offset liquidity shocks by immediate postponement of due payments to suppliers, and withhold money until additional inflows of funds are obtained. If the amount of liquidity extracted upstream proves insufficient to offset the shock, the firm may continue to roll over its overdue trade credit debt until the impact of the original liquidity shock is neutralized. Intuitively, the ability for firms to roll over overdue trade credit debt hinges on their suppliers' willingness to overlook late payments, that is, on the absence of obstacles to the functioning of (implicit) risk sharing networks. In downstream adjustments, firms can extract liquidity by reducing the trade credit maturities in new contracts to prompt faster future payments from customers. But that will free up liquidity only with a lag. An alternative measure is to proactively manage outstanding claims, to avoid late payments from customers. We will shortly study these underlying adjustment mechanisms closer, both upstream and downstream.

To sum up, the baseline results show that the retention of customer funds and the subsequent bankruptcy-related losses caused Panaxia's customers to reduce their cash holdings, increase the amount of drawn trade credit from suppliers, and contract the amount of issued trade credit to customers. In terms of magnitudes, the joint impact for the two trade credit margins is on par with adjustments in cash holdings; and upstream trade credit adjustments dominate downstream adjustments. Thus, trade credit is an important source of reserve liquidity for firms.

4.4 Underlying mechanisms

Liquidity shocks cause the observed adjustments in treated firms' trade credit positions. We will now explore our key presumption for the nature of firms' behavior underlying these adjustments: namely, that reserve liquidity is extracted upstream by postponement of trade credit payments to suppliers, and by enforcing repayment of outstanding debt to customers downstream. Whereas these two types of actions may well be privately conducted between trade credit parties, they will ever so often involve a third party, the Swedish Enforcement Agency (Kronofogdemyndigheten), and leave behind publicly available records. The Enforcement Agency offers legal support to Swedish trade creditors (suppliers) for the management of their unsettled trade credit claims. The creditor can submit an application to the Enforcement Agency for the issuance of an injunction to settlement of the outstanding claim. If approved, the Enforcement Agency will then notify the debtor for prompt payment within a fortnight; and take further measures to enforce payment should the debtor persist in dishonoring the claim after notification. Applying for an injunction to settlement is normally the creditor's last resort and typically occurs when a claim has been overdue for an extended period—several weeks, or longer.

We have, from the Swedish Enforcement Agency, obtained data on applications for the issuance of injunctions to settlement of outstanding claims, submitted by the universe of Swedish corporate firms. The data include details on the date of submission and the identities of involved parties so that unambiguous merging with the treated and control firms of the Panaxia event is straight forward. The merged data set provides an opportunity to assess whether treated firms to a greater extent than control firms have been subjects to applications for injunction issuance due to unpaid debts, i.e., the upstream perspective. We can also consider the downstream perspective and examine whether treated firms to a greater extent than control firms submitted applications for injunction issuance, i.e., took action to enforce repayment of overdue issued debt. The Enforcement Agency data are somewhat restricted in that we can observe applications faced by treated and control firms in the full period 2008Q1–2013Q4; whereas applications submitted by treated and control firms are observed in the period 2010Q1–2013Q1, nonetheless providing a full coverage of the treatment period (in which we have aggregated daily observations to a quarterly level).

Figure 3 offers graphical illustration of the extensive and intensive margins of applications for injunction to settle overdue payments faced (upper panels) and issued (lower panels) by treated and control firms. The upper left panel suggests that the fraction of firms that delayed trade credit payments increased amongst treated relative to control firms; and the upper right panel shows an even more pronounced divergence, when we account for the number of delayed payments that resulted in an application. Moreover, the lower left panel shows that the fractions of treated and control firms that in each quarter acted to enforce payment of overdue debt are fairly similar over the event period. However, when considering the number of applications—the intensive margin—displayed in the lower right panel, we find that treated firms consistently submit more applications in the treatment period, with the exception of one quarter, 2011Q1.

[Insert Figure 3 about here.]

Table 5 reports estimates of the quarterly changes, τ_t, and cumulative effects, T_t, for the four measures reported in Figure 3. Given that Panaxia began to withhold its customers' funds in the second quarter of 2010 (cf. Figure 1), we take the first quarter of 2010 as a pre-treatment quarter, when calculating cumulative effects on applications for injunction due to overdue trade credit. Column (II) shows statistically significant larger cumulative fractions for treated firms facing applications in the quarters 2010Q4, 2011Q1, 2011Q3, 2013Q1 and in 2013Q2. This pattern is pronounced in Column (IV), where the number of applications due to firms' overdue debt is considered; significantly more applications for treated firms now occur in two out of three quarters in the event period. The tests of parallel pre-trends indicate no significant differences in trends between treated and control firms in the outcome variables prior to the event. Thus, these results suggest that late payments are indeed one driver of the increase in payables documented in Table 4 for treated firms.

[Insert Table 5 about here.]

Moreover, Columns (V) and (VI) show results for the differences in fractions of treated and control firms that in a given quarter attempt enforcement of settlement with non-paying customers. Largely, no significant effects occur at this margin, except a slight increase of 2 percentage points for treated firms in the last quarter of 2011. However, when considering the intensive margin and the number of applications submitted, according to Column (VIII), we see that the cumulative measures in quarters 2011Q4 and

2012Q2 are significant, and estimated effects are substantial—albeit not significant—in several other quarters in the event period.

To sum up, this sub-section has demonstrated, or shed light, on how firms' adjustments of their trade credit positions are played out. Upstream, we find that more treated firms than control firms are inclined to postpone trade credit payments when we evaluate at the extensive margin. We find even stronger effects pointing to delinquency behavior for treated firms, when we measure at the intensive margin. Adjustments of accounts receivable—the downstream perspective—which was found to be more moderately used in firms' liquidity management in Table 4, is also associated with weaker evidence of firms actively trying to enforce payment from stalling customers. However, at the intensive margin, we find that treated firms in two quarters submit a significantly larger number of applications for injunction. Hence, adjustments of trade credit positions in the course of firms dealing with liquidity shocks are associated with extension and contraction of credit in the time dimension, in the up- and downstream perspectives, respectively.

4.5 Responses conditional on loss-size

Magnitudes of adjustments in cash and at the trade credit margins should depend positively on the sizes of firms' incurred losses in the Panaxia failure. That is, whereas the fraud in postponing transfers of funds to client accounts is certainly expected to have a negative impact on firms' liquidity positions, the point-in-time realization of a large loss when Panaxia finally went bankrupt should yield a larger negative and more persistent impact. This conceivable conjecture will be examined next and we will consider two cases: firstly, firms that incurred losses versus no losses; and secondly, incurring firms' responses conditional on the size of their losses. For the first case we divide the treated firms into two groups: firms that were fully compensated by their bank in 2012; and firms that incurred losses in 2012. Thus, the firms in the two groups experienced the same fraud treatment in 2010 and 2011—delayed payments—but a differential treatment in the bankruptcy year 2012. For the second case we will leave out the compensated firms.

Table 6 reports results for the two groups; Columns (I) to (V) correspond to the group of treated firms that were fully compensated in 2012 and Columns (VI) to (X) correspond to the group of treated firms that incurred losses in 2012. The results for the former show a downward shift in the firms' cash holdings in 2011 and a subsequent reversal in 2012, so that the estimated cumulative cash effect that year is not significantly different from zero. A similar pattern is observed for accounts payable, where the cumulative adjustments indicate an increase in 2011, followed by an insignificant accumulated effect in

2012. The results for accounts receivable show that a temporary downward adjustment occurred in 2012; but the estimates of the cumulative effects are insignificant throughout the treatment and post-treatment periods, indicating that these firms did not make any significant adjustments in the amount of issued trade credit as compared with the positions held in 2009. Shifting now to the results for firms that did incur losses when Panaxia failed in 2012, we find that adjustments in cash holdings and trade credit positions persist in 2012 and in the post-treatment year. Thus, the results in Table 6 suggest that the postponement fraud underlies the observed adjustments in the first two years of the treatment period and applies to both groups of firms, whereas the existence of failure losses caused the adjustments to persist, or even increase, in the last treatment year and in the post-treatment year.

[Insert Table 6 about here.]

For the sub-sample of firms that incurred losses in 2012, we can deepen the analysis by evaluating whether the size of the adjustment depends on the size of the loss.[16] We do this by estimating the cumulative adjustment effect between 2009 and 2012, conditional on the size of the loss.[17] Columns (I) in Table 7 shows an insignificant relationship between the size of a loss and associated adjustment in cash holdings, whereas Columns (II) and (III) show that larger losses are associated with significantly larger increases in payables as well as larger decreases in receivables, in the statistical sense. These results indicate that the trade credit margins indeed played an important role in absorbing the impact of the incurred losses and the larger the loss, the larger are resulting adjustments.

[Insert Table 7 about here.]

5 Conditional Cash Flow Shortfall Analyses

In the final step of the empirical analysis, we introduce a set of conditional models geared towards capturing the responses to liquidity distress measured by cash flow shortfalls, and estimated on the full Swedish and U.S. samples. The purpose of the analyses in this section is twofold. Firstly, we structure the empirical evaluation to seek external validity for the results in the previous section, by quantifying the impacts of cash flow shortfalls on the liquidity positions, while controlling for a host of factors that may otherwise matter for firms' cash and trade credit positions, such as demand fluctuations in the supply-chain, growth

[16] In this analysis we omit two treated firms—and their matched control firms—for which we have missing data on loss sizes, resulting in a sample of 487 treated firms.

[17] For the years 2009 and 2012, we estimate the model: $E[y_{i,t}] = \beta_0 + \beta_1 Loss/Assets_i \times I_t + \beta_2 Loss/Assets_i + \beta_3 I_t + \boldsymbol{\beta}_4 \mathbf{X}_i$, where $Loss/Assets_i$ is the size of the loss scaled by assets in 2012, I_t is an indicator variable set to unity in 2012 and zero in 2009, and $\mathbf{X}_i$ is a vector of 2009-outcomes of the continues matching variables.

prospects, investment and debt financing. If results for cash flow shortfalls and the Panaxia liquidity shocks come through in broadly similar ways for Swedish firms, we may then infer that the conditional analysis of this section gives results which are substantially similar to the Panaxia experiment, i.e., that endogeneity concerns for cash flow shortfalls here are not overwhelming for our purposes. In other words, cash flow shortfalls can be taken to reasonably well approximate exogenous liquidity shocks in the current context. As a next step, we can then cautiously interpret differences and similarities between Sweden and the U.S.. Secondly, this modelling approach—conducted on large samples—provides a suitable framework for examining cross-sectional heterogeneity in firm- and industry-characteristics for the impacts of cash flow shortfalls on firms' liquidity management. Our model-specifications are on the form:

$$\Delta y_{i,t} = \gamma Shortfall_{i,t} + \delta Sales\ growth_{i,t} + \boldsymbol{\lambda}\mathbf{X}_{i,t} + \mathbf{I}\boldsymbol{\eta}_{i,t} + \varepsilon_{i,t}, \tag{6}$$

where $\Delta y_{i,t} \equiv y_{i,t} - y_{i,t-1}$; $Shortfall_{i,t}$ is declines in cash flow ($Shortfall = \max(-Cash\ flow_{i,t}, 0)$); $Sales\ growth_{i,t}$ is the log differences in sales between t and $t-1$; $\mathbf{X}_{i,t}$ is a vector of firm-characteristics; and $\boldsymbol{\eta}_{i,t}$ is a vector of firm- and time-fixed effects. The vector of firm-characteristics, $\mathbf{X}_{i,t}$, includes a set of control variables that is commonly used in the corporate cash literature.[18] Controlling for sales growth is a key feature of the model. That is, the results for payables and receivables presented in the variance decomposition analysis may very well reflect shifts in demand conditions in the supply-chain rather than responses due to changing liquidity needs. Thus, by controlling for sales growth, our ambition is that the coefficient for cash flow shortfalls, γ, should reflect responses to changes in liquidity needs.

We consider the same set of outcome variables, y, as in the Panaxia analysis: *Cash/Assets*; *Payables/ Assets*; and *Receivables/Sales*. Since the conditional regressions capture yearly adjustments and the Panaxia analysis evaluates adjustments over a three year period, capturing both delayed payments and subsequent losses, it is not obvious how a comparison of the effects from the two liquidity shocks should be interpreted. However, we adopt the following criterion: results showing that firms cash flow shortfalls are associated with drawdowns in cash holdings ($\gamma < 0$), increases in payables ($\gamma > 0$), and contractions in receivables ($\gamma < 0$)—with upstream adjustments dominating downstream adjustments; and joint adjustments at the trade credit margins being roughly of the same magnitude as the ones in cash holdings—would be deemed consistent with the event study results.

[18] The set of firm-characteristics mimic that of Eq. (9) in Almeida et al. (2004), including: the natural logarithm of total assets ($Size_{i,t}$); capital expenditures ($Expenditures_{i,t}$); changes in non-cash and non-trade credit net working capital ($\Delta NWC_{i,t}$); and changes in non-accounts payable short term debt ($\Delta ShortDebt_{i,t}$). For the U.S. data we also include the market value scaled by the book value of assets ($Q_{i,t}$); and acquisitions ($Acquisitions_{i,t}$).

5.1 External validation

Panel A in Table 8 reports the conditional model results for coefficients obtained when estimating Eq. (6) on the sample of Swedish firms. Column (I) shows results for changes in firms' cash holdings, $\Delta y = \Delta Cash/Assets$. The obtained coefficient show that declines in cash flow is significantly associated with declines in cash holdings. By calculating the average, estimated impact of a given reduction in cash flow, we can infer the economic significance of shortfalls in cash flow on cash holdings. Thus, we find that a one-standard-deviation decline in the cash flow variable is associated with ($-0.097 \times 0.201/0.232 =$) 8.4 percent decline, at the mean, in cash holdings. In Column (II) we report results for changes in firms' accounts payable, $\Delta y = \Delta Payables/Assets$. The obtained coefficient is positive and statistically significant, and indicates that cash flow shocks are associated with increased amounts of drawn trade credit. A one-standard-deviation decline in the cash flow variable is associated with ($0.124 \times 0.201/0.115 =$) 21.6 percent increase, at the mean, in the amounts of drawn trade credit. The effects for receivables, $\Delta y = \Delta Receivables/Sales$, is reported in Column (III). We find a coefficient that is negative and statistically significant, hence showing that declines in cash flow are associated with reduced amounts of issued trade credit. The magnitudes of the coefficient implies that a one-standard-deviation larger cash flow shortfall is associated with ($-0.052 \times 0.201/0.161 =$) 6.5 percent decline, at the mean, in accounts receivable. Thus, the estimated cash flow effects have signs that coincide with the Panaxia event study results reported in the previous section; that is, drawdowns in cash holdings, increases in payables, and reductions in receivables, which concurs with the first part of our validation criterion.

[Insert Table 8 about here.]

As a further comparison we evaluate the relative magnitudes of upstream and downstream adjustments. To control for the difference in scaling variables, we calculate the effect for changes in receivables-to-assets, $\Delta y = \Delta Receivables/Assets$, which gives a coefficient (t-value) of -0.033 (-37.8). A t-test for the difference in the absolute changes between payables-to-assets and receivables-to-assets shows that the upstream adjustments are significantly larger in magnitude, with a p-value of 0.000. Moreover, to measure the relative importance of cash and trade credit, we can compare the compounded adjustments in the net trade credit position (i.e., $\Delta(Payables - Receivables)/Assets$) with adjustments in cash holdings. The adjustment (t-value) of net trade credit is estimated to 0.157 (136.8). Testing for the difference in absolute adjustment between cash and net trade credit, shows that the compounded adjustments at the trade credit margins significantly dominate the ones in cash holdings, with a p-value of 0.000. Thus, the conditional model estimates indicate effects which according to our criterion are consistent with the effects documented in the event study analysis. However, one exception is that the conditional model indicates that joint adjustments at the trade credit margins dominate adjustments in cash holdings, whereas these two are not significantly different in the Panaxia analysis. This discrepancy could be due to the difference in sample sizes between the two approaches, where the coefficients in the conditional models are more sharply estimated.

Table 8, Panel B, reports results for the U.S. firms. The signs of the coefficients for cash holdings and the two trade credit margins coincide with the ones reported for the Swedish firms. Comparing the point estimates suggest that the effects are less pronounced for U.S. firms as compared with Swedish ones; however, the estimates of economic significance are close in magnitude across the two samples. In particular, adjustment effects at the accounts receivable margin virtually coincide, -6.5 versus -6.0 percent, for Sweden and the U.S., and adjustment effects at the payables margin upstream, are very close, although somewhat stronger for Swedish firms at 21.6 versus 18.3 percent. But, adjustments of cash-holdings diverge more; U.S. firms adjust less at -5.4 versus -8.4 percent. A potential explanation for the difference in economic significance of adjustment in cash-holdings across the two samples is the huge difference in firm-size between the samples; Swedish firms are considerably smaller than the U.S. ones (cf. Table 1), and in recognition of the close link between firm-size and firms' constraints for raising external funding, see, e.g., Hadlock and Pierce (2010), it is conceivable that Swedish firms depend more on internal cash than do U.S. firms; the latter with access to the most sophisticated financial markets in the world, and for this sample of huge Compustat firms external funding may well be associated with approximately zero constraints.[19] Furthermore, applying the same tests on the U.S. as for the Swedish sample above, shows that upstream adjustments are significantly more pronounced than downstream adjustments, and joint adjustments at the trade credit margins dominate adjustments in cash holdings.

Overall our results for cash flow shortfalls line up with the previous liquidity shock results, and thus support the presumption that the found effects are manifestations of increased liquidity needs; that is cash flow shortfalls can serve as a measure of firms' liquidity distress. The estimated measures of economic significance of effects are found to be remarkably similar across the Swedish and U.S. samples, indicating that our results have general bearing.

[19] This argument was put forward by Rajan and Zingales (1998), for the construction of their empirical industry-level measure of external financing dependence. That is, given absence of constraints to externally fund operations across industries, variation in de facto funding can be attributed to the nature of the industry and not to the composition of firms that belong to it.

5.2 Cross-sectional heterogeneity

The conditional models—estimated on large samples—provide a suitable framework for examining cross-sectional heterogeneity in firm- and industry-characteristics for the impacts of cash flow shortfalls on firms' liquidity management. We will firstly explore the notion that firms with stronger relationship-ties towards suppliers and customers rely more on adjustment capacity at the trade credit margins, and secondly consider whether trade credit adjustments hinges on firms' relative exposure to business cycle variation. To this end, we apply a set of sample-splits and estimate Eq. (6) for sub-samples on the basis of the degree of specialized inputs used by firms and on firms' exposures to aggregate risk. More specifically, for each split-variable, we sort the firms into empirical distributions for each year and construct two sub-samples related to the bottom 30 percent and on the top 30 percent of the distributions.

To study firm-heterogeneity with respect to the degree of specialized input usage, we adopt a measure of specialized inputs used by Giannetti, Burkart, and Ellingsen (2011) in a similar context. It is defined at the industry-level and provides the fraction of firm total inputs that is classified as differentiated goods and services, as opposed to standardized goods and services, where the distinction between differentiated and standardized rests on Rauch (1999), who considered items with clear reference price listings as standardized. The estimates show that Swedish firms (Panel A) using more specialized inputs, adjust their trade credit margins—both upstream and downstream—to a larger extent as compared with firms that obtain standardized inputs. These results are overall consistent with the presumption that rent-seeking from maintenance of long-term relationships incentivize firms to support counterparties in the supply chain. However, the effects estimated for the U.S. firms (Panel B) indicate no significant differences with respect to the degree of specialized inputs. Hence, suggesting that relationship-specific investments may play a more prominent role for small- and medium sized firms, as compared with large ones.

[Insert Table 9 about here.]

Finally, the adjustment capacity at the trade credit margins may potentially depend on the extent to which firms' suppliers and customers are able to provide support when needed. More specifically, the suppliers and customers of a firm are less likely to be able to provide support if they are in distress at the same time as the firm. This logic suggests that adjustment capacity at the trade credit margins as a source of reserve liquidity increases for firms that are less exposed to aggregate risk factors facing their suppliers and customers. Along these lines, Acharya, Almeida, and Campello (2013) show that firms that are more exposed to aggregate risk, favor cash over credit lines, since cash flow shortfalls are more likely to occur in times when banks contract their credit supply.

To explore this presumption, we measure a firm's exposure to aggregate risk as the correlation over time between its yearly cash flows and the yearly average cash flows across all firms in the sample.[20] A large correlation suggests an enhanced aggregate risk exposure. The coefficients for Swedish firms (Panel A) indicate that firms with low exposure to aggregate risk, draw less on their cash holdings, and more on their accounts payable. The estimated effects are very small in magnitude, which may reflect that economy-wide average cash flow is a very imprecise measure of the aggregate risk faced by firms. Nevertheless, the differences in effects at the trade credit margins are more pronounced for U.S. firms (Panel B), whereas there is no statistical difference in the adjustments of cash holdings. Hence, these results are consistent with the presumption that firms rely more on adjustment capacity at their trade credit margins when the suppliers and customers are more likely to be able to provide the desired reserve liquidity. We conclude that these results suggest that firms tend to rely more on trade credit adjustments if their cash flow shortfalls occur when aggregate cash flow in the economy is sound. In other words, if their suppliers and customers are more likely to be able to provide reserve liquidity, and not be liquidity-constrained themselves.

6 Conclusions

Resent research has shown that the buffer motive plays a prominent role for firms' choices of cash holdings. Another conceivably important source of reserve liquidity is adjustment capacity at the trade credit margins—accounts payable and receivable—on firms' balance sheets. In this paper, we empirically gauge how trade credit positions, next to cash holdings, are used by firms to curb the impacts of shortfalls in liquidity. To this end, we evaluate the impact of liquidity shocks that the fraud and failure of a large Swedish cash-in-transit firm imposed on its clients. This unique event provides an opportunity to derive causal inference on the roles played by cash holdings, and trade credit margins to handle liquidity shortfalls.

Our contribution can be summarized by the following main findings. Firms handle adverse liquidity shocks by drawing down on their cash holdings, by increasing the amount of drawn credit from suppliers (payables), and by decreasing the amount of issued credit to suppliers (receivables). In terms of magnitudes, upstream adjustments dominate downstream adjustments; and the compounded adjustment at the two trade credit margins is found to be of the same order as adjustments in cash holdings, suggesting

[20] $\rho_i = \text{Corr}(Cash\ flow_{i,t}\ ,\ Agg\ Cash\ flow_t)$. Hence, our measure of aggregate risk exposure captures the degree of firms' pro-cyclicality. The more pro-cyclical, the more exposed. That is, the approach hinges on an assumption that the firms' trading partners collectively converge to the average of all firms. But on all accounts, the average yearly cash flow for the trading partners—which we cannot observe—should be expected to follow the business cycle, provided that the number of trading partners is large enough.

that trade credit positions indeed provide important sources of reserve liquidity. Moreover, by exploring the underlying mechanism of the trade credit adjustments, we find evidence suggesting that the observed changes are due to shifts in the time dimension, where firms in need of liquidity increase durations on the trade credit contracts upstream and reduce them downstream.

We further explore the external validity of our event study results by a broad evaluation of adjustments in cash holdings and trade credit positions following cash flow shortfalls. Consistent with our event study findings—and when controlling for demand conditions in the supply-chain—we find that cash flow shortfalls are associated with decreases in cash holdings, increases in payables, and reductions in receivables, and again the former dominates the latter; moreover, the compounded adjustments at the trade credit margins are greater than adjustments in cash. These results are documented for a sample covering the universe of predominantly small- and medium-sized Swedish corporate firms, as well as for a sample consisting of large, publicly traded U.S. firms, which suggests that they are general in nature and not size-, nor country-specific.

References

Abadie, Albert, and Guido W. Imbens, 2006. Large Sample Properties of Matching Estimators for Average Treatment Effects. *Econometrica*, 74, 235–267.

Abadie, Albert, and Guido W. Imbens, 2011. Bias-corrected matching estimators for average treatment effects. *Journal of Business & Economic Statistics*, 29, 1-11.

Acemoglu, Daron, Asuman Ozdaglar, and Alireza Tahbaz-Salehi, 2015. Systemic Risk and Stability in Financial Networks. *American Economic Review*, 105, 564–608.

Acharya, Viral, Sergei Davydenko and Ilya Strebulaev, 2012. Cash Holdings and Credit Risk. *Review of Financial Studies*, 25, 3572–3609.

Acharya, Viral, Heitor Almeida, and Murillo Campello, 2013. Aggregate Risk and the Choice between Cash and Lines of Credit. *Journal of Finance*, 68, 2059–2116.

Allen, Franklin, and Douglas Gale, 2000. Financial Contagion. *Journal of Political Economy*, 108, 1-33.

Almeida, Heitor, Murillo Campello, Igor Cunha, and Michael Weisbach, 2014. Corporate Liquidity Management: A Conceptual Framework and Survey. *Annual Review of Financial Economics*, 6, 135-62.

Almeida, Heitor, Murillo Campello and Michael Weisbach, 2004. The Cash Flow Sensitivity of Cash. *Journal of Finance*, 59, 1777–1804.

Almeida, Heitor, Chang-Soo Kim and Brian Kim, 2015. Internal Capital Markets in Business Groups: Evidence from the Asian Financial Crisis. *Journal of Finance*, 70, 2539-86.

Asdrubali, Pierfederico, Bent Sorensen and Oved Yosha, 1996. Channels of Interest Risk Sharing: United States 1963–90. *Quarterly Journal of Economics* 111, 1081–1110.

Bates, Thomas, Kathleen Kahle, and René Stulz, 2009. Why Do U.S. Firms Hold So Much More Cash than They Used To? *Journal of Finance*, 64,1985-2021.

Bakke, Tor-Erik, and Toni Whited, 2012. Threshold Events and Identification: A Study of Cash Shortfalls. *Journal of Finance*, 67, 1083–1111.

Boissay, Fredric, and Reint Gropp, 2013. Payment Defaults and Interfirm Liquidity Provision. *Review of Finance*, 17, 1853–94.

Cuñat, Vincent, 2007. Trade Credit: Suppliers as Debt Collectors and Insurance Providers. *Review of Financial Studies*, 20, 491–527.

Giannetti, Mariassunta, Burkart, Mike, and Tore Ellingsen, 2011. What You Sell Is What You Lend? Explaining Trade Credit Contracts. *Review of Financial Studies*, 24, 1261–98.

Giordani, Paolo, Tor Jacobson, Erik von Schedvin, and Mattias Villani, 2014. Taking the Twists into Account: Predicting Firm Bankruptcy Risk with Splines of Financial Ratios. *Journal of Financial and Quantitative Analysis*, 49, 1071–99.

Gopalan, Radhakrishnan, Vikram Nanda, and Amit Seru, 2007. Affiliated firms and financial support: Evidence from Indian business groups. *Journal of Financial Economics*, 86, 759-795.

Hadlock, Charles and Joshua Pierce, 2010. New Evidence on Measuring Financial Constraints: Moving Beyond the KZ Index. *Review of Financial Studies*, 23, 1909-40.

Jacobson, Tor, Kasper Roszbach, and Jesper Lindé, 2013. Firm Default and Aggregate Fluctuations. *Journal of the European Economic Association*, 11, 945–72.

Jacobson, Tor and Erik von Schedvin, 2015. Trade Credit and the Propagation of Corporate Failure: An Empirical Analysis. *Econometrica*, 83, 1315–71.

Karaivanov, Alexander, Sonia Ruano, Jesús Saurina, and Robert Townsend, 2012. No Bank, One Bank: Does it Matter for Investment. Working Paper 1003, Bank of Spain.

Khanna, Tarun and Yishay Yafeh, 2005. Business Groups and Risk Sharing around the World. *Journal of Business*, 78, 301–40.

Kinnan, Cynthia, and Robert Townsend, 2012. Kinship and Financial Networks, Formal Financial Access, and Risk Reduction. *American Economic Review* 102, 289-93.

Mora, Ricardo and Iliana Reggio, 2015. didq: A command for treatment-effect estimation under alternative assumptions. *The Stata Journal*, 15, 796–808.

Opler, Tim, Lee Pinkowitz, René Stulz, and Rohan Williamson, 1999. The determinants and implications of corporate cash holdings. *Journal of Financial Economics*, 52, 3–46.

Petersen, Mitchell, and Raghuram Rajan, 1997. Trade Credit: Theory and Evidence. *Review of Financial Studies*, 10, 661–91.

Rajan, Raghuram and Luigi Zingales, 1998. Financial dependence and growth. *American Economic Review*, 88, 559–586.

Rauch, James, 1999. Networks versus Markets in International Trade. *Journal of International Economics*, 48, 7–35.

Samphantharak, Krislert, 2009. Internal Capital Markets and Allocation of Resources in Business Groups. Manuscript.

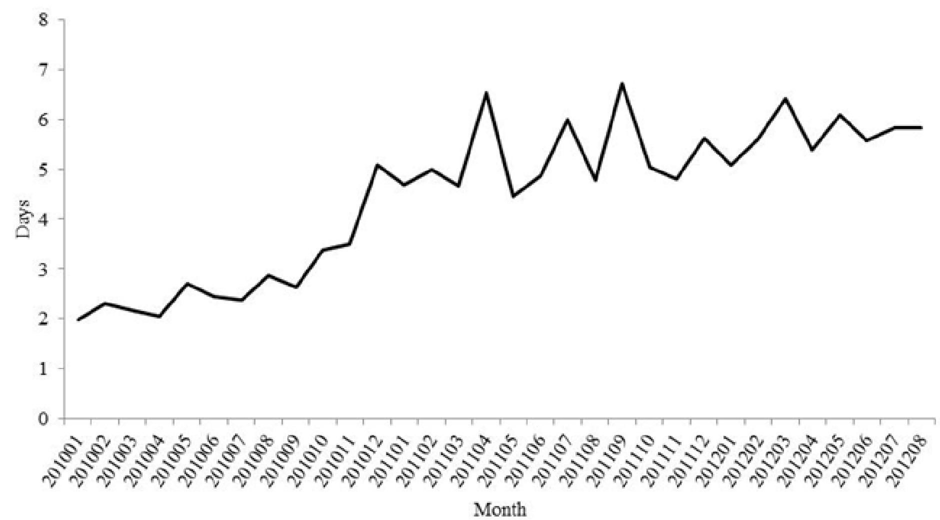
Samphantharak, Krislert, and Robert Townsend, 2009. Households as Corporate Firms: An Analysis of Household Finance Using Integrated Household Surveys and Corporate Financial Accounting. Econometric Society Monograph Series No. 46.

Sufi, Amir, 2007. Bank Lines of Credit in Corporate Finance: An Empirical Analysis. *Review of Financial Studies*, 22, 1057–88.

Wilner, Benjamin S., 2000. The exploitation of relationships in financial distress: The case of trade credit. *Journal of Finance*, 55, 153–78.

Figure 1

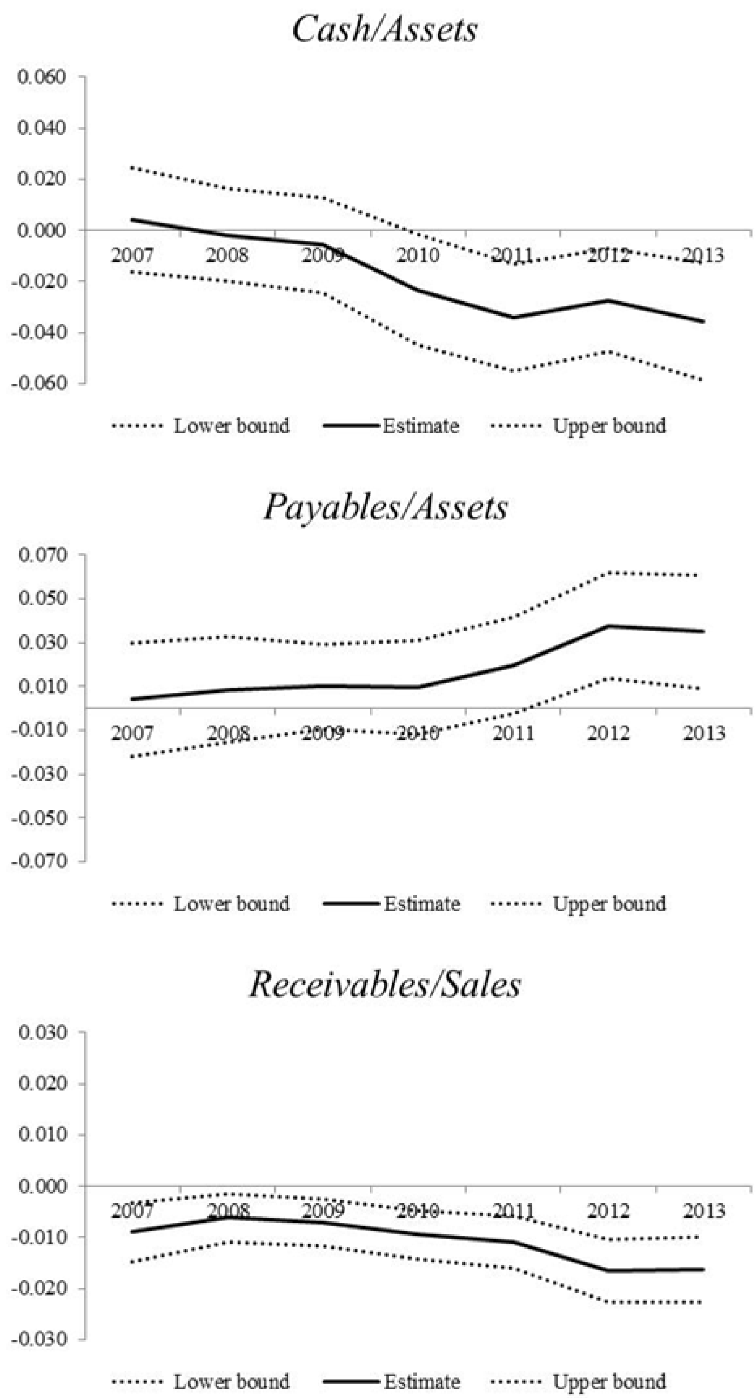
PANAXIA; TIME FROM COLLECTION TO DELIVERY



This figure illustrates, at a monthly frequency, the number of days Panaxia held on to their customers' proceeds in the period running up to the bankruptcy. The time period spans from January 2010 to August 2012.

Figure 2

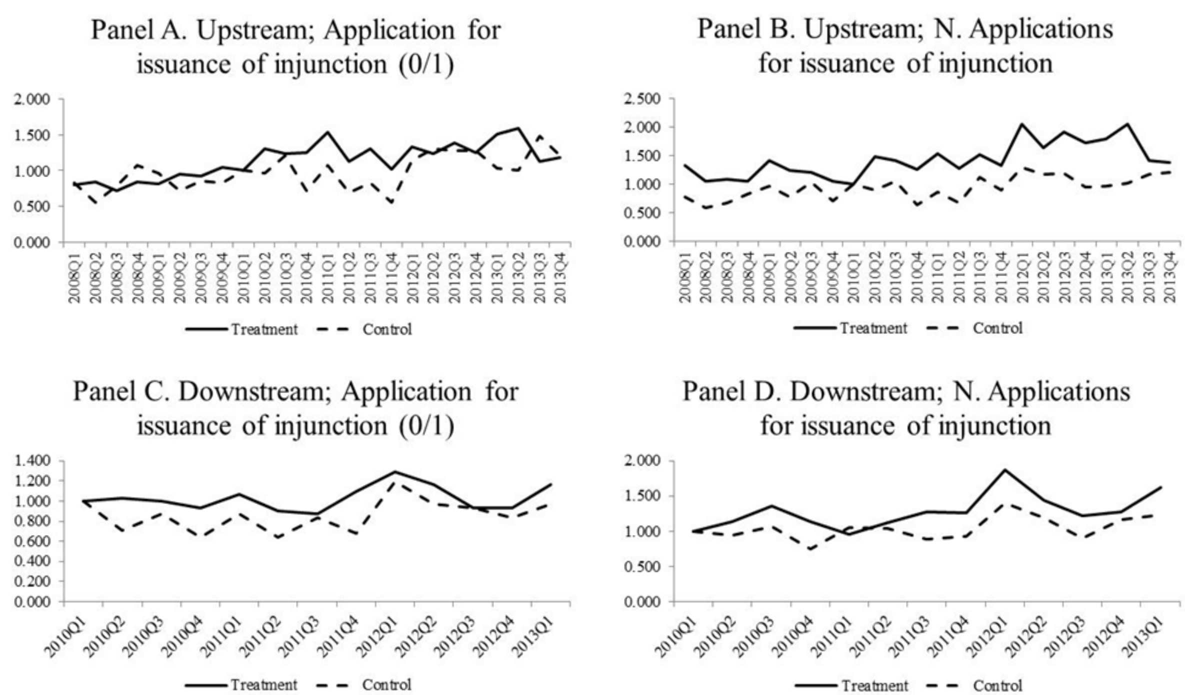
DIFFERENCES IN MEANS DURING THE PRE-TREATMENT, TREATMENT, AND POST-TREATMEN PERIODS



This figure shows yearly differences in means between the treated and matched control firms, over the period 2007–2013, for cash holdings, accounts payable, and accounts receivable. The period comprises the pre-treatment period, 2007–2009, the treatment period, 2010–2012, and the post-treatment period, 2013. The solid lines mark the differences in means between the two groups and the dotted lines correspond to 90-percent confidence bands.

Figure 3

APPLICATION FOR ISSUANCE OF INJUNCTION TO SETTLEMENT OF OVERDUE TRADE CREDIT



This figure shows applications for injunction to settle overdue payments faced by firms (Panels A and B) and issued by firms (Panels C and D), where we have normalized by 2010Q1-outcomes throughout. Panel A shows the fractions of treated and control firms, that in a given quarter were subject to one, or several applications for injunctions to settle a late trade credit payment, and Panel B shows the average number of applications facing firms, in the period 2008Q1–2013Q4. Panel C shows the fractions of treated and control firms that in a given quarter applied for an injunction to enforce late payments from their customers, and Panel D shows the average number of submitted applications, in the period 2010Q1–2013Q1.

Table 1 (Panel A)

DESCRIPTIVE STATISTICS; SWEDISH SAMPLE

Variables	Mean	Std.	25^{th} perc.	Median	75^{th} perc.
$Cash/Assets$	0.232	0.252	0.022	0.134	0.377
$Payables/Assets$	0.115	0.144	0.010	0.060	0.167
$Receivables/Sales$	0.161	0.180	0.008	0.099	0.258
$Debt/Assets$	0.245	0.290	0.000	0.123	0.427
$Tangible\ assets/Asset$	0.326	0.304	0.059	0.226	0.554
$Inventories/Assets$	0.138	0.220	0.000	0.006	0.205
$Assets$ (In M SEK)	32.300	966.000	0.611	1.581	4.879
Age	14.461	13.711	5.000	10.000	20.000
$Cash\ flow/Assets$	0.082	0.201	0.012	0.082	0.177
$Sales\ growth$	0.004	0.426	−0.121	0.005	0.148
$Capex/Assets$	−0.003	0.148	−0.035	−0.003	0.024
$\Delta NWC/Assets$	0.000	0.140	−0.050	0.000	0.055
$\Delta ShortTermDebt/Assets$	−0.003	0.120	−0.047	0.000	0.039
$Differentiated\text{-}inputs$	0.724	0.063	0.699	0.720	0.768
$Exposure\ to\ aggregate\ shocks$	0.044	0.462	−0.220	0.057	0.322
N. Firms			546,366		
N. Obs			4,691,622		

Panel A reports descriptive statistics for the Swedish sample, for the period 1989–2013. Definitions of the variables are provided in Table A1.

Table 1 (Panel B)

DESCRIPTIVE STATISTICS; U.S. SAMPLE

Variables	Mean	Std.	25^{th} perc.	Median	75^{th} perc.
$Cash/Assets$	0.157	0.189	0.022	0.079	0.220
$Payables/Assets$	0.107	0.123	0.039	0.073	0.128
$Receivables/Sales$	0.148	0.108	0.086	0.139	0.190
$Cash\ flow/Assets$	−0.018	0.385	0.005	0.072	0.119
$Assets$ (In M USD)	1,956	8,979	36	182	865
$Market\text{-}to\text{-}Book$ (Q)	2.121	2.412	1.072	1.437	2.168
$Capex/Assets$	0.056	0.060	0.018	0.037	0.071
$Acquisitions/Assets$	0.019	0.051	0.000	0.000	0.005
$\Delta NWC/Assets$	−0.020	0.178	−0.040	−0.002	0.032
$\Delta ShortTermDebt/Assets$	0.020	0.173	−0.023	0.001	0.031
$Differentiated\text{-}inputs$	0.488	0.125	0.378	0.446	0.636
$Exposure\ to\ aggregate\ shocks$	0.099	0.476	−0.265	0.125	0.486
N. Firms			9,497		
N. Obs			74,235		

Panel B reports descriptive statistics for the U.S. sample, for the period 1989–2013. Definitions of the variables are provided in Table A1.

Table 2

VARIANCE DECOMPOSITION

	Panel A. Swedish sample			Panel B. U.S sample		
Balance sheet components	(I) [1^{st}, 2^{nd}, 3^{rd} Quartiles]	(II) Coef.	(III) Coef.	(IV) [1^{st}, 2^{nd}, 3^{rd} Quartiles]	(V) Coef.	(VI) Coef.
A. Assets side						
Decrease in cash (B_1)	[−0.012, 0.177, 0.671]	0.079	0.358^{***}	[−0.128, 0.078, 0.478]	0.119^{***}	0.032^{***}
		(1.3)	(372.3)		(5.1)	(4.1)
Decrease in receivables (B_2)	[−0.039, 0.017, 0.274]	0.003	0.140^{***}	[−0.015, 0.108, 0.397]	0.051^{***}	0.073^{***}
		(0.1)	(210.1)		(3.3)	(19.3)
Decrease in other assets (B_3)	[−0.250, 0.146, 0.719]	0.531^{***}	0.275^{***}	[−0.069, 0.544, 1.473]	0.606^{***}	0.192^{***}
		(5.2)	(191.5)		(4.3)	(16.2)
B. Liability side						
Increase in payables (B_4)	[−0.107, 0.000, 0.094]	−0.009	-0.017^{***}	[−0.178, −0.029, 0.070]	-0.053^{***}	−0.001
		(−1.4)	(−36.5)		(−3.4)	(−0.4)
Increase in liabilities (B_5)	[−0.099, 0.000, 0.280]	−0.016	0.053^{***}	[−0.750, −0.075, 0.443]	-0.303^{***}	0.147^{***}
		(−0.2)	(60.2)		(−6.4)	(11.4)
Increase in equity (B_6)	[−0.229, 0.189, 0.742]	0.412^{***}	0.192^{***}	[−0.449, 0.077, 0.767]	0.580^{***}	0.556^{***}
		(3.6)	(128.2)		(5.6)	(32.7)
Scaled by assets	No	No	Yes	No	No	Yes
N. Obs.	4,691,622			74,235		

This table reports results for estimates of the balance sheet components in Eq. (3), for the period 1989–2013. Panel A reports results for the Swedish sample and Panel B for the U.S. sample. Columns (I) and (IV) report quartiles obtained from time series regressions at the firm-level. Columns (II) and (V) report estimates obtained from pooled firm- and year-fixed effects regressions. Columns (III) and (VI) reports estimates obtained from pooled firm- and year-fixed effects regressions where the variables are scaled by assets in t-1. Variable definitions are provided in Table A1. ***, **,* denote statistically distinct from 0 at the 1, 5 and 10 percent level, respectively.

Table 3

DESRIPTIVE STATISTICS FOR TREATED AND MATCHED CONTROL FIRMS

	Treated firms			Control firms			Mean test	Median test
Variables	Mean	Median	Std.	Mean	Median	Std.	(p-value)	(p-value)
Exposure								
$Exposure_{2012}/Assets_{2012}$	0.039	0.020	0.049	–	–	–	–	–
Firm characteristics								
$Cash\ flow/Assets_{2009}$	0.082	0.076	0.144	0.087	0.080	0.141	0.610	0.430
$Assets_{2009}$ (In M SEK)	249.228	2.844	3,106.542	68.856	2.808	357.280	0.156	0.192
$Sales\ growth_{2009}$	0.046	0.017	0.295	0.025	0.009	0.263	0.191	0.190
$Debt/Assets_{2009}$	0.170	0.005	0.247	0.176	0.056	0.236	0.662	0.010
$Tangible\ assets/Assets_{2009}$	0.201	0.106	0.234	0.216	0.119	0.242	0.275	0.141
$Inventories/Assets_{2009}$	0.274	0.269	0.203	0.277	0.279	0.207	0.810	0.952
Age_{2009}	14.977	9.000	16.848	14.188	9.000	15.065	0.391	0.923
$Cash/Assets_{2009}$	0.178	0.132	0.173	0.184	0.135	0.183	0.584	0.975
$Payables/Assets_{2009}$	0.241	0.223	0.159	0.231	0.207	0.155	0.265	0.287
$Receivables/Sales_{2009}$	0.021	0.001	0.041	0.028	0.006	0.042	0.003	0.000
$Cash/Assets_{2008}$	0.179	0.139	0.171	0.181	0.127	0.181	0.852	0.621
$Payable/Assetss_{2008}$	0.272	0.243	0.192	0.263	0.232	0.184	0.422	0.546
$Receivables/Sales_{2008}$	0.022	0.001	0.046	0.028	0.005	0.045	0.018	0.000
N. Obs.		605			605		–	
N. Unique firms		605			481		–	

This table reports descriptive statistics for the set of matching variables. The p-values refer to tests for differences in means and medians between the treated and the matched control firms. Variable definitions are provided in Table A1.

Table 4

BASELINE ESTIMATES; AVERAGE TREATMENT EFFECTS FOR TREATED FIRMS

	Average treatment effects for treated firms (ATT)				ATT with bias adjustment				
	Treatment period			Post-treatment period	Treatment period			Post-treatment period	Test of parallel pre-trends
	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)	(IX)
Variables	2010	2011	2012	2013	2010	2011	2012	2013	p-value
Panel A. $y = Cash/Assets$									
τ_t^y	-0.018^{**}	-0.011^{*}	0.007	−0.008	-0.018^{***}	−0.009	0.003	−0.010	0.617
	(−2.1)	(−2.0)	(1.1)	(−0.9)	(−2.5)	(−1.4)	(0.5)	(−1.1)	
T_t^y	-0.018^{**}	-0.029^{***}	-0.022^{**}	-0.030^{***}	-0.018^{***}	-0.026^{***}	-0.023^{**}	-0.033^{***}	
	(−2.1)	(−3.3)	(−2.6)	(−2.8)	(−2.5)	(−3.1)	(−2.6)	(−3.0)	
Panel B. $y = Payables/Assets$									
τ_t^y	−0.001	0.010^{**}	0.018^{***}	−0.003	−0.001	0.011^{*}	0.019^{***}	−0.003	0.791
	(−0.1)	(2.0)	(3.1)	(−0.3)	(−0.2)	(1.9)	(3.1)	(−0.4)	
T_t^y	−0.001	0.010	0.028^{***}	0.025^{**}	−0.001	0.010	0.029^{***}	0.026^{***}	
	(−0.1)	(1.3)	(3.1)	(2.2)	(−0.2)	(1.4)	(3.5)	(2.6)	
Panel C. $y = Receivables/Sales$									
τ_t^y	-0.002^{**}	−0.002	-0.006^{**}	0.000	-0.003^{**}	−0.002	-0.006^{**}	0.000	0.407
	(−2.0)	(−1.0)	(−2.6)	(0.1)	(−2.1)	(−1.4)	(−2.6)	(0.1)	
T_t^y	-0.002^{**}	-0.004^{**}	-0.009^{***}	-0.009^{***}	-0.003^{**}	-0.005^{***}	-0.012^{***}	-0.011^{***}	
	(−2.0)	(−2.2)	(−3.2)	(−2.9)	(−2.1)	(−2.8)	(−4.2)	(−3.4)	
N. Treated firms	605				605				–
N. Control firms	605				605				–
N. Unique control firms	481				481				–

This table reports estimates of yearly adjustments, Eq. (4), and cumulative adjustments, Eq. (5), in cash holdings, accounts payable, and accounts receivable, over the treatment and post-treatment periods. The bias-adjusted estimators in Columns (V) to (VIII) control for differences in outcomes, between the treated and matched control firms, in the set of continuous matching-variables (Abadie and Imbens (2011)). The tests of parallel pre-trends are conducted using the 2007–2009 period, and follow the approach proposed by Mora and Reggio (2015). Variable definitions are provided in Table A1. The standard errors in Columns (I) to (IV) are clustered at the firm-level to account for multiplicity of matched control firms. ***, **,* denote statistically distinct from 0 at the 1, 5 and 10 percent level, respectively.

Table 5

APPLICATIONS FOR ISSUANCE OF INJUNCTION TO SETTLE OVERDUE PAYMENTS

	Panel A. Upstream				Panel B. Downstream			
$y =$	Application (0/1)		Number of applications		Application (0/1)		Number of applications	
	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)
Quarter	τ_t^y	T_t^y	τ_t^y	T_t^y	τ_t^y	T_t^y	τ_t^y	T_t^y
2010Q2	0.021	0.021	0.068**	0.068**	0.017	0.017	0.226	0.226
	(1.4)	(1.4)	(2.1)	(2.1)	(1.6)	(1.6)	(1.1)	(1.1)
2010Q3	−0.017	0.005	−0.023	0.045	−0.010	0.007	0.322	0.549
	(−0.9)	(0.3)	(−0.7)	(1.2)	(−1.1)	(0.6)	(0.8)	(1.0)
2010Q4	0.025	0.030*	0.018	0.063*	0.008	0.015	−0.279	0.269
	(1.4)	(1.9)	(0.5)	(1.9)	(0.8)	(1.4)	(−1.0)	(0.9)
2011Q1	0.002	0.031*	0.013	0.076**	−0.005	0.010	−0.340	−0.071
	(0.1)	(1.8)	(0.5)	(2.2)	(−0.5)	(0.9)	(−1.2)	(−0.6)
2011Q2	−0.008	0.023	−0.013	0.063*	0.003	0.013	0.264	0.193
	(−0.5)	(1.5)	(−0.4)	(1.7)	(0.3)	(1.1)	(1.2)	(0.9)
2011Q3	0.005	0.028*	−0.012	0.051	−0.012	0.002	0.263	0.456
	(0.4)	(1.8)	(−0.4)	(1.5)	(−1.1)	(0.1)	(1.4)	(1.3)
2011Q4	−0.005	0.023	−0.003	0.048	0.020*	0.021*	−0.028	0.428*
	(−0.3)	(1.4)	(−0.1)	(1.1)	(1.9)	(1.8)	(−0.2)	(1.7)
2012Q1	−0.008	0.015	0.050	0.098**	−0.017	0.005	0.869	1.298
	(−0.5)	(0.9)	(1.1)	(2.1)	(−1.2)	(0.3)	(1.5)	(1.6)
2012Q2	−0.015	−0.000	−0.036	0.061	0.005	0.010	−0.635	0.663*
	(−0.9)	(−0.0)	(−0.8)	(1.5)	(0.4)	(0.9)	(−1.4)	(1.8)
2012Q3	0.012	0.012	0.030	0.091**	−0.010	0.000	−0.284	0.379
	(0.7)	(0.7)	(0.9)	(2.2)	(−0.9)	(0.0)	(−1.5)	(1.1)
2012Q4	−0.008	0.003	−0.000	0.091**	0.005	0.005	0.015	0.393
	(−0.5)	(0.2)	(−0.0)	(2.3)	(0.4)	(0.4)	(0.1)	(1.5)
2013Q1	0.028	0.031*	0.007	0.098**	0.005	0.010	0.542	0.936
	(1.6)	(1.8)	(0.2)	(2.4)	(0.4)	(0.9)	(1.2)	(1.4)
2013Q2	0.007	0.038**	0.026	0.124**	–	–	–	–
	(0.4)	(2.1)	(0.5)	(2.3)				
2013Q3	−0.053**	−0.015	−0.089**	0.035	–	–	–	–
	(−2.0)	(−0.6)	(−2.0)	(0.8)				
2013Q4	0.017	0.002	−0.008	0.026	–	–	–	–
	(0.6)	(0.1)	(−0.2)	(0.6)				
Test of pre-trends (p-val.)	0.408		0.820		–		–	
N. Treat./Cont./Un. Cont.	605/605/481				605/605/481			

This table reports estimates of quarterly adjustments, Eq. (4), and cumulative adjustments, Eq. (5), in applications for injunction to settle overdue payments faced by firms (Panel A) and issued by firms (Panel B). The dependent variable, y, in Columns (I) and (II) is the fraction of firms that in a given quarter were subject to one, or several applications of injunction to settle a late trade credit payment; the dependent variable, y, in Columns (III) and (IV) is the number of applications faced in a given quarter; the dependent variable, y, in Columns (V) and (VI) is the fraction of firms that in a given quarter applied for an injunction to enforce late payments from their customers; and the dependent variable, y, in Columns (VII) and (VIII) is the number of applications submitted. The tests of parallel pre-trends are conducted on the 2008Q1–2010Q1 period, and follow the approach proposed by Mora and Reggio (2015). Variable definitions are provided in Table A1. Standard errors are clustered at the firm-level to account for the multiplicity of matched control firms. ***, **,* denote statistically distinct from 0 at the 1, 5 and 10 percent level, respectively.

Table 6

NO BANKRUPTCY LOSS VS. BANKRUPTCY LOSS

	No losses in 2012					Incurred bankruptcy losses in 2012				
	Treatment period			Post-treatement period	Test of parallel pre-trends	Treatment period			Post-treatement period	Test of parallel pre-trends
	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)	(IX)	(X)
Variables	2010	2011	2012	2013	(p-value)	2010	2011	2012	2013	(p-value)
Panel A. $y = Cash/Assets$										
τ_t^y	−0.009	−0.032**	0.025**	−0.014	0.756	−0.020**	−0.006	0.003	−0.007	0.689
	(−0.7)	(−2.4)	(2.0)	(−1.0)		(−2.0)	(−1.0)	(0.3)	(−0.6)	
T_t^y	−0.009	−0.040**	−0.015	−0.029		−0.020**	−0.026***	−0.023**	−0.030**	
	(−0.7)	(−2.3)	(−0.8)	(−1.3)		(−2.0)	(−2.6)	(−2.5)	(−2.5)	
Panel B. $y = Payables/Assets$										
τ_t^y	0.011	0.010	−0.000	0.002	0.767	−0.004	0.011*	0.022***	−0.004	0.655
	(1.5)	(1.2)	(−0.0)	(0.2)		(−0.4)	(1.7)	(3.2)	(−0.3)	
T_t^y	0.011	0.021**	0.021	0.023		−0.004	0.007	0.029***	0.025*	
	(1.5)	(2.1)	(1.5)	(1.4)		(−0.4)	(0.8)	(2.8)	(1.9)	
Panel C. $y = Receivables/Sales$										
τ_t^y	−0.001	0.003	−0.010**	−0.002	0.531	−0.003**	−0.003	−0.004*	0.001	0.496
	(−0.4)	(1.5)	(−2.5)	(−0.4)		(−2.0)	(−1.5)	(−1.8)	(0.3)	
T_t^y	−0.001	0.002	−0.008	−0.010		−0.003**	−0.005***	−0.010***	−0.009***	
	(−0.4)	(0.6)	(−1.5)	(−1.3)		(−2.0)	(−2.8)	(−2.9)	(−2.6)	
N. Treated firms			116					489		
N. Control firms			116					489		
N. Unique control firms			116					366		

This table reports estimates of yearly adjustments, Eq. (4), and cumulative adjustments, Eq. (5), in cash holdings, accounts payable, and accounts receivable, over the treatment and post-treatment periods. Columns (I) to (V) report results for the sub-sample of treated firms that were fully compensated for bankruptcy losses in 2012 and Columns (VI) to (X) report results for the sub-sample of treated firms that incurred losses in 2012. The tests of parallel pre-trends are conducted on the 2007–2009 period, and follow the approach proposed by Mora and Reggio (2015). Variable definitions are provided in Table A1. Standard errors are clustered at the firm-level to account for the multiplicity of matched control firms. ***, **,* denote statistically distinct from 0 at the 1, 5 and 10 percent level, respectively.

Table 7

RESPONSES CONDITIONAL ON LOSS-SIZE

	Dependent variables:		
$y =$	$Cash/Assets$	$Payables/Assets$	$Receivables/Sales$
Variable	(I)	(II)	(III)
$Loss/Assets_{2012} \times I_{2012}$	0.034	0.215^{*}	-0.070^{***}
	(0.3)	(1.8)	(−2.7)
$Loss/Assets_{2012}$	−0.015	0.006	-0.023^{*}
	(−0.5)	(0.1)	(−1.8)
I_{2012}	0.003	0.002	0.006^{***}
	(0.6)	(0.4)	(2.7)
R^2	0.721	0.746	0.643
Firm controls		Yes	
N. Obs.		1,948	
N. Treated		487	
N. Control firms		487	
N. Unique control firms		365	

This table reports estimates on the relationships between the cumulative adjustment over the period 2009 to 2012 and the size of the incurred losses, for cash holdings, accounts payable, and accounts receivable. The model is described in Footnote 17. Variable definitions are provided in Table A1. Standard errors are clustered at the firm-level to account for the multiplicity of matched control firms. ***, **,* denote statistically distinct from 0 at the 1, 5 and 10 percent level, respectively.

Table 8

CASH FLOW SHORTFALL SENSITIVITY OF CASH AND TRADE CREDIT POSITIONS

	Dependent variables:					
$y =$	$\Delta Cash/Assets$		$\Delta Payables/Assets$		$\Delta Receivables/Sales$	
	(I)	(II)	(III)	(IV)	(V)	(VI)
Variables	Coef.	E.S.	Coef.	E.S.	Coef.	E.S.
Panel A. Swedish Sample						
$Shortfall$	-0.097^{***}	-0.084	0.124^{***}	0.216	-0.052^{***}	-0.065
	(-92.1)		(145.8)		(-72.7)	
R^2	0.221		0.177		0.122	
N. Obs.	4,691,622					
Panel B. U.S. Sample						
$Shortfall$	-0.022^{***}	-0.054	0.051^{***}	0.183	-0.023^{***}	-0.060
	(-6.3)		(16.2)		(-9.3)	
R^2	0.292		0.306		0.171	
N. Obs.	74,235					

This table reports coefficients from the estimation of Eq. (6) on the Swedish (Panel A) and U.S. (Panel B) samples. t-values, calculated using robust standard errors, clustered at the firm-level, are reported within parenthesis. The economic significance (E.S.) is calculated as the shortfall-coefficient multiplied by the value of a one-standard-deviation in cash flow, divided by the mean of the outcome variable. Variable definitions are provided in Table A1. ***, **,* denote statistically distinct from 0 at the 1, 5 and 10 percent level, respectively.

Table 9

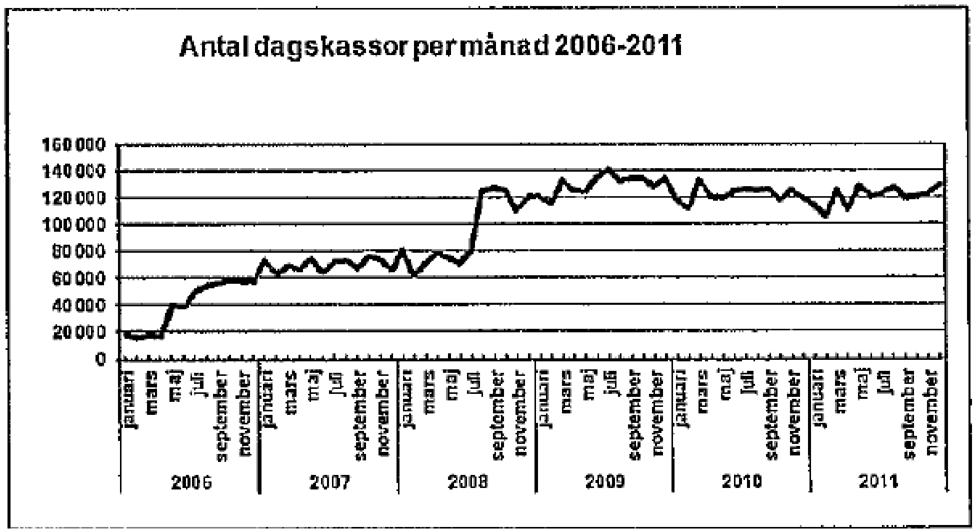
CROSS-SECTIONAL HETEROGENEITY

	Panel A. Swedish sample						Panel B. U.S. sample					
$y =$	$\Delta Cash/Assets$		$\Delta Payables/Assets$		$\Delta Receivables/Sales$		$\Delta Cash/Assets$		$\Delta Payables/Assets$		$\Delta Receivables/Sales$	
	(I)	(II)	(III)	(IV)	(V)	(VI)	(VII)	(VIII)	(IX)	(X)	(XI)	(XII)
Variables	Coef.	p-value	Coef.	p-value	Coef.	p-value	Coef.	p-value	Coef.	p-value	Coef.	p-value
1. Differentiated goods												
Bottom 30%	-0.106^{***}	0.180	0.132^{***}	0.000	-0.049^{***}	0.000	-0.025^{***}	0.155	0.055^{***}	0.962	-0.018^{***}	0.540
	(−60.0)		(95.2)		(−42.2)		(−3.3)		(8.3)		(−3.6)	
Top 30%	-0.102^{***}		0.143^{***}		-0.067^{***}		-0.040^{***}		0.054^{***}		-0.023^{***}	
	(−45.2)		(74.4)		(−41.5)		(−5.9)		(9.8)		(−4.3)	
2. Exposure to aggregate shocks												
Bottom 30%	-0.081^{***}	0.022	0.114^{***}	0.070	-0.052^{***}	0.127	-0.020^{***}	0.514	0.066^{***}	0.006	-0.031^{***}	0.006
	(−42.2)		(73.6)		(−38.5)		(−2.9)		(11.1)		(−6.2)	
Top 30%	-0.087^{***}		0.110^{***}		-0.049^{***}		-0.014^{**}		0.044^{***}		-0.014^{***}	
	(−47.6)		(73.7)		(−38.4)		(−2.4)		(8.3)		(−3.5)	

This table reports coefficients from the estimation of Eq. (6) on the Swedish and U.S. samples. The model is estimated on sub-samples classified with respect to a set of firm- and industry-characteristics. t-values calculated using robust standard errors, clustered at the firm-level, are reported within parenthesis. p-values refer to tests of difference in coefficients between the Top and Bottom 30 percent sub-samples. Variable definitions are provided in Table A1. ***, **,* denote statistically distinct from 0 at the 1, 5 and 10 percent level, respectively.

Figure A1

THE NUMBER OF COLLECTED RECEIPTS DURING THE 2006-2011 PERIOD



This figure is obtained from Panaxia's bankruptcy report. It shows the number of collected receipts in each month in the period 2006–2011.

Table A1

VARIABLE DEFINITIONS

Variable names	Definitions
$Cash$	Cash and short-term investments (CHE).
$Payables$	Accounts payable (AP).
$Receivables$	Accounts receivable (RECTR).
$Exposure$	Bankruptcy claims held on Panaxia in 2012.
$Loss$	Incurred losses due to Panaxia Bankruptcy in 2012
$Debt$	Total liabilities excluding payables. Panaxia analysis only.
$Tangible\ assets$	Property, plant, and equipment. Panaxia analysis only.
$Inventories$	Inventories. Panaxia analysis only.
$Cash\ flow$	Earnings after interest expenses and taxes, but before depreciation and amortization (EBITDA-XINT-TXT).
$Assets$	Total assets (AT) in millions of 2010 USD/SEK.
Age	Years since registration as a corporate. Swedish sample only.
$Market\text{-}to\text{-}Book\ (Q)$	Market value of assets divided by total assets ([AT+CSHO*PRCC_F-CEQ]/AT). U.S. sample only.
$Sales\ growth$	The log difference between sales in periods t-1 and t. Swedish sample only.
$Capex$	Capital expenditures (CAPX).
$Acquisitions$	Acquisitions (ACQ).
NWC	Working capital (WCAP) minus cash holdings (CHE) plus accounts payable (AP) minus accounts receivable (AR).
$ShortTermDebt$	Short-term debt excluding accounts payable (DLC-AP).
$Differentiated\ goods$	Share of differentiated inputs, obtained from Giannetti et al. (2011).
$Exposure\ to\ aggregate\ shocks$	Correlation between a firm's cash flow and the average cash flow of all firms in the sample.

This table reports variable definitions.

Earlier Working Papers:

For a complete list of Working Papers published by Sveriges Riksbank, see www.riksbank.se

Price Setting Transactions and the Role of Denominating Currency in FX Markets 2007:201
by Richard Friberg and Fredrik Wilander

The geography of asset holdings: Evidence from Sweden 2007:202
by Nicolas Coeurdacier and Philippe Martin

Evaluating An Estimated New Keynesian Small Open Economy Model 2007:203
by Malin Adolfson, Stefan Laséen, Jesper Lindé and Mattias Villani

The Use of Cash and the Size of the Shadow Economy in Sweden 2007:204
by Gabriela Guibourg and Björn Segendorf

Bank supervision Russian style: Evidence of conflicts between micro- and macro-prudential concerns 2007:205
by Sophie Claeys and Koen Schoors

Optimal Monetary Policy under Downward Nominal Wage Rigidity 2007:206
by Mikael Carlsson and Andreas Westermark

Financial Structure, Managerial Compensation and Monitoring 2007:207
by Vittoria Cerasi and Sonja Daltung

Financial Frictions, Investment and Tobin's q 2007:208
by Guido Lorenzoni and Karl Walentin

Sticky Information vs Sticky Prices: A Horse Race in a DSGE Framework 2007:209
by Mathias Trabandt

Acquisition versus greenfield: The impact of the mode of foreign bank entry on information and bank lending rates 2007:210
by Sophie Claeys and Christa Hainz

Nonparametric Regression Density Estimation Using Smoothly Varying Normal Mixtures 2007:211
by Mattias Villani, Robert Kohn and Paolo Giordani

The Costs of Paying – Private and Social Costs of Cash and Card 2007:212
by Mats Bergman, Gabriella Guibourg and Björn Segendorf

Using a New Open Economy Macroeconomics model to make real nominal exchange rate forecasts 2007:213
by Peter Sellin

Introducing Financial Frictions and Unemployment into a Small Open Economy Model 2007:214
by Lawrence J. Christiano, Mathias Trabandt and Karl Walentin

Earnings Inequality and the Equity Premium 2007:215
by Karl Walentin

Bayesian forecast combination for VAR models 2007:216
by Michael K. Andersson and Sune Karlsson

Do Central Banks React to House Prices? 2007:217
by Daria Finocchiaro and Virginia Queijo von Heideken

The Riksbank's Forecasting Performance 2007:218
by Michael K. Andersson, Gustav Karlsson and Josef Svensson

Macroeconomic Impact on Expected Default Freqency 2008:219
by Per Åsberg and Hovick Shahnazarian

Monetary Policy Regimes and the Volatility of Long-Term Interest Rates 2008:220
by Virginia Queijo von Heideken

Governing the Governors: A Clinical Study of Central Banks 2008:221
by Lars Frisell, Kasper Roszbach and Giancarlo Spagnolo

The Monetary Policy Decision-Making Process and the Term Structure of Interest Rates 2008:222
by Hans Dillén

How Important are Financial Frictions in the U S and the Euro Area 2008:223
by Virginia Queijo von Heideken

Block Kalman filtering for large-scale DSGE models 2008:224
by Ingvar Strid and Karl Walentin

Optimal Monetary Policy in an Operational Medium-Sized DSGE Model 2008:225
by Malin Adolfson, Stefan Laséen, Jesper Lindé and Lars E. O. Svensson

Firm Default and Aggregate Fluctuations 2008:226
by Tor Jacobson, Rikard Kindell, Jesper Lindé and Kasper Roszbach

Wage Adjustment and Productivity Shocks *by Mikael Carlsson, Julián Messina and Oskar Nordström Skans*	2011:253
Stylized (Arte) Facts on Sectoral Inflation *by Ferre De Graeve and Karl Walentin*	2011:254
Hedging Labor Income Risk *by Sebastien Betermier, Thomas Jansson, Christine A. Parlour and Johan Walden*	2011:255
Taking the Twists into Account: Predicting Firm Bankruptcy Risk with Splines of Financial Ratios *by Paolo Giordani, Tor Jacobson, Erik von Schedvin and Mattias Villani*	2011:256
Collateralization, Bank Loan Rates and Monitoring: Evidence from a Natural Experiment *by Geraldo Cerqueiro, Steven Ongena and Kasper Roszbach*	2012:257
On the Non-Exclusivity of Loan Contracts: An Empirical Investigation *by Hans Degryse, Vasso Ioannidou and Erik von Schedvin*	2012:258
Labor-Market Frictions and Optimal Inflation *by Mikael Carlsson and Andreas Westermark*	2012:259
Output Gaps and Robust Monetary Policy Rules *by Roberto M. Billi*	2012:260
The Information Content of Central Bank Minutes *by Mikael Apel and Marianna Blix Grimaldi*	2012:261
The Cost of Consumer Payments in Sweden *by Björn Segendorf and Thomas Jansson*	2012:262
Trade Credit and the Propagation of Corporate Failure: An Empirical Analysis *by Tor Jacobson and Erik von Schedvin*	2012:263
Structural and Cyclical Forces in the Labor Market During the Great Recession: Cross-Country Evidence *by Luca Sala, Ulf Söderström and AntonellaTrigari*	2012:264
Pension Wealth and Household Savings in Europe: Evidence from SHARELIFE *by Rob Alessie, Viola Angelini and Peter van Santen*	2013:265
Long-Term Relationship Bargaining *by Andreas Westermark*	2013:266
Using Financial Markets To Estimate the Macro Effects of Monetary Policy: An Impact-Identified FAVAR* *by Stefan Pitschner*	2013:267
DYNAMIC MIXTURE-OF-EXPERTS MODELS FOR LONGITUDINAL AND DISCRETE-TIME SURVIVAL DATA *by Matias Quiroz and Mattias Villani*	2013:268
Conditional euro area sovereign default risk *by André Lucas, Bernd Schwaab and Xin Zhang*	2013:269
Nominal GDP Targeting and the Zero Lower Bound: Should We Abandon Inflation Targeting?* *by Roberto M. Billi*	2013:270
Un-truncating VARs* *by Ferre De Graeve and Andreas Westermark*	2013:271
Housing Choices and Labor Income Risk *by Thomas Jansson*	2013:272
Identifying Fiscal Inflation* *by Ferre De Graeve and Virginia Queijo von Heideken*	2013:273
On the Redistributive Effects of Inflation: an International Perspective* *by Paola Boel*	2013:274
Business Cycle Implications of Mortgage Spreads* *by Karl Walentin*	2013:275
Approximate dynamic programming with post-decision states as a solution method for dynamic economic models *by Isaiah Hull*	2013:276
A detrimental feedback loop: deleveraging and adverse selection *by Christoph Bertsch*	2013:277
Distortionary Fiscal Policy and Monetary Policy Goals *by Klaus Adam and Roberto M. Billi*	2013:278
Predicting the Spread of Financial Innovations: An Epidemiological Approach *by Isaiah Hull*	2013:279

SVERIGES RIKSBANK

Sveriges Riksbank
Visiting address: Brunkebergs torg 11
Mail address: se-103 37 Stockholm

Website: www.riksbank.se
Telephone: +46 8 787 00 00, Fax: +46 8 21 05 31
E-mail: registratorn@riksbank.se