

Increased creditor protection in bankruptcy and trade credit:

Evidence from the 2005 BAPCPA

Abstract

We examine whether the increased creditor protection under the 2005 Bankruptcy Abuse Prevention and Consumer Protection Act (BAPCPA) affects suppliers' provision of trade credit to their customers with high default risk. Employing a difference-in-differences analysis for a sample of U.S. public firms during 2002-2008, we find that suppliers whose customers have high default risk extend more trade credit after BAPCPA. We also find that this relation exists when suppliers have stronger reliance on their customers. Overall, our results indicate that the increased creditor protection in bankruptcy induces suppliers to offer more trade credit to customers with high default risk during the ordinary course of business. Our findings have policy implications given the heated debate over the BAPCPA's effect on Chapter 11 bankruptcy process.

Keywords: Bankruptcy risk; BAPCPA; Creditor right protection; Trade credit

JEL classification: G32, G33

1. Introduction

Trade credit is created when a supplier sells goods to a customer and allows the customer to make the payment within a certain period after delivery. As one of the most important sources of short-term financing for the buyers, trade credit is widely used in normal business. In the U.S., more than 70% of firms use trade credit in their ordinary business (Petersen and Rajan, 1997), and accounts receivable derived from trade credit account for 15% of the assets of non-financial U.S. firms (Rajan and Zingales, 1993). Similar to bank credit, trade credit is also one type of private credit, but it is significantly different from bank credit as suppliers deliver goods rather than money to customers and customers' bankruptcy risk has a profound influence on suppliers' decisions and performance (Yang et al., 2015).

On the one hand, different from financial institutions, suppliers and customers are intimate stakeholders in the supply chain, with the former in the upstream and the latter in the downstream. Once a customer collapses, it may be difficult for a supplier to replace this customer with a new one (Cunat, 2007). In addition, the relationship-specific investments that the supplier made will be of useless once the customer goes bankrupt,¹ and deploying these investments will result in a huge loss to the supplier (Cunat, 2007; Wilner, 2000). Therefore, relative to financial institutions, a supplier has an additional interest in the customer, which is called the

¹ The relationship-specific investment can take different forms. It could be a supplier's investment into the production of goods that are tailored to meet the specific needs of the customer (e.g., building a factory close to the customer, or purchasing special machinery), or intangible assets that are specific to the relationship (e.g., acquiring specific technology) (Dass et al., 2015). The considerable time that the salesperson spent with the customer and other point-of-sale efforts may also create a specific non-salvageable investment in the relationship (Ng et al., 1999).

debtor in a bankruptcy case, because the supplier considers not only the uncollected accounts receivable but also the potential profits from selling its goods (Ng et al., 1999). For this reason, suppliers may be more willing to extend trade credit to financially distressed customers to help them overcome temporary financial difficulties (e.g., Ng et al., 1999; Wilner, 2000; Gunat, 2007; Dass et al., 2015).

On the other hand, financial institutions can set up covenants to safeguard their benefits, including requiring collateral and other restrictive covenants, while trade credit extended by suppliers is unsecured creditor right (Li and Tang, 2016). According to the United States Bankruptcy Code, only after all secured creditors have been paid, unsecured creditors could ask for payment. In most circumstances, unsecured creditors will get little repayment in a reorganization bankruptcy or when firms file for liquidation (Teloni, 2014). Consequently, suppliers extending trade credit to customers with high default risk may have to write-off their accounts receivable and thus bear huge credit loss once the customers are eventually liquidated after failed attempts to reorganize² (Cunat, 2007; Wilner, 2000). Therefore, suppliers may be very cautious when extending trade credit to customers with high default risk.

According to the power theory of credit, the legal protection of creditors in bankruptcy will induce financial institutions to extend private credit to firms (Djankov et al., 2007; Hart and Moore, 1994, 1998; Townsend, 1979). Moreover, using a sample of 127 countries, Djankov et al. (2007) find that the role of legal protection of

² As will be discussed in Section 2, under the U.S. bankruptcy laws, a company can file for bankruptcy reorganization under Chapter 11 of the United States Bankruptcy Code, or file for a liquidation bankruptcy under Chapter 7.

creditor rights in encouraging lenders to extend private credit is more important in richer countries. Given the great divergence between bank credit and trade credit, is the power theory of credit also applicable to trade credit? This paper attempts to address this unexplored issue.

To identify an exogenous increase in suppliers' power, we exploit the Bankruptcy Abuse Prevention and Consumer Protection Act of 2005 (BAPCPA hereafter) as an exogenous shock, and construct a difference-in-differences research design to examine the effect of increased supplier power on the trade credit supply. Prior to 2005, bankruptcy in the U.S. was largely governed by the Bankruptcy Reform Act of 1978, which has long been viewed debtor friendly. In practice, bankruptcy courts usually prefer to protect the filing company's benefit (i.e., the debtor's benefit) at the cost of creditors' benefits (Birge et al., 2014; Franks et al., 1996; Ravid and Sundgren, 1998; Teloni, 2014). However, BAPCPA breaks out this situation because it significantly changes the power balance between the debtor and creditors in bankruptcy reorganization under Chapter 11 of the U.S. Bankruptcy Code (Teloni, 2014). This amendment is more creditor friendly, and enhances the bargaining power of creditors in general, suppliers in particular, when a debtor files for reorganization (Mazur, 2014; Teloni, 2014).

The passage of BAPCPA has triggered a heated debate over its effect on Chapter 11 bankruptcy. Some law scholars argue that BAPCPA improves the efficiency of bankruptcy process, which had been lengthy and burdensome (Williams, 2009), while others argue that BAPCPA makes reorganization more difficult and burdensome for

debtors (Miller, 2007). The debate also motivates us to provide empirical evidence on whether BAPCPA has some positive effect on debtors before they file for bankruptcy.

As BAPCPA mainly concerned insolvent customers, it has little influence on financially healthy customers. We use Bharath and Shumway's (2008) expected default risk (EDF) developed from Merton's (1974) distance to default to measure customers' default risk. We calculate the weighted average EDF of each supplier's major customers (labeled as CEDF), where the weight is a major customer's purchase from the supplier divided by the supplier's total sales. We then classify suppliers into two groups based on their CEDF scores in 2004: the treatment group consists of suppliers whose CEDF scores are in the top quintile (i.e., suppliers whose major customers have high default risk; we label these customers as near-insolvent customers), and the control group includes suppliers whose CEDF scores are in the bottom quintile (i.e., suppliers whose major customers have low default risk). Using the trade credit data three years prior to and three years following BAPCPA, we first examine whether suppliers with higher CEDF scores extend more trade credit after BAPCPA. We find that, relative to the control group, suppliers in the treatment group (i.e., suppliers whose major customers have high default risk) extend more trade credit after BAPCPA, indicating that the power theory of credit not only applies to bank credit provided by financial institutions (Townsend, 1979; Aghion and Bolton, 1992; Hart and Moore, 1994, 1998; Djankov, McLiesh, and Shleifer, 2007), but also applies to trade credit offered by suppliers.

We then perform parallel trend analysis and confirm that the differences in trade credit extended by suppliers in the post-BAPCPA period cannot be attributed to the trending differences between the treatment and control groups in the pre-BAPCPA period, which further supports our conclusion. Our baseline result is also robust to additional tests using Altman's (1968) Z-score to measure customers' expected default risk, using both shorter and longer sample periods (i.e., one-year, two-year and four-year windows around the passage of BPACPA), and using two alternative measures of trade credit.

We next test whether the effect of increased creditor power under BAPCPA on trade credit supply depends on suppliers' reliance on customers. Provided that a supplier is highly dependent on a major customer, it is costly to lose this customer (e.g., Cunat, 2007; Dass et al., 2015; Wilner, 2000). Prior to BAPCPA, due to the high switching costs, a supplier had to make great concession in bankruptcy reorganization (e.g., waiving a substantial portion of unpaid amount) to maintain its relationship with the customer (Cunat, 2007; Wilner, 2000). BAPCPA increases creditor rights in bankruptcy, thereby reducing their loss in reorganization. Therefore, suppliers with higher switching costs benefit more from BAPCPA, and thus are more willing to extend trade credit to their near-insolvent customers to help them overcome financial difficulties. Following prior literature (Banerjee et al., 2008; Bowen et al., 1995; Fabbri and Klapper, 2016; Li and Tang, 2016), we consider three attributes of the supply-chain relationship that are deemed to influence a supplier's dependence on its major customers: (i) the sales concentration to major customers; (ii) whether the

supplier is in durable goods industry; and (iii) the product market competition in the supplier's industry. Consistent with our predictions, we find that suppliers with higher CEDF scores extend more trade credit to their customers after BAPCPA only when they are highly dependent on their customers.

Our paper contributes to the literature in several respects. First, our study extends the literature that examines whether the legal protection of creditor rights affects corporate debt financing. Prior studies report that the legal environment influences corporate external financing (La Porta et al., 2008; La Porta et al., 1998), and a more debtholder-oriented legal environment will induce financial institutions to extend more credit to borrowers (Aghion and Bolton, 1992; Djankov et al., 2007; Hart and Moore, 1994, 1998; Townsend, 1979). Different from bank credit provided by financial institutions, trade credit provided by suppliers is also an important form of private credit. In essence, what suppliers lend is what they sell (Giannetti et al., 2011). Our study shows that the power theory of credit documented in the prior literature applies to trade credit as well.

Second, our study adds to the extant theoretical and empirical work that explains why trade credit exists. Some theories posit that suppliers have an information advantage over banks (Biais and Gollier, 1997; Frank and Maksimovic, 1998; Petersen and Rajan, 1994, 1997; Smith, 1987). Other explanations are based on moral hazard faced by the buyer (Babich and Tang, 2012; Kim and Shin, 2012; Lee and Stowe, 1993; Long et al., 1993), moral hazard faced by the supplier (Burkart and Ellingsen, 2004), price discrimination between customers with different levels of

creditworthiness (Brennan et al., 1988), transaction costs (Emery, 1987; Ferris, 1981), supply chain coordination efficiency (Kouvelis and Zhao, 2012; Yang and Birge, 2011), or competition in suppliers (Chod, 2017; Fisman and Raturi, 2004; McMillan and Woodruff, 1999). Yang et al. (2015) develop theoretical models to analyze the supply-chain effects of bankruptcy. However, little attention has been paid to whether increased supplier power in bankruptcy affects the provision of trade credit to near-insolvent firms during the ordinary course of business. Taking advantage of BAPCPA as an exogenous shock, our empirical results provide initial evidence on this issue, and enhance our understanding of legal factors that influence the trade credit provision.

Third, our study also belongs to the line of research that examines the effect of the 2005 BAPCPA and carries important policy implications. Current literature mainly focuses on the effect of BAPCPA on market reactions to the bankruptcy announcements (Coelho, 2010), capital investments of U.S. airlines (Mazur, 2014), and sales of debtors' assets during bankruptcy process and debtors' likelihood of emergence (Teloni, 2014). To our best knowledge, our paper is the first to study the spillover effect of BAPCPA along the supply chain, that is, we examine the BAPCPA's effect on trade credit offered by suppliers to customers. Our results indicate that increased creditor bargaining power in bankruptcy encourages suppliers to provide more trade credit to near-insolvent customers in the ordinary course of business, which may help these customers to overcome temporary financial difficulties and reduce their bankruptcy risk. In contrast to the concerns that BAPCPA

puts debtors at disadvantage during bankruptcy reorganization, our findings shed light on the positive effect of BAPCPA on debtors before filing for bankruptcy. Our findings will be of interest to regulators concerned about the benefits and costs of increased creditor power in bankruptcy.

The rest of the paper proceeds as follows. Section 2 summarizes the key changes of creditor rights under BAPCPA and develops our hypothesis; Section 3 describes the sample selection, research design and descriptive statistics; Section 4 tests our hypothesis and reports the baseline and robustness test results; Section 5 presents the cross-sectional test results; and Section 6 concludes the paper.

2. Background and Hypothesis Development

Firms that are unable to meet their financial obligations can file for bankruptcy. Bankruptcy does not necessarily mean that a firm is forced to shut down. In the U.S., there are two types of bankruptcy: liquidation and reorganization. Liquidation is the process by which the filing firm is brought to an end and the assets and property of the firm are redistributed to creditors and/or shareholders, while reorganization focuses on reducing the filing firm's debt burden to help it return to normal business operation. Prior to 2005, Chapter 7 of the 1978 Bankruptcy Reform Act of the United States governs the process of liquidation, while Chapter 11 focuses on reorganization. In practice, firms usually prefer to file for reorganization rather than liquidation, and they file for liquidation when they cannot reach an agreement with creditors in

reorganization. According to the issue we want to explore, we mainly focus on creditor rights during Chapter 11 reorganization bankruptcy.

The BAPCPA was passed on April 14, 2005 and went into effect on October 17, 2005. Although it mainly focuses on individual bankruptcy, this amendment also includes some modifications and enactments relevant to business bankruptcy provisions. Specifically, BAPCPA made several significant changes to Chapter 11 provisions, which shift the bargaining power from the debtor to creditors. The revised Chapter 11 provisions that strengthen creditor rights are outlined below (Mazur, 2014; Teloni, 2014).

(i) Setting a Limit on the Debtor's Exclusivity Period

Prior to BAPCPA, under the §1121 provision of Chapter 11, the debtor has a 120-day period during which it has an exclusive right to file a reorganization plan for consideration by stakeholders, and it is given an extra 60 days to solicit acceptances (i.e., 180-day exclusivity period to file a plan and have it accepted). Both periods can be extended or reduced by the court for cause. In practice, upon the debtor's requests, the court would routinely grant extensions of the exclusivity period, making the reorganization process last several years (Teloni, 2014). Therefore, the §1121 provision, namely, debtor-in-possession provision, grants the debtor the exclusive right to file a reorganization plan during a prolonged period, which enables the debtor to control the reorganization process to a great extent. In particular, the debtor can use the extension of the exclusivity period as undue bargaining leverage to compel

creditors to give more concessions. Creditors, anticipating the loss in value of their claims due to the delay and in the interest of reaching an agreement, often agree to write down debt (Bharath et al., 2014). Accordingly, the more trade credit suppliers extend to the debtor, the more credit loss they would bear. Naturally, in anticipation of their weak bargaining power in bankruptcy, suppliers would be reluctant to extend trade credit to customers with high default risk.

To reduce the abuse of the exclusivity period, BAPCPA sets a limit of 18 months for the exclusivity period, including all extensions, to file a plan, and the total time of filing a plan and having it accepted may not be extended beyond 20 months. Once the exclusivity period has expired, a creditor or the case trustee may file a competing plan. Because of this cap on extensions, the debtor can no longer compel creditors to make concessions by threatening to prolong the exclusivity period, which greatly reduces the bargaining power of the debtor for waiving debt in reorganization. As such, suppliers would bear less credit loss under the new legal regime.

(ii) Expanded Reclamation Claim

Reclamation is the right of a seller to take back goods sold on credit terms to a debtor in the ordinary course of the seller's business, not realizing that the debtor was insolvent at the time it received the goods (Tabb, 2016). The seller must look to section §546(c) of the Bankruptcy Code and submit a written reclamation demand to enforce its reclamation rights.

Under former §546(c), a seller qualified for a reclamation claim could exercise such right for goods delivered to an insolvent debtor in the ordinary course of business within 10 days before the bankruptcy filing. According to the amended §546(c), a seller can assert a reclamation claim of goods if the debtor had received such goods while insolvent within 45 days before the bankruptcy filing date. As such, BAPCPA enhances the reclamation rights of sellers as it expands the reclamation reach-back period before the bankruptcy filing from 10 days to 45 days, and gives a seller additional time (up to 20 days after the bankruptcy filing) to transmit its reclamation command if the 45-day reclamation-demand period expires after the bankruptcy filing (Douglas, 2008). Accordingly, more goods are subject to the reclamation right in the post-BAPCPA period, which potentially reduces sellers' loss. Furthermore, any seller failing to provide timely notice of its reclamation claim still is entitled to an administrative expense claim under the amended section §503 (b) (9) for goods received by the debtor 20 days before the bankruptcy filing.

(iii) Elevating Pre-Petition Trade Claims

Prior to confirmation of a reorganization plan, which outlines debt repayment and restructuring, the bankruptcy court will enforce an “administrative solvency” test, stipulated by section §1129 (a) (9) (A) of the Bankruptcy Code. A reorganization plan can be approved only if the debtor can make full cash payment of all administrative expenses by the plan's effective date, and creditors' unsecured claims will not be negotiated and paid until the reorganization plan is adopted.

Prior to the enactment of BAPCPA, administrative expenses were limited to post-petition operational expenditures plus direct expenditures relevant to the reorganization procedure itself (Teloni, 2014). BAPCPA adds certain type of suppliers' pre-petition claims to administrative expenses. Specifically, section §503 (b) (9) allows the value of *any* goods, sold to the debtor in the ordinary course of business and received by the debtor within 20 days before the date of commencement of a case, as an administrative expense claim. Different from the requirements for a reclamation claim, it does not require that the debtor was insolvent at the time receiving the goods, and a writing demand is not needed for an administrative expense claim. Therefore, before BAPCPA, the suppliers' pre-petition claims satisfying the above criteria were treated as general unsecured claims and thus suppliers may receive nothing. In contrast, after BAPCPA, these claims can be treated as administrative expense claims. Consequently, suppliers will be paid 100% of the value of the goods delivered in the 20-day period before the debtor's bankruptcy, and suppliers may demand prompt payment even before the confirmation of the plan. Undoubtedly, this new provision benefits suppliers as it substantially increases both the amount and timeliness of the payments for goods delivered and received by the debtor within 20 days before the debtor's bankruptcy filing date.

(iv) Making It Easier for Creditors to Achieve Conversion or Dismissal of the Chapter 11 Process

Under certain circumstances, a debtor in a case under Chapter 11 has a one-time absolute right to convert the Chapter 11 case to a case under Chapter 7, but it does not

have an absolute right to have the case dismissed upon request. A party in interest may file a motion to dismiss or convert a Chapter 11 reorganization case to a Chapter 7 liquidation case “for cause”.³ Prior to 2005, according to the former section §1121 of Bankruptcy Code, the court had discretionary authority to convert or dismiss a Chapter 11 case. BAPCPA modified section §1121. Under the new amendment, the court must convert or dismiss the case, unless it specially identifies unusual circumstances establishing that the requested conversion or dismissal is not in the best interests of the creditors. Obviously, the new section §1121 greatly restricts the discretionary authority of the court. If creditors find evidence that the ongoing restructuring is substantially harmful to them and then file a motion to convert or dismiss a Chapter 11 case, it is now easier for them to win. Therefore, the new section § 1121 increases the bargaining power of creditors (including suppliers) in the reorganization process. Suppliers with stronger bargaining power in reorganization process will make less concession (Cunat, 2007).

To summarize, BAPCPA made several significant changes to Chapter 11 Bankruptcy Code. The expansion of sellers’ reclamation claim and elevation of pre-petition trade claims as administrative expense claims allow the suppliers repossess the goods delivered to the debtor or get fully paid for the value of delivered goods, if certain criteria are satisfied. The cap on the debtor’s exclusivity period and the restriction of the discretionary authority of the bankruptcy court when dealing

³ The following website provides some examples of cause: <http://www.uscourts.gov/services-forms/bankruptcy/bankruptcy-basics/chapter-11-bankruptcy-basics>. Accessed on June 30, 2017.

with a dismissal or conversion motion grant creditors more bargaining leverage against the debtor, and thus provide better protection of supplier rights for goods that are not qualified for reclamation or administrative expense claims. Together, these creditor-friendly amendments provide stronger creditor (supplier, in particular) protection during a reorganization bankruptcy. Therefore, we expect that, in anticipation of the stronger supplier rights in bankruptcy after the enactment of BAPCPA, suppliers tend to be more willing to extend trade credit to customers with high default risk during their normal course of business. Therefore, we develop the following hypothesis stated in alternative form:

Hypothesis: Suppliers extend more trade credit to customers with high default risk after the passage of BAPCPA.

3. Sample Selection and Research Design

3.1 Data Sources and Sample

SEC Regulation S-K Item 101 requires firms whose sales to a single customer exceed 10% of total sales to disclose that customer's identity. Following Campello et al. (2016), we identify firms' major customers using Compustat Segment Customer database only if they account for at least 10% of the total sales of a given firm. We obtain financial statement data from Compustat and stock price data from CRSP. Our sample period covers from 2002 to 2008. Following prior literature, we exclude 2005 as BAPCPA took effect in that year. Therefore, our main analysis focuses on two periods, 2002-2004 and 2006-2008 (i.e., three years before and after the 2005 BAPCPA). We exclude firms in financial (SIC code 6000-6999) and utilities

industries (SIC code 4900-4999). As BAPCPA only applies to firms incorporating in the U.S., we exclude firms that do not incorporate in the U.S. We require customers to have EDF score in 2004, and classify suppliers into treatment (control) group if the weighted-average EDF scores of their major customers (i.e., CEDF) are in the top (bottom) quintile. We drop observations with negative values for sales, cost of goods and total assets, and observations with missing value for the dependent and control variables. We further require that firms have at least one observation in both pre- and post-BAPCPA periods. This procedure yields a sample of 1,531 firm-year observations and 273 unique firms.⁴

[INSERT TABLE 1 HERE]

3.2 Research Design

We use a difference-in-differences approach across two dimensions, i.e., the proximity to bankruptcy status and pre- versus post-BAPCPA, to explore whether suppliers extend more trade credit to their near-insolvent customers after BAPCPA. Specifically, we estimate the following regression model to test our hypothesis:

$$TC_{it} = \beta_0 + \beta_1 HCEDF \times Post + Control\ variables + Firm\ FE + Year\ FE + \varepsilon \quad (1)$$

where, the dependent variable, TC , is the trade credit that suppliers extend to their customers. Following previous literature (Giannetti et al., 2011; Petersen and Rajan,

⁴ Our sample selection procedure follows the approach used by Aier, Chen, and Pevzner (2014). Since we drop observations with missing values and firms that only appear in either pre- or post-BAPCPA period from the combined sample of treatment and control groups constructed based on suppliers' 2004 CEDF scores the final sample that we use to test our hypothesis contains uneven number observations for the treatment group and control group.

1997), we define trade credit extended by supplier i , TC_i , as the ratio of the supplier's accounts receivable to its sales. $POST$ is an indicator variable, which equals 1 for the post-BAPCPA period 2006-2008, and 0 for the pre-BAPCPA period 2002-2004. Following Bharath and Shumway (2008), we calculate EDF based on Merton (1974) model to develop our measure of bankruptcy risk for each customer. Given that a supplier may have multiple major customers, we aggregate customer level variable to the supplier level. Specifically, we calculate the weighted average EDF (i.e., CEDF) for each supplier, where the weight is a major customer's purchase from the supplier divided by the supplier's total sales. Because 2004 is the last pre-BAPCPA full year in our analysis, we construct the near-insolvent indicator, $HCEDF$, based on suppliers' CEDF scores in 2004. $HCEDF$ equals 1 if a supplier's CEDF score is in the top quintile of its distribution (i.e., treatment sample – suppliers whose major customers are near insolvent), and 0 if a supplier's CEDF score in 2004 is in the bottom quintile (i.e., control sample – suppliers whose customers are further away from insolvency). Consistent with prior literature (Aier et al., 2014; Huang et al., 2016), $HCEDF$ only varies cross-sectionally in our model, as we need to fix the near-insolvent status at the 2004 level to conduct the difference-in-differences analyses. Our variable of interest is the interaction term, $HCEDF*POST$, and we predict β_1 to be positive. Given that our model controls for firm- and year-fixed effects, we do not include $HCEDF$ or $POST$ as $HCEDF$ is absorbed in firm-fixed effects and $POST$ is absorbed in year-fixed effects (Huang et al., 2016).

Following prior studies (e.g., Chod, 2017; Dass et al., 2015; Petersen and Rajan, 1997), we include several control variables that may influence suppliers' provision of trade credit. Specifically, we control for firm size (*Size*) as larger suppliers tend to extend more trade credit. We also include firm profitability (*Profitability*). On the one hand, more profitable firms may be able to offer more trade credit. On the other hand, profitability may be positively related to the supplier's market power, which may limit its willingness to provide financing (e.g., Chod et al., 2016). We also control for suppliers' cash holdings (*Cashhold*) and trade credit that suppliers received (*TC_ap*) as they affect firm liquidity. Firms with more cash holdings will be able to extend more trade credit, but more cash holdings may be the result of extending little trade credit (i.e., from cash sales). Therefore, we do not make a directional prediction for *Cashhold*. Firms that receive more trade credit and thus can delay the payment of their purchases (resulting in accounts payable on the balance sheet) will be able to extend more trade credit to their customers, so we predict the coefficient on *TC_ap* to be positive.

We include firms' R&D investment (*RD*) as a proxy for relationship-specific investments. Suppliers that have made relationship-specific investments are more willing to extend trade credit to customers, leading to a positive relation between the two. We also control for asset tangibility (*Tangibility*). On the one hand, firms with more tangible assets have higher capacity to use these assets as collateral to obtain debt financing, and therefore, they should be able to offer more trade credit. On the other hand, firms with more tangible assets have fewer liquid assets; accordingly, they

would tend to offer less trade credit. Therefore, we do not make a prediction on the sign of *Tangibility*. Furthermore, we expect that highly levered firms (*Leverage*) and financially constrained firms (i.e., firms with higher *HP* index) are less likely to extend trade credit, while firms with higher Standard & Poor's credit rating (*Rating*), older firms (*LnAge*), and firms paying high dividends (*Dividend*) are less likely to be financially constrained, and therefore, they tend to offer more trade credit.

The last set of control variables are related to firm growth. Firms with higher market-to-book ratio (*MB*) and firms that want to keep high growth of sales (*Growth_sale*) tend to offer more trade credit to customers to boost their sales. Appendix A provides the definitions of all these variables. To reduce the effect of outliers, we winsorize all continuous variables at the 1st and 99th percentiles.

3.3 Descriptive statistics

Table 1 shows the distributions of our sample (including the treatment and control groups) across the Fama-French 12 industries and each year in our sample period. The majority of our observations are from Business Equipment (36.45%) and Manufacturing (16.85%) industries.

Panel A of Table 2 presents the descriptive statistics of main variables. The mean and median values of *TC* are 0.152 and 0.139, respectively, which are generally comparable to those reported by Dass, Kale, and Nanda (2014) (mean 0.178 and median 0.165) and Chod, Lyandres and Yang (2016) (mean 0.20 and median 0.161).

Our primary interest lies in examining whether the differential trade credit offered by the treatment group relative to the control group shifts after BAPCPA. This

difference-in-differences analysis mitigates the impact of any pre-existing divergence between the treatment and control groups. As shown in Panel B of Table 2, the difference in the average *TC* between the treatment and control groups enlarged significantly subsequent to the enactment of BAPCPA. This univariate test result indicates that suppliers with higher *CEDF* scores extended more trade credit to their customers after BAPCPA, which is a preliminary evidence of our prediction. As to the other explanatory variables, none of them exhibits a significant differential shift after BAPCPA.

[INSERT TABLE 2 HERE]

Table 3 presents the Pearson correlation matrix of key variables. *TC* is positively correlated with *HCEDF* at the 1% level. Given that there is no significant difference between *TC* extended by the treatment group and control group in the pre-BAPCPA period as shown in Panel B of Table 2, the positive correlation between *TC* and *HCEDF* must be driven by the post-BAPCPA period, implying that suppliers with higher *CEDF* scores extend more trade credit after BAPCPA. As predicted, *TC_ap*, *MB*, and *Growth_sale* are positively correlated with *TC*, and *Leverage* is negatively correlated with *TC*. The negative correlations between *Cashhold* and *TC* and between *Profitability* and *TC* indicate that firms with more cash holdings and higher profitability ratio exhibit lower level of outstanding trade credit. Unexpectedly, the correlations between *TC* and three variables, *HP*, *Dividend* and *RD*, are not statistically significant. Contrary to our prediction, *Size* is negatively correlated with

TC. All these correlations are only suggestive of the underlying relationships because other variables potentially affecting *TC* are not controlled for.

[INSERT TABLE 3 HERE]

4. Empirical results

4.1 Baseline regression results

In this section, we investigate whether suppliers with higher CEDF scores extend more trade credit to their customers after BAPCPA, and report the results in Table 4. Column (1) of Table 4 presents the results of estimating Eq. (1) without control variables but with firm- and year-fixed effects. We find that the coefficient on *HCEDF*Post* is positive (0.0151) and statistically significant at the 1% level. In column (2), after including control variables, the coefficient on *HCEDF*POST* remains positive (0.0145) and significant at the 1% level, indicating that suppliers with higher CEDF scores extend more trade credit to their customers after BAPCPA. This result is consistent with our prediction that increased creditor protection in bankruptcy induces suppliers to offer more trade credit to near-insolvent customers. Recall that the mean value of our dependent variable *TC* is 0.1564 for the treatment sample in the pre-BAPCPA period, as shown in Panel B of Table 2. Thus, our estimated coefficient on *HCEDF*POST* in column (2) of Table 4 suggests that an average treatment firm provides 9.3% (0.0145/0.1564) more trade credit to its customers after BAPCPA, indicating that the influence of BAPCPA on trade credit supply is economically significant.

Regarding the control variables, consistent with Chod et al. (2016), we find that suppliers with more cash holdings (*Cashhold*), more relationship-specific investments (*RD*) and higher tangible assets ratio (*Tangibility*) extend less trade credit. As predicted, we find that suppliers with higher accounts payable (*TC_ap*) (i.e., receiving more trade credit from their suppliers), higher dividend payments and higher market-to-book ratio (*MB*) extend more trade credit. The coefficients on *Leverage* and *Growth_sales* have the predicted sign, but they are insignificant at conventional levels based on two-tailed *t*-statistics (they are significant at the 10% level based on one-tailed test only, which are not tabulated). We do not find significant results on *Size*, *Profitability*, *HP*, *Rating* and *LnAge*, even though some of them have the predicted sign. Overall, the sign and significance level of many of our control variables are largely consistent with prior studies (Chod et al., 2016; Dass et al., 2015).

[INSERT TABLE 4 HERE]

4.2 Parallel Trend Analysis

Provided that BAPCPA indeed influences suppliers' willingness to extend trade credit to near-insolvent customers during their normal course of business, we should find no obvious difference in the trade credit supply between the treatment group and control group in years prior to BAPCPA, and such a difference should only appear after BAPCPA. To further strengthen our evidence, in this section, we examine the parallel trend effect (i.e., whether the differences between trade credit extended by

suppliers in the treatment group and control group exhibit any persistent trend) by estimating the following regression.

$$TC_{i,t} = \beta_0 + \beta_i \sum_{year=2003}^{year=2008} HCEDF * YEAR_Dummy + Controls + FirmFE + YearFE + \varepsilon \quad (2)$$

Following Huang et al. (2016), we take 2002, the first year in our sample, as the benchmark year. The variables of interest are the interaction terms between *HCEDF* and indicator variable for each year during 2003-2008 (excluding 2005 when BAPCPA took effect). All other variables are defined as in Eq. (1). As shown in Table 5, there is no significant relative shift between the treatment group and control group with respect to the change in trade credit supply in 2003 and 2004, while there is a significant shift post-BAPCPA, especially in 2006 and 2007, which supports the inference we made from the main results reported in Table 4.

[INSERT TABLE 5 HERE]

4.3 Robustness checks

4.3.1 Shortened/expanded sample period

To check whether our baseline results are robust to the selection of sample period, we re-estimate Eq. (1) using different sample periods. First, we test our hypothesis using two shortened sample periods, 2004-2006 (i.e., one-year window before and after BAPCPA, excluding 2005) and 2003-2007 (i.e., two-year window before and after BAPCPA, excluding 2005), respectively. As shown in columns (1) and (2) in Panel A of Table 6, the coefficient on *HCEDF*POST* is still positive (0.0114 and

0.0157), significant at the 10% level, respectively. Second, we expand our sample period to 2001-2009 (four-year window before and after BAPCPA, excluding 2005). As shown in column (3) in Panel A of Table 6, the coefficient on *HCEDF*POST* is positive (0.0184), significant at the 1% level. Taken together, the results using one-, two- and four-year windows are consistent with our baseline results using three-year window as reported in Table 4, indicating that our finding is not driven by the selection of sample period.

[INSERT TABLE 6 HERE]

4.3.2 Alternative measure of proximity to insolvency

In our baseline analysis, we use Bharath and Shumway (2008)'s EDF to measure customers' expected insolvency risk. In this section, we test our hypothesis using an alternative measure of proximity to insolvency: Altman's (1968) Z-Score. Similar to the construction method of CEDF, we calculate the Altman's (1968) Z-Score for each major customer of a supplier, and then construct the weighted average Z-Score for each supplier (*CZscore*), where the weight is a major customer's purchase from the supplier divided by the supplier's total sales. As lower Z-Score indicates higher default risk, based on suppliers' *CZscore* values in 2004, we put suppliers whose *CZscore* values are in the bottom quintile into the treatment group, and put suppliers whose *CZscore* values are in the top quintile into the control group.⁵ We generate an indicator variable, *HCZscore*, which equals 1 for suppliers in the treatment group, and

⁵ The sample size is 1,694, larger than the sample used in the main tests, because Altman's (1968) Z-score has fewer missing values than EDF.

0 for suppliers in the control group, and then replace *HCEDF*POST* in Eq. (1) with *HCZscore*POST*. As shown in column (1) of Panel B of Table 6, the coefficient on *HCZscore*POST* is positive and statistically significant at the 5% level based on two-tailed *t*-statistics, consistent with the result on *HCEDF*POST* in Table 4.

4.3.3 Alternative measures of trade credit

To check whether our baseline result is robust to the alternative measures of trade credit, we use two alternative proxies, *TCI* and *NTCS*, to measure trade credit extended by suppliers. *TCI* is accounts receivable divided by total assets, and the net trade credit surplus (*NTCS*) is defined as accounts receivable minus accounts payable scaled by total assets (Love et al., 2007).⁶ As shown in columns (2) and (3) of Table 6 Panel B, the coefficient on *HCEDF*POST* is positive and statistically significant at the 1% and 5% level, respectively, suggesting that our main result is robust to the use of these two alternative measures of trade credit.

5. Cross-sectional analysis: The effect of suppliers' reliance on customers

In this section, we explore whether suppliers' provision of trade credit to their near-insolvent customers after BAPCPA depends on their reliance on these customers. We expect that suppliers that rely on near-insolvent customers for their business are more willing to extend trade credit to help these customers to overcome financial difficulties, given the higher protection of creditors under BAPCPA. As explained below, we use supplier's sales percentage to customers, whether the supplier is in the

⁶ We exclude *TC_ap* from the model when *NTCS* is the dependent variable.

lasting or non-lasting goods industry, and the product market competition in the supplier's industry to capture a supplier's dependence on its major customers. To test our prediction, we partition our full sample into paired sub-samples, based on the median value of the proxy for a supplier's dependence on its major customers in 2004 (except the subsamples partitioned based on whether the suppliers are in the durable goods industries or not).

5.1 Subsamples based on suppliers' sales percentage to major customers

Once a major customer, who contributes most of a supplier's sales, falls in insolvency, it would be very difficult and costly for the supplier to find another potential customer to replace the insolvent customer (Cunat, 2007; Wilner, 2000); therefore, the supplier is more willing to help the near-insolvent customer overcome temporary financial difficulties. Following Li and Tang (2016), we use the sales percentage to major customers as the second proxy of a supplier's dependence on its major customers. As shown in column (1) of Table 7, the coefficient on *HCEDF*POST* is positive (0.0219) and statistically significant at the 1% level for suppliers who are more dependent on their near-insolvent customers, while it is positive (0.0010) but not significant in column (2), when the near-insolvent customers are not the main contributors of the supplier's sales. Moreover, the difference in the coefficient on *HCEDF*POST* for the two subsamples (0.0219-0.0010=0.0209) is significant at less than 1% level (Chi-square = 21.14). These results are consistent with our prediction.

[INSERT TABLE 7 HERE]

5.2 Subsamples based on whether the supplier is in a durable industry

Suppliers that sell durable goods tend to build a long-term relationship with their customers, so they are more likely to have significant implicit commitment with major customers (Titman and Wessels, 1988). As durable products have longer useful lives, suppliers have deep communications with their customers and they know these customers better. Once their customers file for bankruptcy and are dissolved, the suppliers will bear great loss and it may be very difficult or costly for them to find and build new relationships with potential customers. Therefore, we use whether a supplier is in a durable goods industry⁷ as the second proxy for a supplier's reliance on its major customers and partition our sample.

As reported in Panel A of Table 7, the coefficient on *HCEDF*POST* is positive and statistically significant at the 1% level for suppliers in durable industries (column 3), but not significant for suppliers in non-durable industries (column 4). The difference in the coefficient on *HCEDF*POST* for the two subsamples is not significant at the conventional levels based on two-tailed test (significant at less than 10% level based on one-tailed test). This result is weaker than the result based on sales concentration to customers, but it is still largely consistent with our prediction.

5.3 Subsamples based on the product market competition in suppliers' industries

⁷ Following Titman and Wessels (1988), industries with SIC codes 150-179, 245, 250-259, 283, 301 or 324-399 are classified as durable goods industries.

If there are many companies in one industry, there will be intense competition among them for market shares. Consequently, their customers have many potential choices. On the one hand, if a supplier does not extend trade credit to a near-insolvent customer, the latter can choose to do business with other suppliers. On the other hand, once the distressed customer goes bankrupt, the shrinking customer market means a higher degree of product market competition that the supplier will face in the future (i.e., the same number of suppliers will fight for fewer customers) (Birge et al., 2014). Therefore, suppliers facing a higher degree of product market competition are more willing to help their near-insolvent customers. Following Fabbri and Klapper (2016), we use the degree of competition in the suppliers' product market as the third proxy for a supplier's dependence on its major customers. The more competitive a supplier's product market, the more difficult to find and maintain a major customer (i.e., the higher switching cost). We use two variables, Herfindahl–Hirschman Index of sales (*HHI_sale*) and product market fluidity (*Fluidity*), to measure the degree of product market competition in a supplier's industry (e.g., Fabbri and Klapper, 2016; Hoberg and Phillips, 2010; Hoberg, Phillips, and Prabhala, 2014). Smaller *HHI_sale* or larger *Fluidity* indicates a higher degree of product market competition.

As reported in Panel B of Table 7, the coefficient on *HCEDF*POST* is positive and statistically significant at the 1% level when suppliers face a higher level of product market competition (columns 1 and 3), and it is positive but insignificant otherwise (columns 2 and 4). Furthermore, the coefficient on *HCEDF*POST* is significantly higher for the subsample with higher level of product market

competition than for the subsample with lower competition (Chi-square = 7.36 for the coefficient comparison in columns 1 and 2, and Chi-square = 13.99 for the coefficient comparison in columns 3 and 4). These empirical results support our prediction.

Taken together, we find consistent results using different measures of suppliers' reliance on customers. Our findings suggest that, after the enactment of BAPCPA, whether suppliers offer more trade credit to their near-insolvent customers is contingent on their reliance on these customers.

6. Conclusion

In this study, we examine whether the increased supplier protection in bankruptcy under BAPCPA induces suppliers to offer more trade credit to near-insolvent customers. From a sample of U.S. public firms with available major customer information from 2002 to 2008 (excluding 2005 when BAPCPA was enacted), we identify suppliers whose major customers are near insolvent (treatment group) and suppliers whose major customers are further away from insolvency (control group). Using a difference-in-differences research design, we find that, after BAPCPA, which grants creditors more bargaining power in bankruptcy, suppliers extend more trade credit to near-insolvent customers during the ordinary course of business. The parallel trend analysis supports our main finding. We also find consistent results using shorter or longer event windows, using an alternative measure of bankruptcy risk, and using two alternative measures of trade credit.

We further explore whether the effect of increased creditor rights on the trade credit provision to near-insolvent customers depends on suppliers' reliance on customers, measured by suppliers' sales concentration to customers, whether suppliers are in the durable goods industries, and suppliers' product market competition. Consistent with our prediction, we find that suppliers who are more dependent on near-insolvent customers extend more trade credit after BAPCPA.

Our findings based on BAPCPA in the U.S. extend the applicable scope of the power theory of credit from bank credit to trade credit, namely, in a more creditor-oriented environment, unsecured creditors such as suppliers also would like to extend more private credit to firms. Moreover, there has been a concern that the increased creditor protection under BAPCPA has negative effects on firms filing for bankruptcy, while our results suggest that BAPCPA actually benefits near-insolvent customers in the ordinary course of business as suppliers are more willing to provide trade credit to them, which will likely help them to overcome temporary financial difficulties and reduce the likelihood of filing for bankruptcy. Therefore, our findings will be of interest not only to academics, but also to stakeholders in the supply chain and regulators.

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Appendix A Variable Definitions

| Variable | Definition |
|----------------------|---|
| <i>TC</i> | Accounts receivable divided by sales (RECT/SALE). |
| <i>TCI</i> | Accounts receivable divided by total assets (RECT/AT). |
| <i>NTCS</i> | Difference between accounts receivable and accounts payable divided by total assets ((RECT-AP)/AT) |
| <i>EDF</i> | Expected Default Frequency. It is defined as the probability that the firm value will fall below the value of debt, i.e., the probability of bankruptcy over the next year. Following Bharath and Shumway's (2008) method, we calculate quarterly EDF based on the Black-Scholes-Merton option valuation model, and then calculate the arithmetic mean of four quarters' EDF for each year. |
| <i>CEDF</i> | The weighted average EDF of each supplier's major customers, where the weight is a major customer's purchase from the supplier divided by the supplier's total sales. |
| <i>HCEDF</i> | Indicator variable that equals 1 if a supplier's CEDF score in 2004 is in the top quintile, and 0 if a supplier's CEDF score in 2004 is in the bottom quintile. |
| <i>Size</i> | The natural logarithm of total assets (AT). |
| <i>Leverage</i> | Sum of debt in current liabilities and long-term debt divided by total assets ((DLC+DLTT)/AT). |
| <i>Profitability</i> | EBIT divided by sales. |
| <i>Cashhold</i> | Cash and cash equivalents divided by total assets (CHE/AT). |
| <i>TC_ap</i> | Accounts payable divided by cost of goods sold (AP/COGS). |
| <i>RD</i> | Research and development expense divided by sales (XRD/SALE). |
| <i>Tangibility</i> | Net PPE divided by total assets (PPENT/AT). |
| <i>HP</i> | HP index = $-0.737 \times \text{Size}_{hp} + 0.043 \times \text{Size}_{hp}^2 - 0.04 \times \text{Age}_{hp}$ (Hadlock and Pierce, 2010; Chod et al., 2016). <i>Size_{hp}</i> : book assets, inflation adjusted to 2004 and capped at \$4.5 billion; <i>Age_{hp}</i> : firm age, capped at 37. |
| <i>Rating</i> | An indicator variable that equals 1 if a firm's Standard & Poors long-term credit rating is BB- or above, and 0 otherwise. |
| <i>LnAge</i> | The natural logarithm of one plus firm age. |
| <i>Dividend</i> | Dividends per share divided by the stock price at the fiscal year end (DVPSX_F/ PRCC_F). |
| <i>MB</i> | Market-to-book ratio, measured as the market value of equity plus the book value of asset, minus prefer/common share value, then divided by total assets ((CSHO*PRCC_F+AT-CEQ)/AT) (Campello and Gao, 2017). |
| <i>Growth_sale</i> | Sales in the current year minus sales in the previous year, then divided by sales in the previous year. |
| <i>Z-Score</i> | Altman's (1968) Z-Score, calculated as $1.2 \times (\text{Current Assets} - \text{Current Liabilities}) / \text{Total Assets} + 1.4 \times \text{Retained Earning} / \text{Total Assets} + 3.3 \times \text{EBIT} / \text{Total Assets} + 0.6 \times \text{Market Value of Equity} / \text{Total Liabilities} + 0.99 \times$ |

| | |
|------------------|--|
| | Sales/Total Assets. |
| <i>CZscore</i> | The weighted average <i>Z-Score</i> of each supplier's major customers, where the weight is a major customer's purchase from the supplier divided by the supplier's total sales. |
| <i>HCZscore</i> | Indicator variable that equals 1 if a supplier's <i>CZscore</i> in 2004 is in the top quintile, and 0 if a supplier's <i>CZscore</i> in 2004 is in the bottom quintile. |
| <i>Post</i> | Indicator variable that equals 1 for the post-BAPCPA period, and 0 for the pre-BAPCPA period. |
| <i>YEAR_2003</i> | Indicator variable that equals 1 for year 2003, and 0 otherwise. |
| <i>YEAR_2004</i> | Indicator variable that equals 1 for year 2004, and 0 otherwise. |
| <i>YEAR_2006</i> | Indicator variable that equals 1 for year 2006, and 0 otherwise. |
| <i>YEAR_2007</i> | Indicator variable that equals 1 for year 2007, and 0 otherwise. |
| <i>YEAR_2008</i> | Indicator variable that equals 1 for year 2008, and 0 otherwise. |
| <i>HHI_sale</i> | The Herfindahl–Hirschman Index of sales by industry (Fama-French 12 industries). |
| <i>Fluidity</i> | A measure of how intensively the product market around a firm is changing in each year based on text-based analysis of firm 10-K product descriptions (Hoberg, Phillips, and Prabhala, 2014); available at http://hobergphillips.usc.edu/industryconcen.htm . |

Table 1 Sample distribution

| | 2002 | 2003 | 2004 | 2006 | 2007 | 2008 | Total | % |
|--|------|------|------|------|------|------|-------|--------|
| Consumer Non-Durables | 24 | 26 | 26 | 26 | 23 | 22 | 147 | 9.60% |
| Consumer Durables | 17 | 18 | 20 | 20 | 19 | 18 | 112 | 7.32% |
| Manufacturing | 43 | 43 | 45 | 44 | 43 | 40 | 258 | 16.85% |
| Oil, Gas, and Coal Extraction and Products | 10 | 11 | 12 | 12 | 11 | 11 | 67 | 4.38% |
| Chemicals and Allied Products | 10 | 10 | 11 | 11 | 10 | 10 | 62 | 4.05% |
| Business Equipment | 93 | 95 | 99 | 99 | 91 | 81 | 558 | 36.45% |
| Telephone and Television Transmission | 5 | 5 | 5 | 5 | 5 | 4 | 29 | 1.89% |
| Wholesale, Retail, and Some Services | 6 | 7 | 7 | 7 | 7 | 6 | 40 | 2.61% |
| Healthcare, Medical Equipment, and Drugs | 24 | 25 | 26 | 26 | 21 | 19 | 141 | 9.21% |
| Other | 19 | 20 | 22 | 22 | 18 | 16 | 117 | 7.64% |
| Total | 251 | 260 | 273 | 272 | 248 | 227 | 1,531 | 100% |

This table presents the industry distribution of our sample. We use Fama-French 12 industry classifications.

Table 2 Descriptive Statistics
Panel A Descriptive Statistics

| | N | Mean | Std. | Min. | p25 | p50 | p75 | Max. |
|----------------------|-------|--------|-------|--------|--------|--------|--------|--------|
| <i>TC</i> | 1,531 | 0.152 | 0.082 | 0.000 | 0.103 | 0.139 | 0.184 | 0.543 |
| <i>HCEDF</i> | 1,531 | 0.485 | 0.500 | 0.000 | 0.000 | 0.000 | 1.000 | 1.000 |
| <i>Size</i> | 1,531 | 5.285 | 2.078 | 1.059 | 3.770 | 5.088 | 6.718 | 9.822 |
| <i>Profitability</i> | 1,531 | -0.236 | 1.181 | -9.404 | -0.084 | 0.040 | 0.106 | 0.425 |
| <i>Leverage</i> | 1,531 | 0.219 | 0.252 | 0.000 | 0.006 | 0.132 | 0.325 | 0.966 |
| <i>Cashhold</i> | 1,531 | 0.230 | 0.236 | 0.000 | 0.037 | 0.132 | 0.387 | 0.875 |
| <i>TC_ap</i> | 1,531 | 0.171 | 0.214 | 0.014 | 0.075 | 0.116 | 0.179 | 1.481 |
| <i>RD</i> | 1,531 | 0.495 | 4.386 | 0.000 | 0.000 | 0.019 | 0.151 | 81.006 |
| <i>Tangibility</i> | 1,531 | 0.229 | 0.202 | 0.006 | 0.076 | 0.170 | 0.321 | 0.895 |
| <i>HP</i> | 1,531 | -3.168 | 0.799 | -4.638 | -3.627 | -3.181 | -2.692 | -0.454 |
| <i>Rating</i> | 1,531 | 0.166 | 0.372 | 0.000 | 0.000 | 0.000 | 0.000 | 1.000 |
| <i>LnAge</i> | 1,531 | 2.749 | 0.695 | 0.693 | 2.197 | 2.639 | 3.367 | 4.060 |
| <i>Dividend</i> | 1,531 | 0.008 | 0.045 | 0.000 | 0.000 | 0.000 | 0.000 | 1.406 |
| <i>MB</i> | 1,531 | 2.030 | 1.557 | 0.551 | 1.143 | 1.552 | 2.381 | 10.125 |
| <i>Growth_sale</i> | 1,531 | 0.134 | 0.440 | -0.662 | -0.056 | 0.066 | 0.222 | 2.617 |

Panel B Univariate Comparison

| | Pre-BAPCPA | | | Post-BAPCPA | | | |
|----------------------|--------------------|------------------|------------|--------------------|------------------|------------|----------------|
| | Control (n=405) | Treat (n=379) | Diff. | Control (n=384) | Treat (n=363) | Diff. | Diff. in Diff. |
| <i>TC</i> | 0.1494 | 0.1564 | 0.007 | 0.1384 | 0.1666 | 0.0282*** | 0.021** |
| <i>Size</i> | 5.2723 | 5.0296 | -0.2427 | 5.6097 | 5.2218 | -0.3879** | -0.145 |
| <i>Profitability</i> | -0.1635 | -0.4219 | -0.2584*** | -0.1326 | -0.234 | -0.1014 | 0.132 |
| <i>Leverage</i> | 0.2007 | 0.2115 | 0.0109 | 0.2225 | 0.2432 | 0.0208 | 0.010 |
| <i>Cashhold</i> | 0.1928 | 0.2986 | 0.1058*** | 0.1695 | 0.2654 | 0.0960*** | -0.010 |
| <i>TC_ap</i> | 0.1739 | 0.1712 | -0.0027 | 0.1642 | 0.1763 | 0.0121 | 0.015 |
| <i>RD</i> | 0.3507 | 0.7617 | 0.411 | 0.2314 | 0.6546 | 0.4233 | 0.423 |
| <i>Tangibility</i> | 0.2485 | 0.2236 | -0.0249* | 0.2356 | 0.2051 | -0.0306** | -0.006 |
| <i>HP</i> | -3.1946 | -3.0866 | 0.1080* | -3.266 | -3.12 | 0.1460** | 0.038 |
| <i>Rating</i> | 0.2222 | 0.1108 | -0.1114*** | 0.2422 | 0.0799 | -0.1623*** | -0.051 |
| <i>lnAge</i> | 2.6856 | 2.5473 | -0.1383*** | 2.9449 | 2.8215 | -0.1234*** | 0.015 |
| <i>Dividend</i> | 0.0063 | 0.0067 | 0.0005 | 0.0112 | 0.0071 | -0.0041* | -0.005 |
| <i>MB</i> | 2.0675 | 2.1065 | 0.039 | 2.0776 | 1.8567 | -0.2209** | -0.260 |
| <i>Growth_sale</i> | 0.1557 | 0.1307 | -0.0251 | 0.1185 | 0.1284 | 0.0098 | 0.035 |

Panel A presents the descriptive statistics of main variables. Panel B reports the univariate comparison between the treatment group and control group in the pre- (2002-2004) and post-BAPCPA (2006-2008) periods. All variables are defined in Appendix A. *, **, *** denote the significance level at 10%, 5%, and 1%, respectively, based on two-tailed *t*-statistics.

Table 3 Correlation matrix

| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P |
|------------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|--------------|---------------|---------------|---------------|--------------|---------------|---------------|--------------|----------|
| <i>A.TC</i> | 1 | | | | | | | | | | | | | | | |
| <i>B.POST</i> | -0.004 | 1 | | | | | | | | | | | | | | |
| <i>C.HCEDF</i> | 0.105 | 0.003 | 1 | | | | | | | | | | | | | |
| <i>D.Size</i> | -0.144 | 0.064 | -0.075 | 1 | | | | | | | | | | | | |
| <i>E.Profitability</i> | -0.099 | 0.045 | -0.077 | 0.138 | 1 | | | | | | | | | | | |
| <i>F.Leverage</i> | -0.173 | 0.053 | 0.031 | 0.205 | 0.007 | 1 | | | | | | | | | | |
| <i>G.Cashhold</i> | 0.064 | -0.059 | 0.214 | -0.243 | -0.298 | -0.437 | 1 | | | | | | | | | |
| <i>H.TC_ap</i> | 0.234 | -0.006 | 0.011 | -0.133 | -0.202 | -0.02 | 0.072 | 1 | | | | | | | | |
| <i>I.RD</i> | 0.022 | -0.013 | 0.047 | 0.014 | -0.656 | 0.018 | 0.174 | -0.009 | 1 | | | | | | | |
| <i>J.Tangibility</i> | -0.166 | -0.039 | -0.069 | 0.265 | 0.086 | 0.275 | -0.443 | 0.029 | -0.024 | 1 | | | | | | |
| <i>K.HP</i> | 0.144 | -0.033 | 0.079 | -0.812 | -0.210 | -0.144 | 0.293 | 0.249 | 0.013 | -0.287 | 1 | | | | | |
| <i>L.Rating</i> | -0.148 | -0.007 | -0.183 | 0.626 | 0.133 | 0.129 | -0.311 | 0.000 | -0.048 | 0.204 | -0.468 | 1 | | | | |
| <i>M.LnAge</i> | -0.161 | 0.191 | -0.094 | 0.192 | 0.167 | 0.066 | -0.311 | -0.19 | -0.049 | 0.186 | -0.63 | 0.216 | 1 | | | |
| <i>N.Dividend</i> | 0.009 | 0.03 | -0.02 | 0.075 | 0.017 | 0.027 | -0.041 | -0.026 | -0.016 | 0.03 | -0.098 | 0.087 | 0.085 | 1 | | |
| <i>O.MB</i> | 0.073 | -0.037 | -0.028 | -0.253 | -0.187 | -0.181 | 0.258 | 0.286 | 0.035 | -0.161 | 0.343 | -0.11 | -0.191 | -0.066 | 1 | |
| <i>P.Growth_sale</i> | 0.173 | -0.023 | -0.009 | -0.015 | 0.016 | -0.071 | 0.072 | 0.093 | -0.053 | -0.03 | 0.056 | -0.05 | -0.118 | -0.055 | 0.201 | 1 |

This table presents the Pearson correlation matrix of key variables. All numbers in bold indicate correlations significant at the 5% level or less.

Table 4 Effect of BAPCPA on the trade credit supply to near-insolvent customers

| | Prediction | (1) | (2) |
|----------------------|------------|-----------------------------------|-----------------------------------|
| <i>HCEDF*POST</i> | + | 0.0151*** (4.23) | 0.0145*** (3.84) |
| <i>Size</i> | + | | 0.0076 (0.59) |
| <i>Profitability</i> | +/- | | -0.0022 (-0.47) |
| <i>Leverage</i> | - | | -0.0255 (-1.68) |
| <i>Cashhold</i> | +/- | | -0.1534*** (-5.30) |
| <i>TC_ap</i> | + | | 0.1012** (3.11) |
| <i>RD</i> | + | | -0.0013*** (-4.69) |
| <i>Tangibility</i> | +/- | | -0.0816 (-1.41) |
| <i>HP</i> | - | | -0.0216 (-0.62) |
| <i>Rating</i> | + | | -0.0063 (-0.92) |
| <i>LnAge</i> | + | | 0.0108 (0.51) |
| <i>Dividend</i> | + | | 0.0789** (2.52) |
| <i>MB</i> | + | | 0.0030** (2.29) |
| <i>Growth_sale</i> | + | | 0.0051 (1.51) |
| <i>Constant</i> | | 0.1495*** (29.79) | 0.0570 (1.08) |
| Year FE & Firm FE | | YES | YES |
| N | | 1,531 | 1,531 |
| Adjusted R-square | | 1.3% | 18.6% |

This table reports the OLS regression results of estimating whether suppliers provide more trade creditor to near-insolvent customers after BAPCPA. The sample period is from 2002 to 2008 (excluding 2005 - the year when BAPCPA went into effect). All variables are defined in Appendix A. The *t*-statistics are presented beneath the coefficients within parentheses. *, **, *** denote the significance level at 10%, 5%, and 1%, respectively, based on two-tailed *t*-statistics. Standard errors are corrected for heteroscedasticity and industry-level (Fama-French 12 industries) clustering.

Table 5 Parallel Trend Analysis

| | (1) |
|-------------------------|----------------------------------|
| <i>HCEDF*YEAR_2003</i> | 0.0033 (0.28) |
| <i>HCEDF* YEAR_2004</i> | -0.0061 (-0.61) |
| <i>HCEDF* YEAR_2006</i> | 0.0102** (2.28) |
| <i>HCEDF* YEAR_2007</i> | 0.0160** (2.78) |
| <i>HCEDF* YEAR_2008</i> | 0.0146 (1.73) |
| <i>Size</i> | 0.0075 (0.55) |
| <i>Profitability</i> | -0.0021 (-0.44) |
| <i>Leverage</i> | -0.0255 (-1.73) |
| <i>Cashhold</i> | -0.1531*** (-5.34) |
| <i>TC_ap</i> | 0.1012** (3.10) |
| <i>RD</i> | -0.0013*** (-4.68) |
| <i>Tangibility</i> | -0.0814 (-1.41) |
| <i>HP</i> | -0.0216 (-0.60) |
| <i>Rating</i> | -0.0067 (-1.02) |
| <i>LnAge</i> | 0.0107 (0.51) |
| <i>Dividend</i> | 0.0812** (2.57) |
| <i>MB</i> | 0.0031** (2.39) |
| <i>Growth_sale</i> | 0.0052 (1.55) |
| <i>Constant</i> | 0.0579 (1.09) |
| Year FE & Firm FE | YES |
| N | 1531 |
| Adjusted R-square | 18.5% |

This table presents the parallel trend analysis for the treatment and control groups during the sample period 2002-2008 (excluding 2005 - the year when BAPCPA went into effect). The holdout/benchmark group is year 2002. All variables are defined in Appendix A. The t -statistics are presented beneath the coefficients within parentheses. *, **, *** denote significance level at 10%, 5%, and 1%, respectively, based on two-tailed t -statistics. Standard errors are corrected for heteroscedasticity and industry-level (Fama-French 12 industries) clustering.

Table 6 Robustness checks**Panel A Alternative Sample Periods**

| | One-year window | Two-year window | Four-year window |
|--------------------------|-----------------|-----------------|------------------|
| | (1) | (2) | (3) |
| <i>HCEDF*POST</i> | 0.0114* | 0.0157* | 0.0184*** |
| | (1.90) | (2.19) | (3.58) |
| <i>Size</i> | 0.0086 | 0.0085 | -0.0049 |
| | (0.29) | (0.52) | (-0.36) |
| <i>Profitability</i> | 0.0077* | 0.0046 | -0.0061* |
| | (1.87) | (1.31) | (-2.26) |
| <i>Leverage</i> | -0.0100 | 0.0092 | -0.0205** |
| | (-0.25) | (0.36) | (-2.58) |
| <i>Cashhold</i> | -0.0450 | -0.1129** | -0.1405*** |
| | (-0.72) | (-3.02) | (-6.84) |
| <i>TC_ap</i> | 0.0265 | 0.0709 | 0.1016*** |
| | (0.84) | (1.74) | (6.87) |
| <i>RD</i> | -0.0059*** | -0.0020*** | -0.0016*** |
| | (-24.68) | (-7.79) | (-3.90) |
| <i>Tangibility</i> | -0.1050 | -0.0628 | -0.0873 |
| | (-0.65) | (-0.50) | (-1.52) |
| <i>HP</i> | 0.0017 | -0.0399 | -0.0484 |
| | (0.04) | (-1.72) | (-1.51) |
| <i>Rating</i> | 0.0009 | -0.0027 | -0.0003 |
| | (0.06) | (-0.37) | (-0.05) |
| <i>LnAge</i> | 0.0014 | -0.0140 | -0.0039 |
| | (0.04) | (-0.67) | (-0.19) |
| <i>Dividend</i> | -0.2804 | 0.1489 | 0.0511* |
| | (-1.56) | (1.09) | (1.89) |
| <i>MB</i> | -0.0103*** | 0.0004 | 0.0045* |
| | (-3.82) | (0.19) | (2.02) |
| <i>Growth_sale</i> | 0.0115 | -0.0010 | -0.0010 |
| | (0.70) | (-0.27) | (-0.31) |
| <i>Constant</i> | 0.1738 | 0.0507 | 0.0682 |
| | (1.66) | (0.72) | (1.68) |
| N | 540 | 1042 | 1989 |
| Year FE & Firm FE | YES | YES | YES |
| Adjusted R-square | 30.5% | 17.8% | 16.4% |

Panel B Alternative measures of proximity to insolvency and trade credit

| | <i>TC</i> | <i>TCI</i> | <i>NTCS</i> |
|----------------------|---------------------------|----------------------------|---------------------------|
| | (1) | (2) | (3) |
| <i>HCZscore*POST</i> | 0.0186** (2.33) | | |
| <i>HCEDF*POST</i> | | 0.0135*** (3.27) | 0.0139** (2.27) |
| <i>Size</i> | -0.0242*** (-4.16) | 0.0022 (0.25) | 0.0077 (1.22) |
| <i>Profitability</i> | 0.0102** (2.86) | 0.0115*** (3.83) | 0.0138*** (3.84) |
| <i>Leverage</i> | -0.0297 (-1.27) | -0.0328 (-1.50) | -0.0439*** (-3.40) |
| <i>Cashhold</i> | -0.1429*** (-10.31) | -0.2286*** (-7.01) | -0.1256*** (-5.51) |
| <i>TC_ap</i> | -0.0266* (-1.86) | -0.0153 (-0.48) | |
| <i>RD</i> | 0.0000 (0.02) | 0.0013** (2.70) | 0.0007 (1.43) |
| <i>Tangibility</i> | -0.1076* (-2.05) | -0.1564* (-2.05) | -0.0919 (-1.61) |
| <i>HP</i> | -0.0072 (-0.28) | 0.0833* (2.20) | 0.0050 (0.14) |
| <i>Rating</i> | 0.0003 (0.07) | -0.0035 (-0.47) | -0.0075 (-0.71) |
| <i>LnAge</i> | -0.0088 (-0.58) | 0.0108 (0.39) | 0.0102 (0.55) |
| <i>Dividend</i> | 0.0332 (0.56) | 0.0477 (1.79) | 0.0417* (2.26) |
| <i>MB</i> | 0.0025 (1.08) | 0.0073*** (3.98) | 0.0001 (0.06) |
| <i>Growth_sale</i> | 0.0088 (1.29) | 0.0122*** (6.10) | 0.0053 (0.82) |
| <i>Constant</i> | 0.3498*** (3.30) | 0.4649*** (4.07) | 0.0768 (1.05) |
| Year FE & Firm FE | YES | YES | YES |
| N | 1694 | 1531 | 1531 |
| Adjusted R-square | 14.7% | 28.0% | 11.6% |

Panel A reports the OLS regression results using three alternative sample periods: 2004-2006 (one-year window pre- and post-BAPCPA) in column (1), 2003-2007 (two-year window pre- and post-BAPCPA) in column (2), and 2001-2009 (four-year window pre- and post-BAPCPA) in column (3) (excluding 2005 in all sample periods). Column (1) of Panel B reports the OLS regression results using an alternative measure of customers' proximity to insolvency for the sample period 2002-2008 (excluding 2005). *HCZscore* is an indicator variable that equals 1 if a supplier's 2004 weighted average customer z-score (*CZscore*) is in the top quintile, and 0 if a supplier's 2004 *CZscore* is in the bottom quintile. Columns (2) and (3) of Panel B report the results using two alternative measures of trade credit, *TCI* and *NTCS*, respectively, for the sample period 2002-2008 (excluding 2005). All variables are defined in Appendix A. The *t*-statistics are presented beneath the coefficients within parentheses. *, ** and ***

denote significance level at 10%, 5%, and 1% respectively, based on two-tailed t -statistics. Standard errors are corrected for heteroscedasticity and industry-level (Fama-French 12 industries) clustering.

Table 7 Cross-Sectional Analyses: The effect of suppliers' reliance on customers**Panel A** Percentage of sales to major customers, and durable versus non-durable industries

| | Percentage of sales to major customers | | Durable vs. Non-durable goods industries | |
|----------------------|--|-----------------------|--|-----------------------|
| | High (1) | Low (2) | Durable (3) | Non-durable (4) |
| <i>HCEDF*POST</i> | 0.0219*** (5.26) | 0.0010 (0.29) | 0.0196*** (4.21) | 0.0075 (1.46) |
| <i>Size</i> | -0.0062 (-0.17) | 0.0129** (2.47) | -0.0248 (-0.77) | 0.0257*** (8.40) |
| <i>Profitability</i> | 0.0007 (0.27) | 0.0033 (0.62) | 0.0049 (1.29) | -0.0085 (-1.04) |
| <i>Leverage</i> | -0.0431** (-2.33) | -0.0173* (-2.07) | -0.0308 (-1.86) | -0.0335 (-1.51) |
| <i>Cashhold</i> | -0.1540** (-3.25) | -0.1417** (-2.94) | -0.1612** (-3.63) | -0.1403*** (-5.56) |
| <i>TC_ap</i> | 0.0678* (1.92) | 0.1544** (2.86) | 0.0918* (2.54) | 0.0868* (2.21) |
| <i>RD</i> | -0.0014*** (-3.58) | 0.0124*** (5.83) | -0.0011*** (-13.60) | 0.0101*** (3.86) |
| <i>Tangibility</i> | -0.0637 (-0.81) | -0.1397*** (-3.39) | -0.1127 (-1.90) | -0.0846 (-1.00) |
| <i>HP</i> | -0.0719 (-0.72) | -0.0073 (-0.35) | -0.0977 (-1.06) | 0.0050 (0.42) |
| <i>Rating</i> | -0.0101 (-1.08) | 0.0089 (0.49) | 0.0069 (0.94) | -0.0223* (-1.95) |
| <i>LnAge</i> | 0.0117 (0.42) | 0.0097 (0.78) | -0.0202 (-0.72) | 0.0364* (2.11) |
| <i>Dividend</i> | 0.1398** (3.03) | 0.0617** (2.71) | 0.0912 (1.91) | 0.0264 (0.70) |
| <i>MB</i> | 0.0041 (1.52) | -0.0007 (-0.43) | 0.0021 (0.76) | 0.0021 (1.31) |
| <i>Growth_sale</i> | 0.0080* (1.88) | -0.0050 (-1.16) | 0.0037 (0.63) | 0.0036 (0.82) |
| <i>Constant</i> | -0.0029 (-0.02) | 0.0666 (1.16) | 0.0943 (1.05) | -0.0361 (-0.54) |
| Year FE & Firm FE | YES | YES | YES | YES |
| N | 743 | 788 | 857 | 674 |
| Adjusted R-square | 15.5% | 36.5% | 17.7% | 31.2% |
| Chi-square | 21.14 ($p = 0.00$) | | 2.27 ($p = 0.13$) | |

Panel B Product market competition in suppliers' industries

| | HHI_sale | | Fluidity | |
|----------------------|---------------------|-----------------|--------------------|-----------------|
| | High Competition | Low Competition | High Competition | Low Competition |
| | (1) | (2) | (3) | (4) |
| <i>HCEDF*POST</i> | 0.0223*** | 0.0019 | 0.0231*** | 0.0040 |
| | (11.97) | (0.26) | (4.63) | (0.81) |
| <i>Size</i> | 0.0057 | -0.0087 | 0.0085 | 0.0073 |
| | (0.44) | (-0.27) | (0.38) | (0.95) |
| <i>Profitability</i> | 0.0064 | 0.0012 | -0.0036 | 0.0290* |
| | (0.55) | (0.50) | (-0.72) | (1.98) |
| <i>Leverage</i> | -0.0152 | -0.0482** | -0.0383 | -0.0036 |
| | (-0.57) | (-3.34) | (-1.32) | (-0.57) |
| <i>Cashhold</i> | -0.1234* | -0.1728*** | -0.1576*** | -0.1006* |
| | (-3.14) | (-4.23) | (-5.61) | (-2.05) |
| <i>TC_ap</i> | 0.1092 | 0.0746** | 0.0876** | 0.2324*** |
| | (2.44) | (2.47) | (2.62) | (5.32) |
| <i>RD</i> | 0.0166* | -0.0013** | -0.0014*** | 0.0634* |
| | (3.37) | (-3.40) | (-4.97) | (2.21) |
| <i>Tangibility</i> | -0.0880 | -0.1088*** | -0.0592 | -0.1076 |
| | (-0.73) | (-3.52) | (-1.01) | (-1.40) |
| <i>HP</i> | -0.0308 | -0.0664 | -0.0202 | -0.0087 |
| | (-1.25) | (-0.76) | (-0.37) | (-0.55) |
| <i>Rating</i> | 0.0100 | -0.0169 | -0.0236** | 0.0031 |
| | (0.78) | (-1.52) | (-2.65) | (0.45) |
| <i>LnAge</i> | 0.0235 | -0.0185 | 0.0103 | 0.0056 |
| | (1.00) | (-0.49) | (0.48) | (0.60) |
| <i>Dividend</i> | 0.0808 | 0.0500 | 0.0965* | 0.0316** |
| | (1.77) | (1.48) | (2.03) | (2.50) |
| <i>MB</i> | 0.0000 | 0.0032 | 0.0033* | 0.0027 |
| | (0.02) | (1.15) | (1.85) | (1.06) |
| <i>Growth_sale</i> | 0.0023 | 0.0051 | 0.0070 | -0.0053 |
| | (0.92) | (0.71) | (1.48) | (-0.82) |
| <i>Constant</i> | 0.0059 | 0.0958 | 0.0895 | 0.0581 |
| | (0.06) | (1.08) | (1.24) | (1.27) |
| Year FE & Firm FE | YES | YES | YES | YES |
| N | 822 | 709 | 817 | 714 |
| Adjusted R-square | 29.1% | 16.2% | 17.7% | 28.9% |
| Chi-square | 7.36 ($p = 0.01$) | | 13.99 ($p=0.00$) | |

This table reports the OLS regression results of testing whether the increased creditor rights under BAPCPA on trade credit supply to near-insolvent customers is dependent on suppliers' reliance on their customers. We partition our full sample into paired sub-samples, based on the median value of proxies for a supplier's dependence on its major customers in 2004 (except the subsamples partitioned based on whether the suppliers are in the durable goods industries or not). Panel A reports the

regressions results for the subsamples partitioned on percentage of sales to major customers, and whether the suppliers are in durable or non-durable industries. Panel B reports the regression results for the subsamples partitioned on the level of market competition in suppliers' industries (Low value of *HHI_sale* and high value of *Fluidity* indicate high degree of product market competition). All variables are defined in Appendix A. *t*-statistics are presented beneath the coefficients within parentheses. *, ** and *** denote significance level at 10%, 5%, and 1%, respectively, based on two-tailed *t*-statistics. Standard errors are corrected for heteroscedasticity and industry-level (Fama-French 12 industries) clustering.