MFC290 - DO FINANCIAL CRISES DRIVE FIRMS TOWARD TRADE CREDIT?

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Resumo

We examine how financial crisis influence firms financing decision. Financial crisis increases economic uncertainty and induces financial institutions to be more careful when providing credit to firms finance short-term operations. Hence, firms are led to use more trade credit and avoid credit constraints harms. We use a sample of firm's quarterly data from 2002 to 2017, which gives us three periods of financial crisis. Literature presents controversial evidences whether firms demand/supply more commercial credit when banking credit is cut back. We first look for the aggregate effect on our sample and find that trade credit use increases during and after financial crisis. Thus, we separate the sample on whether firms use a credit line from Brazilian national development bank (BNDES) or not and perform a propensity score match difference-in-difference. According to the literature, firms that use BNDES credit line are less expose to financial constraints and can be a valorous control group to understand the dynamics of trade credit during economic crises. We find that firms not using government money increases their demand/supply of trade credit comparing to firms entitle to credit lines provided by Brazilian Economic Development Bank. We look into crisis individually and found consistent results, although weaker when comparing to the main results.

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ABSTRACT

We examine how financial crisis influence firms financing decision. Financial crisis increases economic uncertainty and induces financial institutions to be more careful when providing credit to firms finance short-term operations. Hence, firms are led to use more trade credit and avoid credit constraints harms. We use a sample of firm's quarterly data from 2002 to 2017, which gives us three periods of financial crisis. Literature presents controversial evidences whether firms demand/supply more commercial credit when banking credit is cut back. We first look for the aggregate effect on our sample and find that trade credit use increases during and after financial crisis. Thus, we separate the sample on whether firms use a credit line from Brazilian national development bank (BNDES) or not and perform a propensity score match difference-in-difference. According to the literature, firms that use BNDES credit line are less expose to financial constraints and can be a valorous control group to understand the dynamics of trade credit during economic crises. We find that firms not using government money increases their demand/supply of trade credit comparing to firms entitle to credit lines provided by Brazilian Economic Development Bank. We look into crisis individually and found consistent results, although weaker when comparing to the main results.

Key-words: Trade credit; Financial crises; Short-term funding; Trade-off; Banking credit

1 INTRODUCTION

We investigate firm's behavior on funding short-term operations during financial crisis. It is well known that monetary policies affect real economic activity by increasing the cost of financial resources available to firms. In particular, during economic crises, financial institutions act by restricting the banking credit supply, which drives firms to shift to trade credit focusing on financing short-term operations. Nevertheless, firms that have no banking credit constraints are less exposed and will use less trade credit than other firms, achieving comparative advantages on the account of cheaper credit.

Beck, Demirgüç-Kunt, and Maksimovic (2004) shows that on a highly concentrated banking market, such as Brazil, that is an increase in the obstacles to obtain bank credit and the impact of this monetary restriction can be softened by trade credit availability. Prior findings indicate that trade credit can play a major part serving as banking credit alternative, as first pointed out by Meltzer (1960). In turn, Nilsen (2002) presented evidences about increase dependence on trade credit for firms without bond ratings during financial shrinkage. Fisman and Love (2003) examine countries with undeveloped financial intermediaries and found that trade credit is a reliable back-up source of financial funds.

Trade credit comes directly from the long-term relationship between clients and suppliers, as a natural consequence of commercial interconnection of counterparts. Besides, suppliers have an instinctive interest on the good financial health of their costumers (Cunat, 2007). Moreover, an analysis about 1994 Mexican devaluation crisis and 1997 Asian crisis found an increase on credit provided and received after the event, but that was a collapse of credit provided in the following years (Preve, Love & Sarria-Allende, 2005)

However, the literature also provides diffuse evidences. There are documentation that small and medium enterprises from East Asia constrained in bank credit after 1998 financial crisis also were less able to use trade credit, indicating a liquidity shock disseminated over the supply chain (Love & Zaidi, 2010). Moreover, an investigation about the shocks on credit supply of private UK firms during 2008-2009 financial crisis found that firms dealt with credit contraction holding cash and issuing equity. There was no evidence of shifting from bank loans to trade credit (Akbar, Rehman & Ormrod, 2013).

Furthermore, Meriläinen (2016) shows that bank ownership type can influence how much credit is provided and that during 2008-2009 financial crisis the shock was weakened if credit did not reduce during the crisis. Besides, that is evidences that state-owned banks charge lower rates to loans (Gulde & Wolf, 2005), indicating that firms with access to such line credits might have a privileged position comparing to competitors, although they can have an important role providing financial instability (Andrianova, 2012). These results indicate that firms with access to government provided money might be in a privileged position during financial crisis.

Moreover, firms entitle to a continue line of credit that do not shrinks during economic crisis might be less exposed to banking credit constraints and do not have to turn to a more expensive financial strategy such trade credit. Brazilian National Economic and Social Development Bank (BNDES in Portuguese) is a major actor in Brazilian credit market, used by Brazilian government to perform countercyclical politics, not reducing or even increasing credit during economic distress periods (Torres & Zeidan, 2016; Ferraz, Leal, Marques, & Miterhof, 2013).

Trade credit theory predicts that small firms with limited capability to access capital markets use more trade credit when financial institutions are inaccessible (Petersen & Rajan, 1997). Burkhart and Ellingsen (2004) model show that trade credit and bank credit might be either complement or substitute. Brandt and Li (2003) present theoretical evidences that banks discriminate firms for non-profit reasons. Therefore, we can expect to see firms shifting from banking credit to trade credit during economic crisis. We also expect to find that firms entitle to receive credit from BNDES have lower financial risk exposure. Development banks normally are focused on countercyclical policies and do not restrict credit on economic crisis periods (Torres & Zeidan, 2016). Hence, theoretical results point that government-owned banks provide more credit than private banks during financial crisis, focusing on counter-cyclical policies (Brei & Schclarek, 2015).

Brazil presents an interesting context because the appealing particularities that can be found. First, we have high bank concentration. This characteristic indicates that firms might have difficulties when demanding banking credit to fund short-term operation. Ceterelli and Strahan (2006) found evidences that potential entrants have greater adversities demanding credit in markets with higher banking concentration. Zambaldi, Aranha, Lopes and Politi (2011) found evidences that Brazilian small and medium-sized firms face credit constraints and credit rationing. Second, Brazil presents a greater list of economic crises in the last 20 years. Such unstable environment presents a big informational background about how firms deal with financial crisis and banking credit shrinkage. Third, Brazil has a major development bank financing only part of the firms. The circumstances create conditions to compare the effect of Development Bank participation on a low-competitive market favoring a group of firms over the rest of the market.

In this paper we use quarterly balance sheet data of 252 publicly traded firms from 1995 to 2017 and analyze their trade credit behavior before, during and after crises. The intuition for these is that in crisis periods, firms are more vulnerable financially, making it harder and more expensive for them to obtain bank loans. We see post-crisis periods, as a transitional stage and trade credit either could return to prior crisis levels or could keep on higher levels. Our main variables of interest are accounts payable (scaled by cost of goods sold) and receivable (scaled by net operating revenue), as a proxy of the amount of trade credit that firms obtain from suppliers and provide to costumers. According to Yang (2011), these ratios capture the importance of trade credit in the financing of economic activity. We also are interested on Net Receivables (Accounts receivable minus payable scaled by net operating revenue) to measure whether trade credit flows over firms.

To conduct the investigation, we perform Difference-in-Difference (Diff-in-Diff) tests on a propensity score matched sample, comparing firms that use BNDES credit with firms that

do not. It has been documented on the literature that Brazilian government has adopt an aggressive anti-cyclical fiscal policy and BNDES credit lines did not shrink during financial crisis. Results indicates that firms not entitle with BNDES credit increase how much trade credit they use if banking credit is constrained. More specifically, we see an increase of credit provided and demanded, indicating the importance of this credit line to finance operation when bank credit is constraint. Moreover, we find that net trade credit is augmented during and after financial crisis, suggesting that firms are transferring the credit received to their costumers creating a better environment to face periods of financial turbulence.

The paper continue as follows: Section 2 presents a literature review and presents our testing hypothesis; Section 3 presents data used and how variables were created. Sections 4 discuss the empirical strategy; sections 5 and 6 brings the results and conclusion, respectively.

2 LITERATURE REVIEW

We are focused on testing if firms shift their funding source during crises periods from banking credit to trade credit. Financial development is an important issue when thinking about economic growth (Greenwood & Jovanovic, 1990; Levine, 2005; Laeven, Levine & Michalopoulos, 2015). and during economic uncertainty periods, most credit sources tend to dry out, waiting for high volatility to past and risk to diminish (Popov & Udell, 2012). This issue is very important given how credit disruption can aggravate economic crisis or induce crisis that affect real activities (Gertler & Kiyotari, 2010).

It is expected to see an intimate relationship between financial crisis and firms' funding capability. Whenever an economy turns downward, uncertainty becomes progressively a concern for firms, banks and investors. A financial crisis is characterized specially by enlargement of adverse selection and moral hazard issues. Financial markets become unable to efficiently provide funds to those firms with better financial health or best investment opportunities (Mishkin, 1992). Bank financial health and real economic activity are deeply connected and setbacks on banking course of business can spillover to firms harming investments and operations (Rosengren, 2000; Campello, Graham & Harvey, 2010; Aghion, Bacchetta & Banerjee, 2001).

The 2008-2009 financial crisis is the earliest example of these spillover effects in the world. We saw a great decrease of new loans, in lending for real investment and lending for restructuring, especially for banks with worse access to deposit financing and those more vulnerable to credit-line drawdowns (Ivashina & Scharfstein, 2010). During this crisis, it was also seen a collapse on international trade flows, exemplifying the connection between banks and firm's financial health. Countries with higher interbank rates (Such Brazil) were more affect by the downturn of trade with U.S. because the tighter credit market. Such effect was more pronounced in cases of lower trade credit access (Chor & Manova, 2012).

Therefore, trade credit comes as an important safety net to firms in times of inflated instability caused by uncertainty from low economic activity. Bank lending channel theory have an important discussion about how during monetary contractions banks change their loans, restricting credit to finance firms' operations and investments. To bear the cut back on banking credit, firms tend to shift their funding to trade credit as a substitute credit (Nilsen, 2002; Mateut, Bougheas & Mizen, 2006). Small- and medium-sized enterprises (SMEs) from Europe resort to alternative lending strategies to deal with lending constraint due 2008-2009 financial crisis. There is evidences that firm denied of working capital turn to trade credit as alternative for bank loans (Casey & O'Toole, 2014)

Previous investigations show that there is evidences of how high credit spreads becomes prohibitive to some borrowers (Brock & Suarez, 2000). Borrowers with weak relationships with lenders or related with less healthy lenders are more susceptible to financial crisis and pay higher interest rates if they are able to have access to banking credit after Lehman bankruptcy

(Chodorow-Reich, 2013). Moreover, trade credit has a more flexible profile and is more prevalent in less developed credit markets (Burkart & Ellingsen, 2004). Countries with not well-developed financial institutions have a growth bottleneck and trade credit might become an alternative solution that gives some breathing space to firms having difficult to access banking credit (Fisman &Love, 2003).

Developing countries with their not well-developed credit markets are more sensitive to credit constraints due financial crisis (Mishkin, 1996) and previous research shows that credit quality has a procyclical behavior in Brazil and that this behavior varies across credit types (Vazquez, Tabak, & Souto, 2012). The bankruptcy law approved in 2005 improved the efficiency of Brazilian credit market and as a consequence decrease the necessity of trade credit, indicating its countercyclical profile (Araujo, Ferreira, & Funchal, 2012). These evidences are consistent with our hypothesis that Brazilian firms change their credit portfolio during economic crisis, probably because lack of banking credit.

Empirical evidences show that non-state-owned firms from China used trade credit as growth opportunities when financial support from banks are limited (Ge & Qiu, 2007). Contrarily, previous research investigating 2008-2009 financial crisis and the following sovereign debt crisis in western Europe found that crisis effect was substantially weakened when stakeholder bank had no decrease on lending growth or at least decreased much less than commercial banks, indicating the importance of credit availability to mitigate economic crisis financial issues (Meriläinen, 2016).

Hence, we believe that during financial crisis and banking credit constraints firms must shift their source of credit to finance their short-term operations, increasing trade credit usage. However, the existence of a large financial institution providing credit even during economic distress periods might affect firms' decisions about funding short-term operations. To avoid decrease of GDP growth rate resulting from economic crisis, governments might perform countercyclical policies increasing earmarked credit which might unbalance credit market (Arora, 2017; Bonomo, Brito & Martins, 2015) and influence how firms respond to economic crisis. Government act on credit market through their own banks during financial crisis (Ogura, 2018; Lin, Srinivasan, and Yamada, 2017). Government preferences might generate credit misallocation (Xu, Yongwei, Mohan, & Yi, 2016) which might lead to inefficiency.

Thus, we investigate if the intimate relationship between government credit and private companies creates an unbalanced environment. We believe that firms entitle with government credit are less exposed to credit contraction. Previous research in Brazil found that, after 2008-2009 financial crisis, more loans were received in areas with higher government banks operations, which resulted on lower unemployment rates. Such police resulted on inefficient outcomes and reduced productivity growth in Brazilian regions with high share of government banks (Coleman & Feler, 2015).

Moreover, firms more benefited with earmarked credit in the period from 2004 to 2015 were larger, older and less risky firms. These are the firms that would have more access to private credit market, which indicates distorted is the credit market in Brazil (Pazarbasioglu-Dutz, Byskov, Carneiro, Martins & Perez, 2017). Ru (2017) found a value decrease firms in the same industry of those that were benefited from China Development Bank. It is also found a spillover effect on private firms of downstream industries unbalancing the competition. Thus, we use firms with access to BNDES credit lines as a control group and expect to find that firms with access to government money have lower exposition to financial constraints during financial crisis. This strategy allows us to verify whether firms that are truly exposed to financial distress periods and face banking credit constraints are indeed using more trade credit to finance short-term operations.

3 DATA DESCRIPTION AND VARIABLES

To create the database, we consider 252 non-financial firms available on Economatica database from 1995 to 2017, which gives us 25,575 firm-quarters observations. We disregard quarters with any indication of miss reporting and firms with less than five years information. Table 1 indicates the sample selection process for each dependent variable. To control for firms, access to BNDES credit lines, we restrict our sample from 2002 to 2017 given information availability.

Table 1: Sample Description

Sample description			
Restrictions	**Receivables**	**Payables**	**Net Receivables**
All consolidate firm-quarters available on Economatica database	25,300	25,300	25,300
less prior years with missing total assets	7,660	7,660	7,660
less firms without at least 5 years observations	157	157	157
less firms missing cash flows	115	115	115
less firms missing sales growth	1,878	1,878	1,878
less firms missing cash balances	7	7	7
less years before BNDES sample	3,064	3,064	3,064
Sub-total sample	12,419	12,419	12,419
less missing dependent variables	336	688	426
Total sample	12,083	11,731	11,993

We are interested on investigate the behavior of trade credit used by firms during crisis periods. As characteristic, trade credit has short maturity (Burkart & Ellingsen, 2004). Thus, to measure how much credit firms offer to their costumers (Receivables), we use short-term client's debt scaled by net revenue (as a proxy for sales). To measure credit from suppliers used by firms (Payables), we use short-term supplier's debt scaled by cost of goods sold.

Receivables captures how much of firms give as credit when selling their goods and Payables shows which part of firm's purchases was bought on trade credit. We expect with these ratios to measure the amount of trade credit used on day-to-day firm operations and its importance as informal credit lines during financial hazard periods. There is an alternative interpretation for these ratios. Normally trade credit has a short-term maturity (Burkart & Ellingsen, 2004), the results can be interpreted as how many days firms take to repay their creditors.

Moreover, we investigate whether firms sustain the same profile of trade credit or give more (less) credit during financial crisis periods. Thus, we consider a net receivable variable as the difference between Receivables and Payables scaled by total assets (NTCS). These ratios can be interpreted as the proportion of production/sales on credit, or since the trade credit usually has much shorter maturity than bank loans or bond issues, the alternative interpretation is the number of days costumers take to repay the credit (for quarterly data we multiply the ratio by 90) (Love & Zaidi, 2007).

We use the control variables indicated by trade credit literature (Petersen & Rajan, 1997; Fisman & Love, 2007). More specifically, we use ratio of operational cash flows to total asset (CFTA), cash balances to total assets (CBTA), growth of sales (Salesgr) and depreciation of currency exchange rate (ExcRateVar). CFTA and CBTA are both measured on beginning of the period indicating firm's capability to face any financial constraint that might occur during a financial crisis. Table 2 presents variables descriptions.

Table 2: Variables description

Names	Description
Crisis	Dummy variable equals one if quarter within crisis period and zero otherwise.
Post Crisis	Dummy variable equals one for the first year after a crisis period and zero otherwise.
BNDES	Dummy variable equals one if a firm used any BNDES credit line for a given year and zero otherwise.
CFTA	Ratio of cash flow from operations to total assets. Measured at the beginning of the period.
CBTA	Ratio of cash balances to total assets. Measured at the beginning of the period.
Salesgr	Growth rate of sales. Measured at the current period.
ExcRateVar	Depreciation of currency exchange rate. Measured at the current period.

Table 3 presents descriptive statistics. We can see that CFTA presents a wide distribution, although the standard deviation is quite small. Salesgr has an extremely high maximum value, in comparison to its mean and standard deviation. Both distributions indicate possible presence of outliers on our sample. Moreover, the distribution of the independent variables calls for more attention. They all are widely distributed over the sample and have extremes minimum or maximum values, which generates a very high standard deviation. All these together indicates the necessity of dealing with outliers. We winsorized all non-categorical variables at 1%.

Table 3: Descriptive statistics

VARIABLES	N	mean	sd	min	max
BNDES	12,424	0.292	0.455	0	1
Crisis	12,424	0.451	0.498	0	1
Post Crisis	12,424	0.152	0.359	0	1
CFTA	12,424	0.002	0.234	-5.628	12.127
CBTA	12,424	0.090	0.108	-0.018	0.969
Salesgr	12,424	0.434	5.516	-0.997	591.0
ExcRateVar	12,424	0.008	0.083	-0.145	0.366
Receivables	12,083	0.974	7.418	8.6E-06	322.0
Payables	11,731	1.123	30.811	-1.324	2015.7
Net Receivables	11,998	-0.077	55.457	-6042.0	268.4
Number of id	252	252	252	252	252

4 EMPIRICAL STRATEGY

We focused on testing whether firms use more trade credit during financial crisis periods. However, that is a group of firms that are not exposed to credit constraints given their access to BNDES credit lines. Thus, we use such firms as a control group as a comparison over economic crisis events. We expect that firms exposed to credit constraints are compelling to increase trade credit usage to finance short-term operations given banking credit constraints. To perform this investigation, we use a quarterly data from January of 2002 until December 2017 of non-financial public Brazilian firms. More specifically, we investigate if that is an increase of trade credit demand and supply during or after an economic crisis, in comparison to the period before crisis starts and baking credit shrinks.

To identify crisis periods, we first identify possible dates candidates the time series of

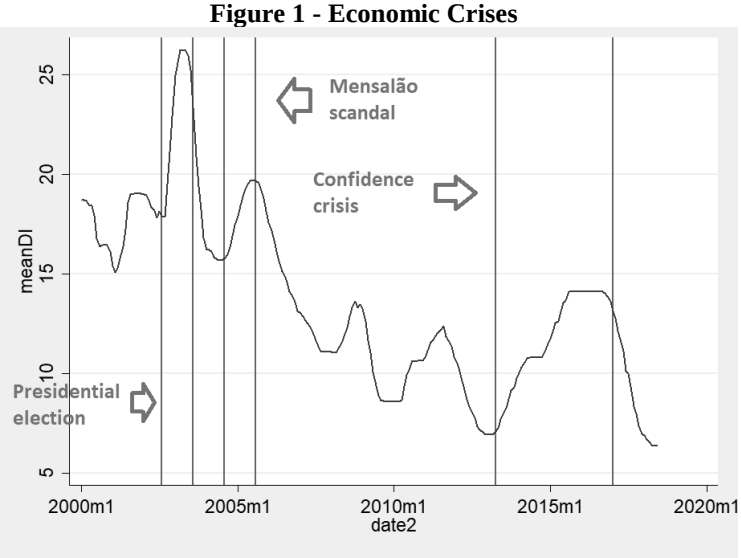
Interbank Deposit Rate[1] (hereafter CDI) as a proxy of market response to financial instability. Then, we perform structural break tests on possible dates of beginning and ending of financial crisis. We find three crisis periods: The first election won by the labor party, a political scandal of congressman being bribed to vote according to the president willingness and Dilma's credibility and governability crisis. We also define as post-crisis periods the four following quarters after crisis ending date and as pre-crisis periods every quarter that is not define as a crisis or post crisis cycle[2].

Thus, to conduct our analysis, we first create a sub-sample to each trade credit variable. We adopt this strategy to confirm that each sub-sample has no missing independent variable and to make sure that all variables are winsorized when data is ready to be tested. Having the date being well defined, we first perform a panel analysis to check the overall effect of credit constraints due economic crisis over trade credit market. We hope to find an increase on trade credit usage during distress periods. These results indicate that firms are indeed shifting their short-term operation funding from banking credit to trade credit.

Having the increase of trade credit on crisis (post-crisis) periods being established, we turn to investigate whether firms that have no access to BNDES credit lines are more exposed to banking credit constraints during financial crisis. Hence, we perform difference-in-difference analysis on a propensity scored matched sample. This strategy allows to compare firms that are similar on pre-crisis periods and would have the same necessity of trade credit, if neither firm were entitle to BNDES credit. Next, we disaggregate our sample to conduct our analysis on each crisis individually[3]. This procedure allows us to control for the heterogeneity of the market given the maturity discrepancy of a decade and a half of difference.

We start our analysis by determining crisis periods. We consider a potential crisis period if CDI have a strong growth sustained by at least 4 quarters. Therefore, we conduct Chows' tests for structural breaks on the suggested dates to verify which quarters we define as begin and end of crises periods. We tested three possible crisis periods: 2002-2003 presidential election, 2005 Mensalão scandal and 2013-2016 confidence crisis. We use CDI tendency changes to test for ending of crisis date. Figure 1 illustrates the possible dates.

Figure 1 - Economic Crises



[1] available on Brazilian Institute of Applied Economy (IPEA)

[2] The period between the end of the first financial crisis and beginning of the second comprises a three quarters period. Having two financial crises so close to each other, results that we have only three quarters as first post-crisis period and no pre-crisis period before the second financial crisis.

[3] Because lack of pre-crisis period associated with the second financial crisis, we conduct these tests only on first and third economic crisis.

Table 4 presents the results. We can see statistical significance for each one, indicating when crisis started and ended. To identify post-crisis periods, we impose two restrictions. First, post-crisis periods cannot be over one year after a crisis. We impose this restriction to avoid capture regular economic growth periods as crisis ending period. Second, it cannot coincide with another crisis period, to mitigate the risk of bias by double effect. Thereby, having the structural breaks being identified, we define dummies variables for crisis (CRISIS) equals 1 for quarters between beginning and ending crisis dates identified on Table 4. We call post-crisis period variable (POST) the four quarters after a crisis period.

Table 4: Structural Break

	Begin	End	Begin	End	Begin	End
Date	2002q3	2003q3	2004q3	2005q4	2013q2	2017q1
Chi2	4.8400	68.1705	39.1376	63.4669	74.297	8.1967
p-value	0.088	0.000	0.000	0.000	0.000	0.017

We are interested to investigate whether firms depending on bank credit to finance short-term operation have more difficult to bare financial crisis credit constraints than firms with BNDES credit access. We call treatment group those firms that are more exposed to credit constraints due uncertainty characteristic of economic crisis cycles. Control group are those firms that have used a BNDES credit line on a given year.

First, we use propensity score matching to find a counterfactual control sample of BNDES firms that were more likely to be in the treatment sample. We conduct DID estimations to compare the heterogeneity of financial crisis effects between the two groups for each sub-sample, comparing pre-crisis periods with crisis and post-crisis endurance. Moreover, we also perform DID tests on the whole sample to check for robustness of our results.

To match firms, we choose to use variables indicated in the literature to measure firms' necessity of funding to finance their short-term operations, as described earlier. Furthermore, to conduct DID tests, we add exchange rate depreciation and dummies of quarters, to capture fixed effects and trade credit seasonality. The difference-in-difference model is presented below.

$$TC_{i,t} = \beta_0 + \beta_1 Crisis_t + \beta_2 BNDES_{i,t} + \beta_3 BNDES_{i,t} * Crisis_t + \gamma Controls + FE + \varepsilon_{i.t} \quad (1)$$

$$TC_{i,t} = \beta_0 + \beta_1 Post_t + \beta_2 BNDES_{i,t} + \beta_3 BNDES_{i,t} * Post_t + \gamma Controls + FE + \varepsilon_{i.t} \quad (2)$$

Where, TC represents one of our three trade credit proxies; Crisis is a dummy variable equals 1 if the quarter is within a crisis period and 0 otherwise; Post is a dummy variable equal 1 if the quarter is within the following four quarter after crisis periods; BNDES is a dummy variable equal 1 if a firm did not use a BNDES credit line on a given year; Controls are variables commonly used on trade credit literature, as previously discussed.

5 RESULTS

First, we check for evidences that on the account of banking credit constraints from economic distress during and after financial crisis. We first perform a panel analysis on overall firms[4]. Table 5 presents this first set of results. The first important result is how firms with

[4] To perform this test, we use a bigger sample with all information available since 1995. When we proceed to investigate whether that is a difference on the behavior of firms according with access to BNDES credit, we had to narrow our sample to 2002 - 2017 period because of BNDES credit information availability.

access to BNDES money behave. We can see no significant change on trade credit offer and demand during and after crisis periods. Nevertheless, that is a statistically significant reduction of Net Receivables indicating that such firms offering less trade credit in relation of how much they are demanding. These evidences suggest that is not a credit overflow effect from BNDES cash flow toward firms during economic distress periods.

Table 5: Panel Results

Panel A						
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	TCrecta	TCpayco	NTCS	TCrecta	TCpayco	NTCS
Crisis	-0,0099	0,00454	-0,0216	-0,0317	0,000934	-0,0363*
	-0,0182	-0,0105	-0,0195	-0,0202	-0,0125	-0,0199
Post Crisis	-0,0264	-0,0005	-0,0447*	-0,0357	-0,00122	-0,0510**
	-0,0406	-0,0321	-0,0245	-0,0404	-0,0324	-0,0246
BNDES	-0,108***	-0,0407*	-0,0859***	-0,113***	-0,0413*	-0,088***
	-0,0404	-0,0245	-0,0289	-0,0404	-0,0245	-0,029
BNDES*Crisis	0,144***	0,0646*	0,0923**	0,140***	0,0646*	0,0906**
	-0,0506	-0,0332	-0,0369	-0,0499	-0,0333	-0,0368
BNDES*Post Crisis	0,150**	0,0774*	0,0979**	0,142**	0,0759*	0,0930**
	-0,0585	-0,0411	-0,0384	-0,0573	-0,0403	-0,0377
CFTA				-0,175	-0,100***	0,0224
				-0,116	-0,0381	-0,0531
CBTA				-0,499**	0,0098	-0,392***
				-0,234	-0,118	-0,102
Salesgr				-0,222***	-0,0765	-0,0942***
				-0,0636	-0,0503	-0,031
Varcamb				0,012	0,052	0,029
				-0,059	-0,0385	-0,0458
Constant	1,080***	0,671***	0,599***	0,985***	0,619***	0,577***
	-0,0306	-0,0187	-0,0287	-0,052	-0,0392	-0,0346
Observations	12,088	11,736	11,998	12,088	11,736	11,998
R-squared	0,173	0,165	0,108	0,183	0,167	0,114
Number of id	252	252	252	252	252	252
SECTOR FE	YES	YES	YES	YES	YES	YES
QUARTER FE	YES	YES	YES	YES	YES	YES
Robust standard errors in parentheses *** p<0,01, ** p<0,05, * p<0,1						
Panel B						
f-tests						
Crisis effect on regular firms						
Coeff	0,1341	0,0692	0,0707	0,1088	0,0656	0,0542
p-value	0,007	0,017	0,029	0,018	0,018	0,076
Post crisis effect on regular firms						
Coeff	0,1239	0,0769	0,0531	0,1062	0,0747	0,0419
p-value	0,01	0,005	0,065	0,019	0,005	0,128

Moreover, we find differences regard those firms that do not use BNDES money

(hereafter, regular firms). First of all, that is a statistically significant difference on how financial crisis effect trade credit decisions among the two group of firms. Furthermore, Panel B presents the net effect of crisis and post-crisis among regular firms. that is a significant different participation of these firms on trade credit market after financial crisis. We see that they increase trade credit offer and demand during and after economic crisis periods.

Columns (3) and (6) on Panel B shows firms' profile on trade credit market. The results suggest that regular firms are increasing more trade credit offer than demand during economic crisis. However, that is evidence that this behavior is mitigated on post-crisis periods. If we look into the big picture, evidences are suggesting that regular firms are actually funding the decrease of BNDES firms decrease of trade credit offer.

We are investigating whether firms that have BNDES credit line access are less exposed to financial crisis credit constraints. Table 6 presents the first set of results for the combined sample. In panel A we can see the results for Receivables, our metric to measure how much trade credit is offered by firms. Firstly, it is interesting to note that in periods of economic calmness, that is no difference on how much trade credit is offered by the two groups of firms. Such result indicates the lack of an overflow effect of credit provided by BNDES to other companies.

Next, we can see in the first column the change in the supply of commercial credit during periods of economic crisis. We found evidence that regular firms with no access to government money offer mode trade credit when bank credit is restricted when comparing with firms that use BNDES credit. This behavior shows that the resources provided by the government are not having much multiplier effects in the economy, having benefited precisely those firms that received the money directly. However, when we look at the second column, we can see that after the economic crisis this trend is sustained. The gap between how much trade credit is offered by the two group of firms remains one year after the credit crunch.

Table 6: Matching Model: BNDES credit line access for individual crisis

Panel A: Dependent Variable: Receivables				
	Crisis		**Post crisis**	
	Coefficient	P-Value	Coefficient	P-Value
Before				
Control	0,601		0,601	
Treated	0,630		0,630	
Diff (T-C)	0,029	0,441	0,029	0,441
After				
Control	0,476		0,418	
Treated	0,674		0,584	
Diff (T-C)	0,198	0,000***	0,166	0,000***
Diff-in-Diff	0,169	0,001***	0,136	0,013**
Number of observations:	10243		6581	
Painel B: Dependent Variable: Payables				
	Crisis		**Post crisis**	
	Coefficient	P-Value	Coefficient	P-Value
Before				
Control	0,310		0,310	
Treated	0,384		0,384	
Diff (T-C)	0,074	0,000***	0,074	0,000***
After				
Control	0,286		0,268	
Treated	0,450		0,383	

Diff (T-C)	0,164	0,000***	0,116	0,000***
Diff-in-Diff	0,090	0,000***	0,042	0,158
Number of observations:	9882		6528	

Painel C: Dependent Variable: Net Receivables

	Crisis		Post crisis	
	Coefficient	P-Value	Coefficient	P-Value
Before				
Control	0,415		0,415	
Treated	0,335		0,335	
Diff (T-C)	-0,080	0,028**	-0,080	0,028**
After				
Control	0,295		0,223	
Treated	0,337		0,284	
Diff (T-C)	0,042	0,174	0,061	0,013**
Diff-in-Diff	0,122	0,011**	0,140	0,001***
Number of observations:	10162		6530	
SECTOR FE	Yes		Yes	
Quarter FE	Yes		Yes	

Panel B brings the results for Payables, our proxy for trade credit demand. We can see again a significant difference in the participation of the two groups in the trade credit market. Firms that receive BNDES funds are more financially comfortable and demand less trade credit than regular firms. Moreover, we can see that during financial crises periods that is an increase in the trade credit gap demanded by the two groups of firms.

Furthermore, Panel C exposes firms trade credit profile. We can see that the difference on Net Receivable among the two groups of firms increases during and one year after economic crisis periods. These results indicate that firms not using BNDES money are relatively offering more trade credit, which goes against the argument that increasing government cash flow towards firms during economic crisis has a spillover effect over the economy. Our evidences show that these firms are offering relatively less trade credit comparing with how much trade credit they are demanding.

These tables have an important result. Although firms that are no entitle with BNDES credit increases trade credit usage during financial crisis and banking credit constraints, they are relatively offering more trade credit than demanding. Such result is interesting and important because shows a spillover effect across firms, indicating that firms receiving more trade credit and funding more clients. This movement across trade credit market is important to guarantee firms short-term operations funding. In accordance with the behavior illustrated above, firms entitle to BNDES credit lines usage also do not change their trade credit market profile. The problem is, that they receive subsidized credit from the government and do not increase trade credit offering to their clients. This behavior harms the economic capability of credit offering during financial distress given that credit is being canalized to firms that offer less trade credit and do not increase their offering when other firms are increasing their demand.

Furthermore, we look for economic crisis individually[5]. Untabulated results for Receivables and Payables shows similar although weaker results than those presented earlier.

[5] We use only first and third financial crisis because the second one starts right after the first post-crisis period. Thus, there it is no possible the make the comparisons we are doing because lack of information

Table 7 have the results for Net Receivables. Although this variable is directly related to the Receivables and Payables, it enables to a different analysis. This variable capture trade credit market participation profile, i.e., it captures whether firms offer more trade credit than demand and if it changes due banking credit constraints. First, let's introduce the results by doing an overall analysis. We can see an inconsistency. Firms that have BNDES money offer a higher (lower) amount of trade credit relatively to how much they are demanding before the first (third) economic crisis. However, during both crisis we see regular firms with greater Net Receivables[6]. Moreover, we see that the results persist throughout 1 year after economic crisis ends. These results indicate that firms using subsidized government money offer relatively less credit than they demand comparing to their peer firms deprived of BNDES credit.

Table 7: Matching Model: BNDES credit line access for individual crisis

Panel A: Dependent Variable: Net Receivables				
	1st crisis		**3rd crisis**	
	Coefficient	P-Value	Coefficient	P-Value
Before				
Control	0,291		0,413	
Treated	0,492		0,326	
Diff (T-C)	0,201	0,027**	-0,087	0,020**
After				
Control	0,220		0,318	
Treated	0,412		0,351	
Diff (T-C)	0,192	0,003***	0,033	0,374
Diff-in-Diff	-0,009	0,935	0,120	0,023**
Number of observations:	657		8330	
Painel B: Dependent Variable: Net Receivables				
	1st post-crisis		**3rd post-crisis**	
	Coefficient	P-Value	Coefficient	P-Value
Before				
Control	0,291		0,388	
Treated	0,492		0,304	
Diff (T-C)	0,201	0,027**	-0,084	0,017**
After				
Control	0,218		0,163	
Treated	0,389		0,260	
Diff (T-C)	0,172	0,003***	0,097	0.011**
Diff-in-Diff	-0,029	0,787	0,181	0,000***
Number of observations:	665		4970	
SECTOR FE	Yes		Yes	
QUARTER FE	Yes		Yes	

Although the results have some difference from Table 6 overall results, we find many consistency corroborating with our prior results. Moreover, it is important to highlight that looking crisis individually might have lower informational power because a very heterogeneous sample specially on post-crisis analysis. This is a limitation of our paper at this point. The prosecution is to use seasonally adjusted data to check the behavior around events dates. We also performed diff-in-diff tests on unmatched sample and use several liquidity indicators to match firms. Untabulated results are qualitatively the same to those presented.

[6] Although it is not significant during the third event, the difference between pre-crisis and during crisis is positive and statistically significant

6 CONCLUSION

We are investigating firms' behavior when choosing how to finance operations in times of financial crisis. It is expected that moments of economic turbulence create an environment of high uncertainty and, as a consequence, lead to a contraction of bank credit available to firms. This decrease of banking credit induces firms to finance each other to continue their operations in order to cope with this turbulent period. That being true, companies with better financial health are better prepared to deal with credit restrictions and continue their operations. We expect these companies to seek less trade credit in times of crisis.

However, Brazil has one of the largest economic development banks in the world, BNDES. It is to be expected that the government does not retract credit in times of crisis. It might be that perhaps BNDES even strengthens money orders seeking to leverage economic growth by an overflowing effect between companies. Thus, companies that have access to BNDES credit are less vulnerable to economic crises and do not need to turn to commercial credit.

In this article we used quarterly data of Brazilian companies listed on the Bovespa between 2002 and 2017. Structural break tests were performed to identify dates of entry and exit of economic crisis. The moments following crisis exit are transitory moments between reduction of uncertainty and normalization of economic activity. Thus, we consider the next four quarters as a moment of transition and that can also affect business behavior in relation to commercial credit. As controls, we use firm characteristics in cash generation capacity and macroeconomic variables that may affect credit relationships among firms.

The results show that firms use more trade credit in times of economic crisis and that this effect persists during the period of transition to economic normalization. The result is consistent Table 7 for supply and demand of trade credit. There is also evidence that firms are transferring the credit received to their customers, inducing a flow of credit that may enable a more favorable environment to deal with bank credit cutbacks. On the other hand, the evidence indicates that firms with BNDES credit do not change their behavior in relation to the supply and demand of commercial credit, evidencing that they are less vulnerable to credit market turbulence and have comparative advantages over competitors to face crises. It is important to note that we do not find evidence that these firms are increasing their trade credit supply and are not transferring their greater capability to face crises for other firms.

Moreover, we investigate crisis individually and found consistencies with our main result. The results are stronger for the third crisis, which could be explained by Brazilian market maturity over the years. Finally, we found evidence that the difference between how much trade credit firms are offering and demanding do no change during financial crisis, indicating a continuous flow of credit among firms. Such behavior generates an enabling environment to finance short-term operations during economic crisis.

The results we find are important to better understand how firms make financing decisions in turbulent and uncertain periods. It also helps complement commercial credit literature by two important angles: first, showing the Brazilian context, which had not yet been studied; second, bringing the development bank into the discussion. Our results show that Brazilian firms compete unfairly and face crises and uncertainties with different fundamentals. Those that are protected by government credit are more able to deal with difficulties and do not help create a favorable context for the economy as a whole, a fact emphasized by advocates of government transfers to firms in times of crisis.

REFERENCES

Aghion, P., Bacchetta, P., Banerjee, A. (2001). Currency crises and monetary policy in an economy with credit constraints. *European Economic Review*, *45*(7), 1121-1150.

Akbar, S., ur Rehman, S., Ormrod, P. (2013). The impact of recent financial shocks on the

financing and investment policies of UK private firms. *International Review of Financial Analysis, 26*, 59-70.

Andrianova, S. (2012). Public banks and financial stability. *Economics Letters, 116*(1), 86-88.

Araujo, A. P., Ferreira, R. V., Funchal, B. (2012). The Brazilian bankruptcy law experience. *Journal of Corporate Finance, 18*(4), 994-1004.

Arora, R. (2017). Government intervention and financial sector development. In *Development Finance* (pp. 53-78).

Beck, T., Demirgüç-Kunt, A., Maksimovic, V. (2004). Bank competition and access to finance: International evidence. *Journal of Money*, Credit and Banking, 627-648.

Bonomo, M., Brito, R. D., Martins, B. (2015). The after crisis government-driven credit expansion in Brazil: A firm level analysis. *Journal of International Money and Finance, 55*, 111-134.

Brei, M., Schclarek, A. (2015). A theoretical model of bank lending: Does ownership matter in times of crisis?. *Journal of Banking Finance, 50*, 298-307.

Brock, P. L., Suarez, L. R. (2000). Understanding the behavior of bank spreads in Latin America. *Journal of Development Economics, 63*(1), 113-134.

Burkart, M., Ellingsen, T. (2004). In-kind finance: A theory of trade credit. *American Economic Review, 94*(3), 569-590.

Campello, M., Graham, J. R., Harvey, C. R. (2010). The real effects of financial constraints: Evidence from a financial crisis. *Journal of Financial Economics, 97*(3), 470-487.

Casey, E., O'Toole, C. M. (2014). Bank lending constraints, trade credit and alternative financing during the financial crisis: Evidence from European SMEs. *Journal of Corporate Finance, 27*, 173-193.

Chodorow-Reich, G. (2013). The employment effects of credit market disruptions: Firm-level evidence from the 20089 financial crisis. *The Quarterly Journal of Economics, 129*(1), 1-59.

Chor, D., Manova, K. (2012). Off the cliff and back? Credit conditions and international trade during the global financial crisis. *Journal of International Economics, 87*(1), 117-133.

Coleman, N., Feler, L. (2015). Bank ownership, lending, and local economic performance during the 2008–2009 financial crisis. *Journal of Monetary Economics, 71*, 50-66.

Cuñat, V. (2007). Trade Credit: Suppliers as Debt Collectors and Insurance Providers. *Review of Financial Studies, 20*(2), 491-527.

Ericsson, J., Renault, O. (2006). Liquidity and credit risk. *The Journal of Finance, 61*(5), 2219-2250.

Ferraz, J. C., Leal, C. F. C., Marques, F. S., Miterhof, M. T. (2013). Financing Development: the case of BNDES. *In The Industrial Policy Revolution I* (pp. 143-157).

Fisman, R., Love, I. (2003). Trade credit, financial intermediary development, and industry growth. *The Journal of finance, 58*(1), 353-374.

Fisman, R., Love, I. (2007). Financial dependence and growth revisited. *Journal of the European Economic Association, 5*(2-3), 470-479.

Garcia-Appendini, E., Montoriol-Garriga, J. (2013). Firms as liquidity providers: Evidence from the 2007–2008 financial crisis. *Journal of Financial Economics, 109*(1), 272-291.

Ge, Y., Qiu, J. (2007). Financial development, bank discrimination and trade credit. *Journal of Banking Finance, 31*(2), 513-530.

Gertler, M., Kiyotaki, N. (2010). Financial intermediation and credit policy in business cycle analysis. *In Handbook of monetary economics* (Vol. 3, pp. 547-599).

Elsevier. Greenwood, J., Jovanovic, B. (1990). Financial development, growth, and the distribution of income. *Journal of Political Economy, 98*(5, Part 1), 1076-1107.

Gulde, A. M., Wolf, H. (2005). Publicly owned banks in the development process. *Finanzmarkt–und Währungsprobleme von Schwellen–und Transformationsländern*, 115-

130.
Ivashina, V., Scharfstein, D. (2010). Bank lending during the financial crisis of 2008. *Journal of Financial Economics, 97*(3), 319-338.
Laeven, L., Levine, R., Michalopoulos, S. (2015). Financial innovation and endogenous growth. *Journal of Financial Intermediation, 24*(1), 1-24.
Levine, R. (2005). Finance and growth: theory and evidence. *Handbook of economic growth, 1*, 865-934.
Lin, Y., Srinivasan, A., Yamada, T. (2017). The effect of government bank lending: Evidence from the financial crisis in Japan.
Love, I., Zaidi, R. (2010). Trade credit, bank credit and financial crisis. *International Review of Finance, 10*(1), 125-147.
Mateut, S., Bougheas, S., Mizen, P. (2006). Trade credit, bank lending and monetary policy transmission. *European Economic Review, 50*(3), 603-629.
Meriläinen, J. M. (2016). Lending growth during the financial crisis and the sovereign debt crisis: The role of bank ownership type. *Journal of International Financial Markets, Institutions and Money, 41*, 168-182.
Mishkin, F. S. (1992). Anatomy of a financial crisis. Journal of evolutionary Economics, 2(2), 115-130. Mishkin, F. S. (1996). Understanding financial crises: a developing country perspective (No. w5600). *National Bureau of Economic Research.*
Nilsen, J. H. (2002). Trade credit and the bank lending channel. *Journal of Money, credit and Banking*, 226-253.
Ogura, Y. (2018). The objective function of government-controlled banks in a financial crisis. *Journal of Banking Finance, 89*, 78-93.
Pazarbasioglu-Dutz, C., Byskov, S., Bonomo, M., Carneiro, I., Martins, B., Perez, A. (2017). *Brazil Financial Intermediation Costs and Credit Allocation.*
Petersen, M. A., Rajan, R. G. (1997). Trade credit: theories and evidence. *The review of financial studies, 10*(3), 661-691.
Popov, A., Udell, G. F. (2012). Cross-border banking, credit access, and the financial crisis. *Journal of international economics, 87*(1), 147-161.
Preve, L. A., Love, I., Sarria-Allende, V. (2005). *Trade credit and bank credit: Evidence from recent financial crises.* The World Bank.
Ru, H. (2018). Government Credit, a DoubleEdged Sword: Evidence from the China Development Bank. *The Journal of Finance, 73*(1), 275-316.
Torres, E., Zeidan, R. (2016). The life-cycle of national development banks: The experience of Brazil's BNDES. *Quarterly Review of Economics Finance*, 6297-104.
Vazquez, F., Tabak, B. M., Souto, M. (2012). A macro stress test model of credit risk for the Brazilian banking sector. *Journal of Financial Stability, 8*(2), 69-83.
Xu, W., Yongwei, C., Mohan, Z., Yi, Z. (2016). SOE preference and credit misallocation: A model and some evidence from China. *Economics Letters*, 13838-41.
Yang, X. (2011). The role of trade credit in the recent subprime financial crisis. *Journal of Economics and Business, 63*(5), 517-529.
Zambaldi, F., Aranha, F., Lopes, H., Politi, R. (2011). Credit granting to small firms: A Brazilian case. *Journal of Business Research, 64*(3), 309-315.