Trade Credit, the Financial Crisis, and Firm Access to Finance

Santiago Carbó-Valverde

Francisco Rodríguez-Fernández

Gregory F. Udell

Presented at the
BdE-CNMV Workshop on SME Finance

KELLEY SCHOOL OF BUSINESS

INDIANA UNIVERSITY

THE TOPIC

- **Broad topic:**
  - **Trade credit and access to finance**

- **Specific topic**
  - **Did trade credit provide insurance against the credit crunch?**
  - **That is, were trade creditors an alternative source of finance during the crisis?**

Our Paper

- **We find evidence of a credit crunch**
  - Using a different methodology
  - Fraction of credit constrained firms increased

- **Evidence on trade credit**
  - Trade credit in general is a substitute for bank loans
    - Utilized by credit constrained firms

  - Trade credit becomes more important during the credit crunch because more firms are credit constrained

The Literature on the SME Credit Crunch

- **Growing literature on this crisis and credit supply**
  - **Mostly European-focused (no SME data in the U.S.)**
  - **Key challenge: separating demand and supply**

- **U.S. studies (large firms only), e.g., Garcia-Appendini and Montoriol-Garriga (2011) de Haas and van Horen (2011), Ivashina and Sharfstein (2010)**

- **Europe (SMEs), e.g., Artola and Genre (2011), Albertazzi and Marchetti (2009), Ferrando, Annalisa and Mullier (2011), Presbitero, Udell and Zazzaro (2011), Puri, Rocholl and Steffen (2011), Iyer et al. (2010), Popov and Udell (2011)**

- **Spain (SMEs), e.g., Jimenez et al. (2011), Illueca, Norden and Udell (2011)**

The Literature on Trade Credit

- **Many, many theories of trade credit.**

    - **<u>Real-operations based theories</u>**

        - **Transactions cost minimization (e.g., Ferris 1981)**

        - **Product guarantees (e.g., Emery and Nayar 1998, Long, Malitz and Ravid1993)**

        - **price discrimination (e.g., Brennan, Maksimovic and Zechner 1988)**

        - **Market power (e.g., Fabri and Klapper 2009)**

The Literature on Trade Credit

- **Many, many theories of trade credit (cont.)**

  - **<u>Financial-based theories</u>**

    - **Collateral/liquidation advantages (e.g., Frank and Maksimovic 2005 and Longhofer and Santos 2003).**

    - **Diversion advantages (Burkart and Ellingsen 2004, Burkart, Ellingsen and Giannetti 2006).**

    - **Relationship advantages (e.g., Mian and Smith 1992, Biais and Gollier 1997, McMillan and Woodruff 1999, Cook 1999, Jain 2001, Miwa and Ramseyer 2008, and Fabri and Menichini 2006)**

    - **Liquidity insurance (more to come!)**
      - **We need to put trade credit in context first**

Trade Credit in Context

- **Trade credit an important part of SME finance**
  - **Globally: nearly as important as bank finance**
    - **37% of debt finance in U.S.**
    - **33% of debt finance in Spain**

- However, SME finance is more complex than this
  - Understanding SME access to finance requires a "more complete framework" (Berger and Udell 2006)
  - The concept of *lending technologies*
  - Trade credit one of many lending technologies

Table 1
U.S. Small Business Finance at a Glance:
Estimated Distributions of Equity and Debt
Percent of Total Equity Plus Debt (top numbers), and Billions of Dollars (bottom numbers)

From Berger and Udell (1998)

| | Sources of Equity | | | | | Sources of Debt | | | | | | | | | | Total Equity plus Debt |
| | | | | | | Financial Institutions[a] | | | Nonfinancial Business and Government | | | Individuals | | | | |
	Principal Owner[b]	Angel Finance	Venture Capital	Other Equity	Total Equity	Commercial Banks	Finance Companies	Other Fin. Insts.	Trade Credit[c]	Other Business	Govt.	Principal Owner[d]	Credit Card[e]	Other Indivi-duals	Total Debt	
A: All Nonfarm, Nonfinancial, Nonreal-Estate Small Businesses[f]																
	31.33% $524.3	3.59% $60.0	1.85% $31.0	12.86% $215.2	49.63% $830.6	18.75% $313.8	4.91% $82.1	3.00% $50.1	15.78% $264.1	1.74% $29.2	0.49% $8.1	4.10% $68.5	0.14% $2.4	1.47% $24.5	50.37% $842.9	100.00% $1,673.4
B: Breakout by Size of Small Business																
"Smaller" (< 20 employees & < $1 mill. sales)	44.53% $175.7	n.a.	n.a.	n.a.	56.00% $220.9	14.88% $58.7	3.08% $12.1	3.53% $13.9	11.81% $46.6	1.06% $4.2	0.37% $1.4	5.59% $22.1	0.53% $2.1	3.16% $12.5	44.00% $173.6	100.00% $394.5
"Larger" (≥ 20 employees or ≥ $1 mill.sales)	27.22% $348.1	n.a.	n.a.	n.a.	47.67% $609.6	19.94% $255.0	5.47% $70.0	2.83% $36.2	17.01% $217.5	1.95% $25.0	0.52% $6.7	3.63% $46.5	0.02% $0.3	0.94% $12.0	52.33% $669.3	100.00% $1,278.9
C: Breakout by Age of Small Business																
"Infant" (0 - 2 years)	19.61% $8.6	n.a.	n.a.	n.a.	47.90% $21.1	15.66% $6.9	8.33% $3.7	3.84% $1.7	13.40% $5.9	1.52% $0.7	0.33% $0.1	6.04% $2.7	0.21% $0.1	2.77% $1.2	52.10% $23.0	100.00% $44.1
"Adolescent" (3 - 4 years)	17.37% $25.1	n.a.	n.a.	n.a.	39.37% $56.8	30.84% $44.5	2.51% $3.6	2.36% $3.4	13.42% $19.4	1.06% $1.5	0.72% $1.0	6.19% $8.9	0.20% $0.3	3.32% $4.8	60.63% $87.4	100.00% $144.2
"Middle-Aged" (5 - 24 years)	31.94% $324.9	n.a.	n.a.	n.a.	48.00% $488.2	17.86% $181.6	?.85% $59.5	2.87% $29.2	17.10% $174.0	2.39% $24.3	0.44% $4.4	3.91% $39.7	0.17% $1.7	1.42% $14.4	52.00% $528.9	100.00% $1,017.1
"Old" (25 or more years)	35.42% $165.8	n.a.	n.a.	n.a.	56.50% $264.5	17.25% $80.8	3.28% $15.3	3.38% $15.8	13.86% $64.9	0.56% $2.6	0.54% $2.5	3.68% $17.2	0.06% $0.3	0.88% $4.1	43.50% $203.6	100.00% $468.0

From Berger and Udell (1998)

Table 1
U.S. Small Business Finance at a Glance:
Estimated Distributions of Equity and Debt
Percent of Total Equity Plus Debt (top numbers), and Billions of Dollars (bottom numbers)

	Sources of Equity				Sources of Debt — Financial Institutions				Nonfinancial Business and Government	Individuals	Total Debt	Total Equity plus Debt
	Principal Owner	Angel Finance	Venture Capital	Other Equity	Commercial Banks	Finance Companies	Other Fin. Insts.	Trade Credit				
	31.33% $524.3	3.59% $60.0	1.85% $31.0	12.86% $215.2							50.37% $842.9	100.00% $1,673.4
"Smaller" (< 20 employees & < $1 mill. sales)	44.53% $175.7	n.a.	n.a.	n.a.							44.00% $173.6	100.00% $394.5
"Larger" (≥ 20 employees or ≥ $1 mill. sales)	27.22% $348.1	n.a.	n.a.	n.a.	18.75% $313.8	4.91% $82.1	3.00% $50.1	15.78% $264.1			52.33% $669.3	100.00% $1,278.9

Nonfarm, Nonfinancial, Nonreal-Estate Small Business

	Principal Owner															Total Debt	Total Equity plus Debt
"Infant" (0 - 2 years)	19.61% $8.6	n.a.	n.a.	n.a.	47.90% $21.1	15.66% $6.9	8.33% $3.7	3.84% $1.7	13.40% $5.9	1.52% $0.7	.33% $0.1	6.04% $2.7	0.21% $0.1	2.77% $1.2	52.10% $23.0	100.00% $44.1
"Adolescent" (3 - 4 years)	17.37% $25.1	n.a.	n.a.	n.a.	39.37% $56.8	30.84% $44.5	2.51% $3.6	2.36% $3.4	13.42% $19.4	1.0% $1.5	0.72% $1.0	6.19% $8.9	0.20% $0.3	3.32% $4.8	60.63% $87.4	100.00% $144.2
"Middle-Aged" (5 - 24 years)	31.94% $324.9	n.a.	n.a.	n.a.	48.00% $488.2	17.86% $181.6	5.85% $59.5	2.87% $29.2	17.10% $174.0	2.39% $24.3	0.44% $4.4	3.91% $39.7	0.17% $1.7	1.42% $14.4	52.00% $528.9	100.00% $1,017.1
"Old" (25 or more years)	35.42% $165.8	n.a.	n.a.	n.a.	56.50% $264.5	17.25% $80.8	3.28% $15.3	3.38% $15.8	13.86% $64.9	0.56% $2.6	0.54% $2.5	3.68% $17.2	0.06% $0.3	0.88% $4.1	43.50% $203.6	100.00% $468.0

Trade Credit in Context

- **Trade credit an important part of SME finance**
  - **Globally: nearly as important as bank finance**
    - **37% of debt finance in U.S.**
    - **33% of debt finance in Spain**

- **However, SME finance is more complex than this**
  - **Understanding SME access to finance requires a "more complete framework" (Berger and Udell 2006)**
  - **The concept of _lending technologies_**
  - **Trade credit one of many lending technologies**

Trade Credit in Context (cont.)

- **What happens in a credit crunch requires a further extension of this framework (Taketa and Udell 2007, Udell 2009):**

    - **the concept of _lending channels_**
    - **Lending channels may be different in different countries**

Lending Channels in the U.S. During the Crisis

	Large Banks	Small Banks	Large Com. Finance Cos.	Small Com. Finance Cos.	Corporations
Relationship Lending		?			
Financial Statement Lending	x	?			
Asset-Based Lending	x	?	?	o	
Factoring	x	?	?	o	
Equipment Lending	x	?	?	o	
Leasing	x	?	?	o	
Real Estate-Based Lending	x	?			
Small Bus. Credit Scoring	x	?			
Trade Credit					?

o = open "lending channel"
x = constricted "lending channel"
? = we don't know yet

Lending Channels in the U.S. During the Crisis

	Large Banks	Small Banks	Large Com. Finance Cos.	Small Com. Finance Cos.	Corporations
Relationship Lending		?			
Financial Statement Lending	x	?			
Asset-Based Lending	x	?	?	o	
Factoring	x	?	?	o	
Equipment Lending	x	?	?	o	
Leasing	x	?	?	o	
Real Estate-Based Lending	x	?			
Small Bus. Credit Scoring	x	?			
Trade Credit					?

o = open "lending" channel"
x = constricted "lending channel"
? = we don't know yet

Lending Channels in Japan During the "Lost Decade" (1990-2000)

Japanese Lending Channels: Credit Crunch (1990-2000) - Capital Shock Hypothesis

	City Banks	Regional Banks	Shinkin Banks	Gov't Affil. Banks*	Non-Bank Shoko	Corporations
Relationship Lending		x	x	o	o	
Financial Statement Lending	x	x	x	o		
Factoring	x	x	x	o		
Leasing	x	x	x	o	o	
Equipment Lending	x	x	x	o	o	
Real Estate-Based Lending	x	x	x	o	o	
Trade Credit						o/x
Sogo Shosha Lending						o/x

o = open "lending channel"
x = constricted "lending channel"

The Context (cont.)

- **Trade creditors may provide liquidity insurance**

  - **Theoretical motivation (Wilner 2000, Cunat 2007)**

  - **Empirical evidence**

    - **Micro shocks (Evans 1998, Bossaiy and Gropp 2007, Cunat 2007)**

    - **Macro shocks (Calomiris, Himmelberg and Wachtel 1995, Love, Preve and Sarria-Allende 2007, Taketa and Udell 2007)**

The Context (cont.)

- **What's missing? Evidence during this crisis!**

    - **One exception: a recent paper on _large firms_ in the U.S. (Garcia-Appendini and Montrorio-Garriga 2011)**

    - **No papers yet on SMEs during the crisis**

    - **Key challenge: Data**
        - **Can't be done in the US: no SME panel data, no SSBF**
        - **Spain is ideal**

    - **The main contribution of our paper, i.e., we analyze the importance of trade credit _on SMEs_ during the crisis**

Our Paper:
Trade Credit in Spain During the Crisis

- **Empirical strategy**

    1. **Estimate probability of a firm being constrained using a *disequilibrium* model**

    2. **Classifies firms as *constrained* or *unconstrained***

    3. **Conduct Granger causality tests:**

    Investment sensitivity of bank loans and trade credit for unconstrained and constrained firms

    (If trade creditors serve as lender of last resort, then trade credit will predict investment for constrained firms, but bank loans will predict investment for unconstrained firms)

Data and Methodology

- **Bureau-Van-Dijk Amadeus database**

  - **40,215 Spanish SMEs from 1994-2008**
  - **SMEs defined as < 250 employees**
  - **Annual financial information**
  - **Regional-level macro information and market industry variables**

- **Disequilibrium model with two reduced form equations**

  - **Demand for credit equation**
  - **Supply of credit equation**

Disequilibrium Model

- **Demand equation**

$$Bank\ loans_{it}^d = \beta_0^d + \beta_1^d (Sales)_{it}^d + \beta_2^d Cash\ flow_{it}$$
$$+ \beta_3^d (Loan\ interest\ spread)_{it} + \beta_4^d \log(GDP) + u_{it}^d \qquad (1)$$

- **Supply equation (max credit available)**

$$Bank\ loans_{it}^s = \beta_0^d + \beta_1^s Tangible\ assets_{it} + \beta_2^s Bank\ market\ power$$
$$+ \beta_3^s Default\ risk_{it} + \beta_4^s \log(GDP) + u_{it}^s \qquad (2)$$

- **where**

$$Bank\ loans_{it} = Min(Bank\ loans_{it}^d, Bank\ loans_{it}^s) \qquad (3)$$

- **System estimated as a switching regression. Firm defined as financially constrained if the probability that the desired amount of bank credit exceeds the maximum available > .5**

$$\Pr(loan_{it}^d > loan_{it}^s) = \Pr(X_{it}^d \beta^d + u_{it}^d > X_{it}^s \beta^s + u_{it}^s) = \Phi\left(\frac{X_{it}^d \beta^d - X_{it}^s \beta^s}{\sigma}\right) \qquad (4)$$

Predictability Tests

- **Dynamic panel data predictability tests**
  - **For bank loans:**

    - ***Bank loans ratio is significant in***

$$(Capital\ expenditure_{it}\ /\ capital_{it-1})_t\ =\ \alpha_0\ +\ \sum \beta_i(Capital\ expenditure_{it}\ /\ capital_{it-1})_{t-1}$$
$$+\ \sum \gamma_i(Bank\ loans_{it}\ /\ total\ liabilities_{it})_{t-1} + \psi_t f_i + u_{it} \qquad (5)$$

    - ***Investment rate is not significant in***

$$(Bank\ loans_{it}\ /\ total\ liabilities_{it})_t\ =\ \alpha_0\ +\ \sum \beta_i(Bank\ loans_{it}\ /\ total\ liabilities_{it})_{t-1}$$
$$+\ \sum \gamma_i(Capital\ expenditure_t\ /\ capital_{t-1})_{t-1}\ +\ \psi_t f_i + u_{it} \qquad (6)$$

  - **Also run for trade credit using two proxies:**
    - **Accounts payable/total liabilities**
    - **Trade credit payment period**

Results – Disequilibrium Model

TABLE III. PERCENTAGE OF BORROWING CONSTRAINED FIRMS

	Fully-constrained	Partially-constrained	Constrained (fully plus partially constrained)
Entire period (1994-2008)	6.07	29.89	35.96
1994	8.59	28.34	36.93
1995	7.63	25.22	32.85
1996	6.25	30.38	36.63
1997	6.57	27.41	33.98
1998	5.23	30.17	35.40
1999	5.01	30.15	35.16
2000	4.66	30.93	35.59
2001	4.53	30.18	34.71
2002	4.01	30.22	34.23
2003	3.89	30.03	33.92
2004	3.85	29.76	33.61
2005	3.94	29.83	33.77
2006	3.89	29.28	33.17
2007	4.53	34.59	39.12
2008	6.19	36.23	42.42

Results – Disequilibrium Model

TABLE III. PERCENTAGE OF BORROWING CONSTRAINED FIRMS

Increase in fraction of constrained firms in crisis consistent with earlier studies (e.g., Popov and Udell 2011, Puri et al. 2001, Jimenez et al. 2011) - *but with different methodology.*

	Fully-constrained	Partially-constrained	Constrained (fully plus partially constrained)
Entire period (1994-2008)	6.07	29.89	35.96
1994	8.59	28.34	36.93
1995	7.63	25.22	32.85
1996	6.25	30.38	36.63
1997	6.57	27.41	33.98
1998	5.23	30.17	35.40
1999	5.01	30.15	35.16
2000	4.66	30.93	35.59
2001	4.53	30.18	34.71
2002	4.01	30.22	34.23
2003	3.89	30.03	33.92
2004	3.85	29.76	33.61
2005	3.94	29.83	33.77
2006	3.89	29.28	33.17
2007	4.53	34.59	39.12
2008	6.19	36.23	42.42

Results – Table V
Predictability Tests for Bank Loans

For _unconstrained_ firms

PANEL B. UNCONSTRAINED FIRMS (CRUNCH, 2007-2008)	(1) Capital expenditure$_t$ / capital$_{t-1}$	(2) Bank loans/total liabilities
Constant	0.0116* (0.039)	0.0132** (0.008)
Dependent variable$_{t-1}$	0.0221* (0.011)	0.0724 (0.053)
(Capital expenditure$_t$/ capital$_{t-1}$)$_{t-1}$	-	0.8908 (0.266)
Bank loans/total liabilities $_{t-1}$	0.0327** (0.005)	-

Results – Table V
Predictability Tests for Bank Loans

For _unconstrained_ firms

Capex doesn't predict bank loans

Bank loans predict capex

PANEL B. UNCONSTRAINED FIRMS (CRUNCH, 2007-2008)	(1)	(2)
	Capital expenditure$_t$ / capital$_{t-1}$	Bank loans/total liabilities
Constant	0.0116* (0.039)	0.0132** (0.008)
Dependent variable$_{t-1}$	0.0221* (0.011)	0.0724 (0.053)
(Capital expenditure$_t$/ capital$_{t-1}$)$_{t-1}$	-	0.8908 (0.266)
Bank loans/total liabilities $_{t-1}$	0.0327** (0.005)	-

Results – Table V
Predictability Tests for Trade Credit

For _unconstrained_ firms

PANEL B. UNCONSTRAINED FIRMS (CRUNCH, 2007-2008)

	(3) Capital expenditure$_t$/ capital$_{t-1}$	(4) Accounts payable/ total liabilities	(5) Capital expenditure$_t$/ capital$_{t-1}$	(6) Credit period
(Capital expenditure$_t$/ capital$_{t-1}$)$_{t-1}$	-	0.0204 (0.595)	-	0.0142 (0.380)
Credit period$_{t-1}$	-	-	0.1458 (0.139)	-
(Accounts payable/ total liabilities)$_{t-1}$	0.1146 (0.208)	-	-	-

KELLEY SCHOOL OF BUSINESS

INDIANA UNIVERSITY

Results – Table V
Predictability Tests for Trade Credit

For _unconstrained_ firms

Capex doesn't predict trade credit

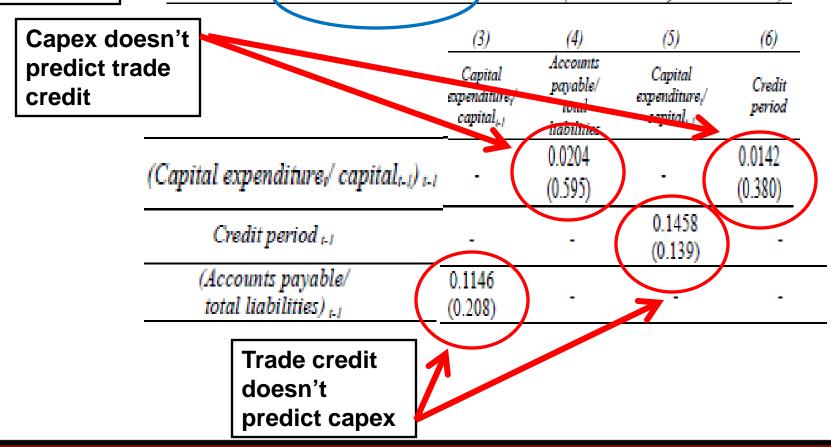**Trade credit doesn't predict capex**

PANEL B. UNCONSTRAINED FIRMS (CRUNCH, 2007-2008)

	(3) Capital expenditure$_t$/ capital$_{t-1}$	(4) Accounts payable/ total liabilities	(5) Capital expenditure$_t$/ capital$_{t-1}$	(6) Credit period
(Capital expenditure$_t$/ capital$_{t-1}$)$_{t-1}$	-	0.0204 (0.595)	-	0.0142 (0.380)
Credit period$_{t-1}$	-	-	0.1458 (0.139)	-
(Accounts payable/ total liabilities)$_{t-1}$	0.1146 (0.208)	-	-	-

Results – Table VI
Predictability Tests for Bank Loans

For _constrained_ firms

PANEL B. PARTIALLY & FULLY-CONSTRAINED FIRMS (CRUNCH, 2007-2008)

	(1) Capital expenditure$_t$/ capital$_{t-1}$	(2) Bank loans/total liabilities
Constant	0.0221* (0.011)	0.0135* (0.022)
Dependent variable$_{t-1}$	0.0325* (0.023)	0.0202** (0.013)
(Capital expenditure$_t$/ capital$_{t-1}$)$_{t-1}$	-	0.3244 (0.463)
Bank loans/total liabilities $_{t-1}$	0.1424 (0.585)	-

Results – Table VI
Predictability Tests for Bank Loans

For _constrained_ firms

PANEL B. PARTIALLY & FULLY-CONSTRAINED FIRMS (CRUNCH, 2007-2008)

	(1) Capital expenditure/ capital$_{t-1}$	(2) Bank loans/total liabilities
Constant	0.0221* (0.011)	0.0135* (0.022)
Dependent variable$_{t-1}$	0.0325* (0.023)	0.0202** (0.013)
(Capital expenditure/ capital$_{t-1}$) $_{t-1}$	-	0.3244 (0.463)
Bank loans/total liabilities $_{t-1}$	0.1424 (0.585)	-

Capex doesn't predict bank loans

Bank loans doesn't predict capex

Results – Table VI
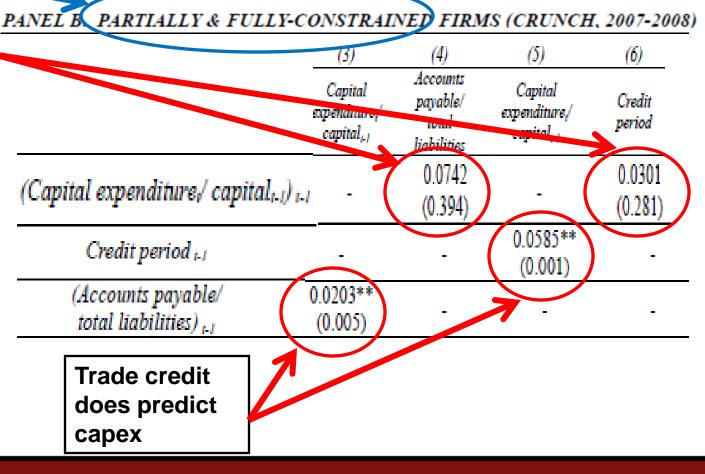# Predictability Tests for Trade Credit

For *constrained* firms

PANEL B. PARTIALLY & FULLY-CONSTRAINED FIRMS (CRUNCH, 2007-2008)

	(3) Capital expenditure/ capital$_{t-1}$	(4) Accounts payable/ total liabilities	(5) Capital expenditure/ capital$_{t-1}$	(6) Credit period
(Capital expenditure/ capital$_{t-1}$)$_{t-1}$	-	0.0742 (0.394)	-	0.0301 (0.281)
Credit period$_{t-1}$	-	-	0.0585** (0.001)	-
(Accounts payable/ total liabilities)$_{t-1}$	0.0203** (0.005)	-	-	-

Results – Table VI
Predictability Tests for Trade Credit

For _constrained_ firms

Capex doesn't predict trade credit

PANEL B. PARTIALLY & FULLY-CONSTRAINED FIRMS (CRUNCH, 2007-2008)

	(3) Capital expenditure/ capital$_{t-1}$	(4) Accounts payable/ total liabilities	(5) Capital expenditure/ capital$_{t-1}$	(6) Credit period
(Capital expenditure/ capital$_{t-1}$)$_{t-1}$	-	0.0742 (0.394)	-	0.0301 (0.281)
Credit period$_{t-1}$	-	-	0.0585** (0.001)	-
(Accounts payable/ total liabilities)$_{t-1}$	0.0203** (0.005)	-	-	-

Trade credit does predict capex

Predictability Tests

- **Predictability relationships hold during pre-crunch and crunch periods**

- **However, during crunch period**
  - **Bank loan sensitivity less for unconstrained firms**
  - **More firms credit constrained**
    - **Direct trade credit effect**
    - **Strength of effect greater for "trade credit period" measure of trade credit, less for "amount of trade credit" measure**

Conclusions

- **Trade credit a substitute for bank loans**
    - **Utilized by credit constrained firms**

- **Becomes more important during credit crunch because more firms are credit constrained**