Financial Frictions: Empirical Facts

Princeton Initiative

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This lecture

- "Survey" lecture: overview of empirical research on financial frictions and their impact on firm-level and macro level outcome.
- Empirically difficult task: supply vs. demand? Holy grail: find the perfect empirical setting/instrument.
- Literature mostly focused on showing effects of financial frictions.
  - Precise theories (moral hazard vs. adverse selection vs. limited commitment) have yet to be tested (as opposed to insurance industry).

Roadmap

Firm-level evidence

- Firm liquidity and investment
- Financial sector liquidity and investment
- Beyond Investment

"Macro" evidence

Alternative research designs

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Neoclassical Theory of Investment

- Hayashi [1982] dynamic theory of investment: frictionless capital markets, perfect competition in product markets, convex adjustment costs $c(I, K)$.
- Assume production function and adjustment costs homogenous of degree 1. ($F(K) = \theta K$, $c(I, K) = \gamma \frac{I^2}{K}$).

$$\left(\frac{I}{K}\right)_t = \delta q_t = \delta Q_t$$

where $q_t = \frac{\partial V}{\partial K}(K_t)$ and $Q_t = \frac{V_t}{K_t}$ and V_t is the discounted sum of future profit.

- Q is a sufficient statistic for investment. Only determinant of investment in a project is the project NPV. Simple empirical model.

The failure of the Neoclassical Theory?

- Simple reduced-form way of thinking about credit constraints: internal funds are less costly than external funds.
- If this is the case, then available liquidity (i.e. cash) should influence investment behavior beyond Q.
- Run on a large sample of public corporations in the US:

$$\left(\frac{I}{K}\right)_{it} = \alpha_i + \alpha_t + \beta Q_{it} + \mu \left(\frac{cash - flows}{K}\right)_{it} + \epsilon_{it}$$

- Typically: $\mu > 0$ and ***: a rejection of neo-classical investment theory?
  - **Endogeneity bias**: cash-flows are > 0 correlated with ϵ_{it}
  - Measurement error on $Q \Rightarrow$ upward-bias on μ.

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Epistemology: Fazzari et al. [1988]

- Literature starts with Fazzari et al. [1988].
- Empirical strategy: estimate μ separately for firms that are likely to be constrained and firms that are not. Compare estimates.
- Idea: bias should be the same, i.e. same correlation of unobserved investment opportunities to cash flows in both sample.
- Issue for implementation: proxy for likelihood of credit constraints? Fazzari et al. [1988] use payout policy: large dividend payers vs. non-dividend payers.
- Later in the literature: firm size, credit ratings and various indices.

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Table 4. Effects of Q and Cash Flow on Investment, Various Periods, 1970–84[a]

Independent variable and summary statistic	*Class 1*	*Class 2*	*Class 3*
		1970–75	
Q_{it}	−0.0010	0.0072	0.0014
	(0.0004)	(0.0017)	(0.0004)
$(CF/K)_{it}$	0.670	0.349	0.254
	(0.044)	(0.075)	(0.022)
$\bar{R}^2$	0.55	0.19	0.13
		1970–79	
Q_{it}	0.0002	0.0060	0.0020
	(0.0004)	(0.0011)	(0.0003)
$(CF/K)_{it}$	0.540	0.313	0.185
	(0.036)	(0.054)	(0.013)
$\bar{R}^2$	0.47	0.20	0.14
		1970–84	
Q_{it}	0.0008	0.0046	0.0020
	(0.0004)	(0.0009)	(0.0003)
$(CF/K)_{it}$	0.461	0.363	0.230
	(0.027)	(0.039)	(0.010)
$\bar{R}^2$	0.46	0.28	0.19

Source: Authors' estimates of equation 3 based on a sample of firm data from Value Line data base. See text and Appendix B.

a. The dependent variable is the investment-capital ratio $(I/K)_{it}$, where I is investment in plant and equipment and K is beginning-of-period capital stock. Independent variables are defined as follows: Q is the sum of the value of equity and debt less the value of inventories, divided by the replacement cost of the capital stock adjusted for corporate and personal taxes (see Appendix B); $(CF/K)_{it}$ is the cash flow–capital ratio. The equations were estimated using fixed firm and year effects (not reported). Standard errors appear in parentheses.

Issues.

- Larger measurement error in Q in constrained sample $\Rightarrow$ larger coefficient on cash in constrained sample (Erickson and Whited [2000]).
- Maybe "constrained" firms have more persistent investment opportunities?
- Ideal solution: find shocks to cash flows that are exogenous to investment opportunity set (ϵ_{it}) and Q.
- Large literature devoted to finding the perfect instrument for cash flows. No "smoking gun", but some suggestive evidence.

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Oil shocks: Lamont [1997]

- Oil price shocks affect cash flows of oil division. If there are capital markets, this means a decline in available cash for all divisions in oil conglomerates.
- Empirical strategy: investment behavior of non-oil division following large decline in oil prices.
- Hypothesis: with financing constraints (and internal capital markets), a decline in oil prices $\Rightarrow$ decline in available cash for non-oil divisions $\Rightarrow$ decline in capex for non-oil division.
- Identifying assumption: oil price shocks $\perp$ non-oil division investment opportunities.

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Assumptions in the data

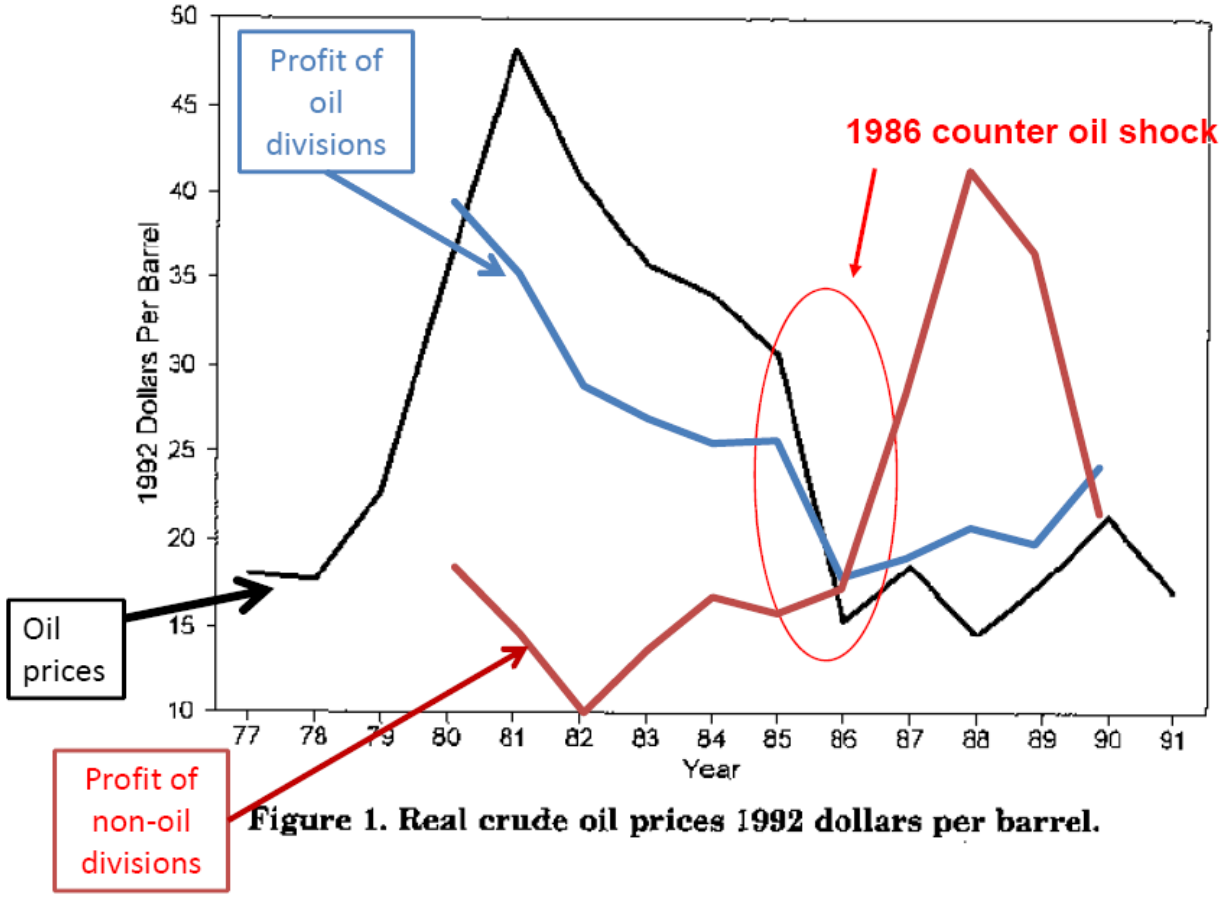

Figure 1. Real crude oil prices 1992 dollars per barrel.

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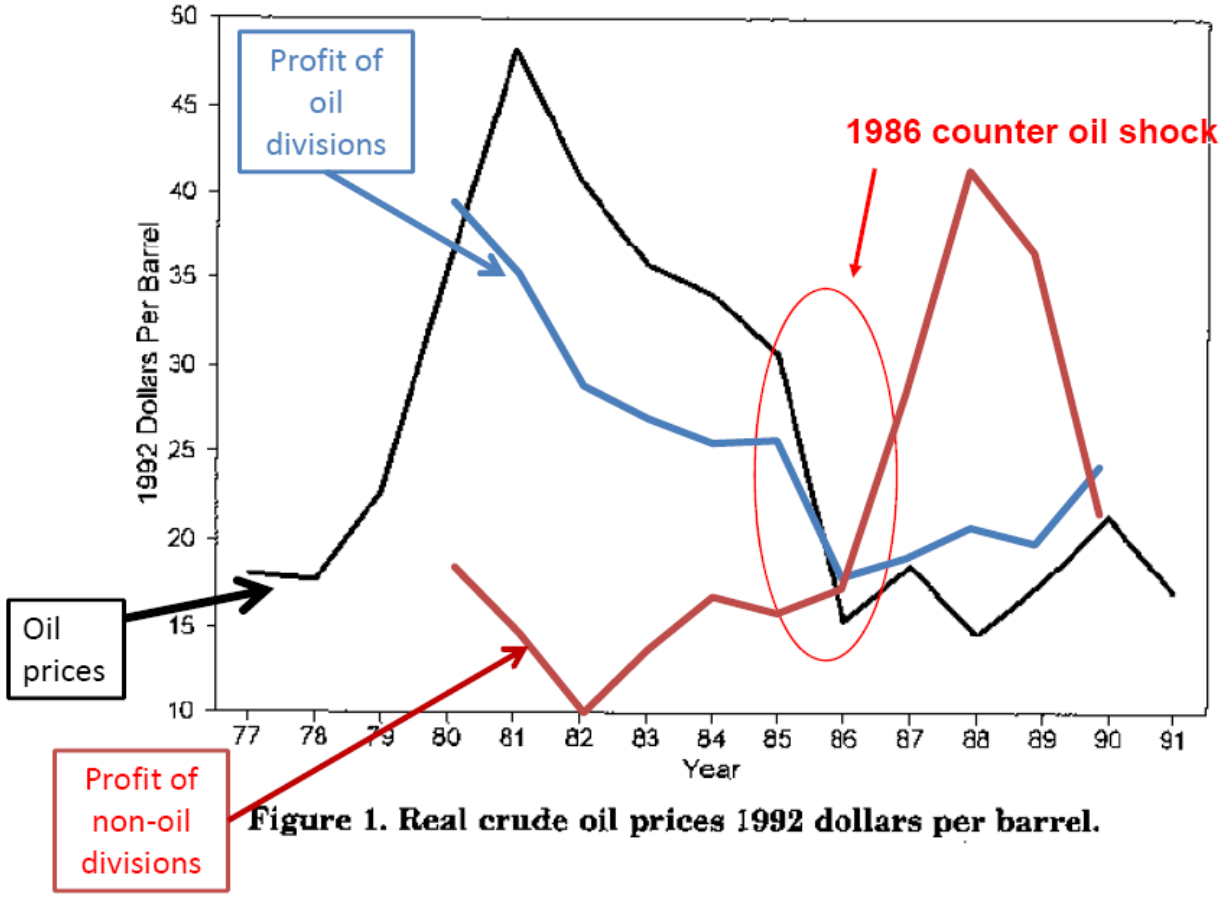


Figure 1. Real crude oil prices 1992 dollars per barrel.

Non-oil division investment decreases following oil shock.

Change in I/S, 1985–1986

Dependent variable: Δ *I/S*, where I is segment capital expenditure and S is segment sales. Expressed as percentage points. Median: The *Z*-statistic is the Wilcoxon signed-rank test, which tests the hypothesis that the observations are iid and symmetrically distributed around zero. Number positive: the 2-sided *p*-value is the probability of observing at most this number of positive or negative values, under the null hypothesis that the observations are independent and prob[positive] = 0.5. Industry-adjustment: For each observation of Δ *I/S*, I subtract the median value of Δ *I/S* from a control group of COMPUSTAT segments that were in the same industry, but were owned by companies that did not have an oil extraction segment.

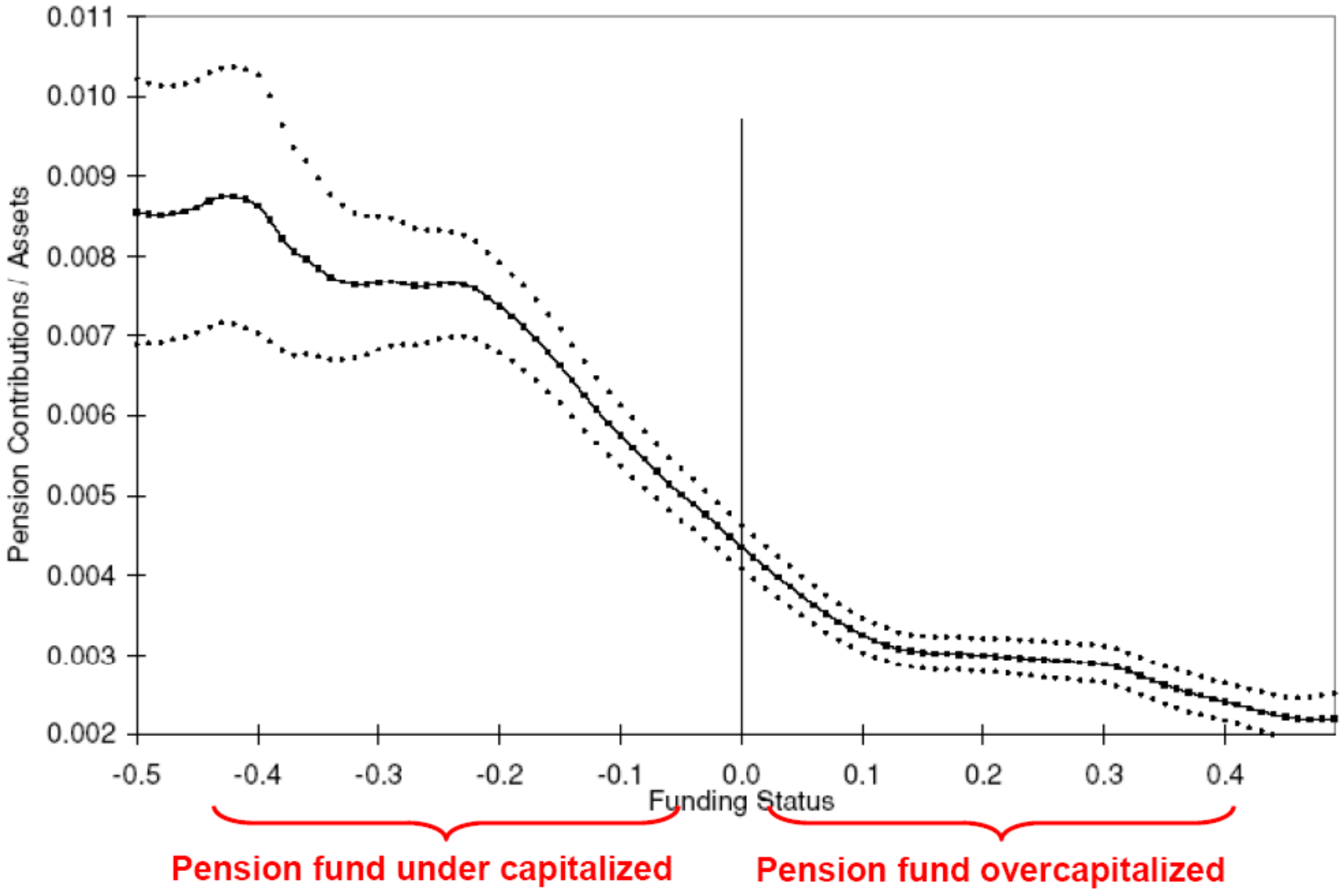
	Raw	Industry-Adjusted
No. of Observations	40	39
Mean	−1.46	−1.41
t-statistic	(2.34)	(2.06)
p-value	(0.02)	(0.05)
Median	−0.90	−0.80
Z-statistic	(2.51)	(2.18)
p-value	(0.01)	(0.03)
Number positive	13	12
p-value	(0.04)	(0.02)

Caveats: small sample size; downward bias (upper bound).

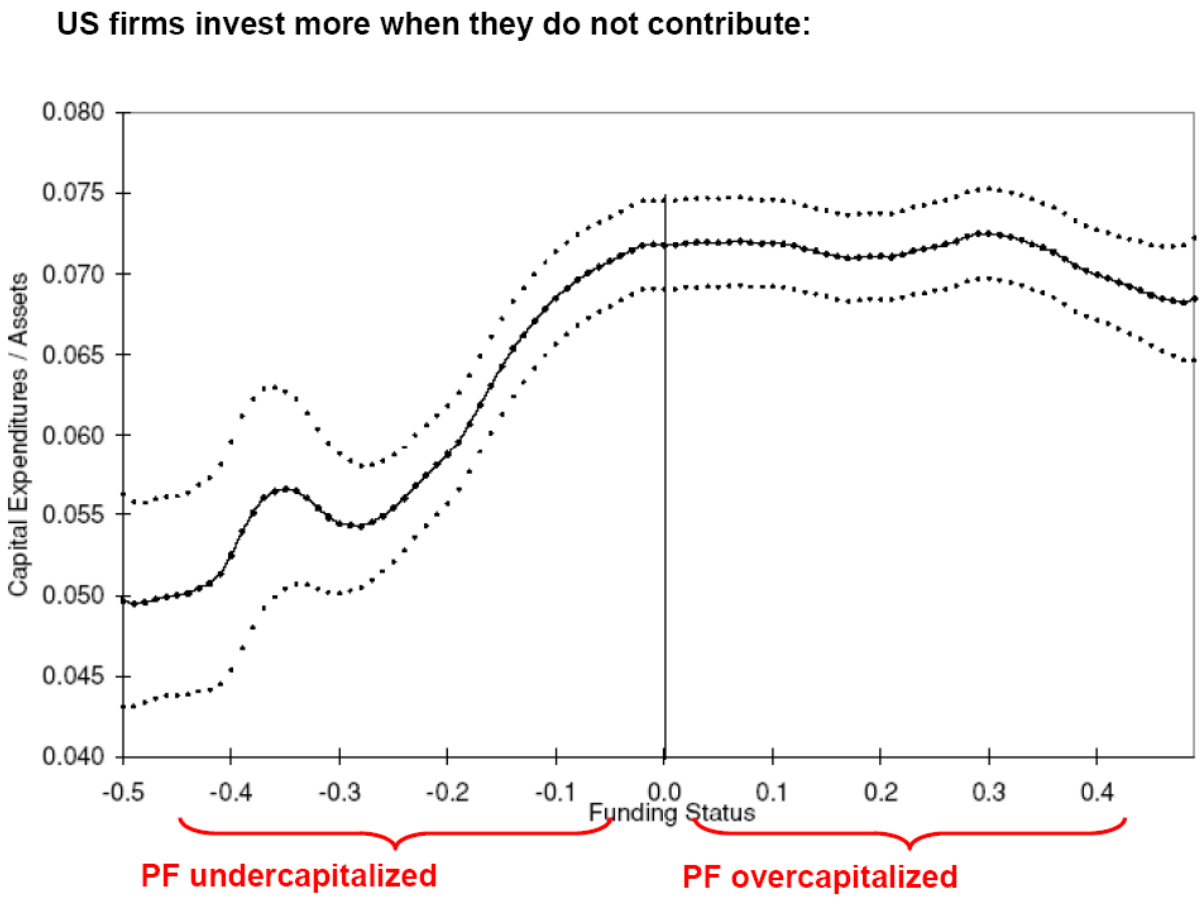
Mandatory Contributions to Pension Plans: Rauh [2006]

- Firms with defined benefit plans and funding deficits are required to contribute to the pension plans.
  Underfunding $\Rightarrow$ negative cash outflows.
- Funding status mostly determined by variations in the value of the asset side of pension fund (stocks, bonds, etc.).
- Identifying assumption: variation in asset prices $\perp$ investment opportunities.
- Empirical strategy: Compare investment behavior of firms with and without mandatory contributions (not observed contribution).

US firms contribute mostly when their pension fund is under capitalized:



Large estimate: 60c of investment per $ of extra cash



Caveat: **Manipulation** of pension fund returns?

Over vs. Under-investment

- That firms invest more when > 0 cash-flow shocks is not necessarily a sign of inefficiency.
  - "Empire builder" managers – agency costs of free cash flows. (LBOs)
- Blanchard et al. [1994] use cash from unexpected wins in corporate lawsuits as an instrument for cash flows. Somewhat convincing. Caveat: 13 observations – case studies.
- Finding: extra cash mostly invested in "pet" projects (corporate acquisitions).
- Welfare analysis essentially lacking from the literature ($\Leftrightarrow$ hard to empirically pin down micro-mechanism at play (adverse selection, moral hazard, limited commitment, etc.).

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Cash is not the Only Source of Liquidity

- Remember the motivation for cash-flows in the investment equation: "liquidity" position of the firm should not affect its investment decision.
- Firms' tangible assets are another source of liquidity: provide collateral to borrow against. Theoretical foundation: Hart and Moore [1994].
- Empirical question: does collateral value affect corporate investment beyond Q? If so, this is another rejection of neo-classical theory.
- Similar challenge: Find variations in the value of collateral that are orthogonal to investment opportunities.

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Liquidation values affect financial contracts

- Benmelech et al. [2005] use zoning regulation to determine the collateral value of commercial property: properties in regulated areas are less redeployable – thus less valuable as collateral.
- Within a census tract, more redeployable assets receive loans that are (1) larger (2) longer maturity (3) lower interest rates.
- This analysis controls for many property characteristics, including sale price.
- Caveat: hard to entirely rule out endogenous selection of projects.
- Real effects?

Collateral value affect Corporate Investment

- Chaney et al. [2010] use variation in local real estate prices as shock to the value of collateral for firms that own real estate.
- Empirical strategy: triple differences – compare **evolution** of investment of firms **with vs. without** real estate in cities with **increasing vs. decreasing** real estate prices.
- Endogeneity issues:
  1. Real estate prices is a proxy for local demand shocks. $\Rightarrow$ compare renters vs. owners in same city.
  2. Reverse causality: firm's investment impact city level real estate prices. $\Rightarrow$ instrument real estate prices with interest rates $\times$ local elasticity of land supply.

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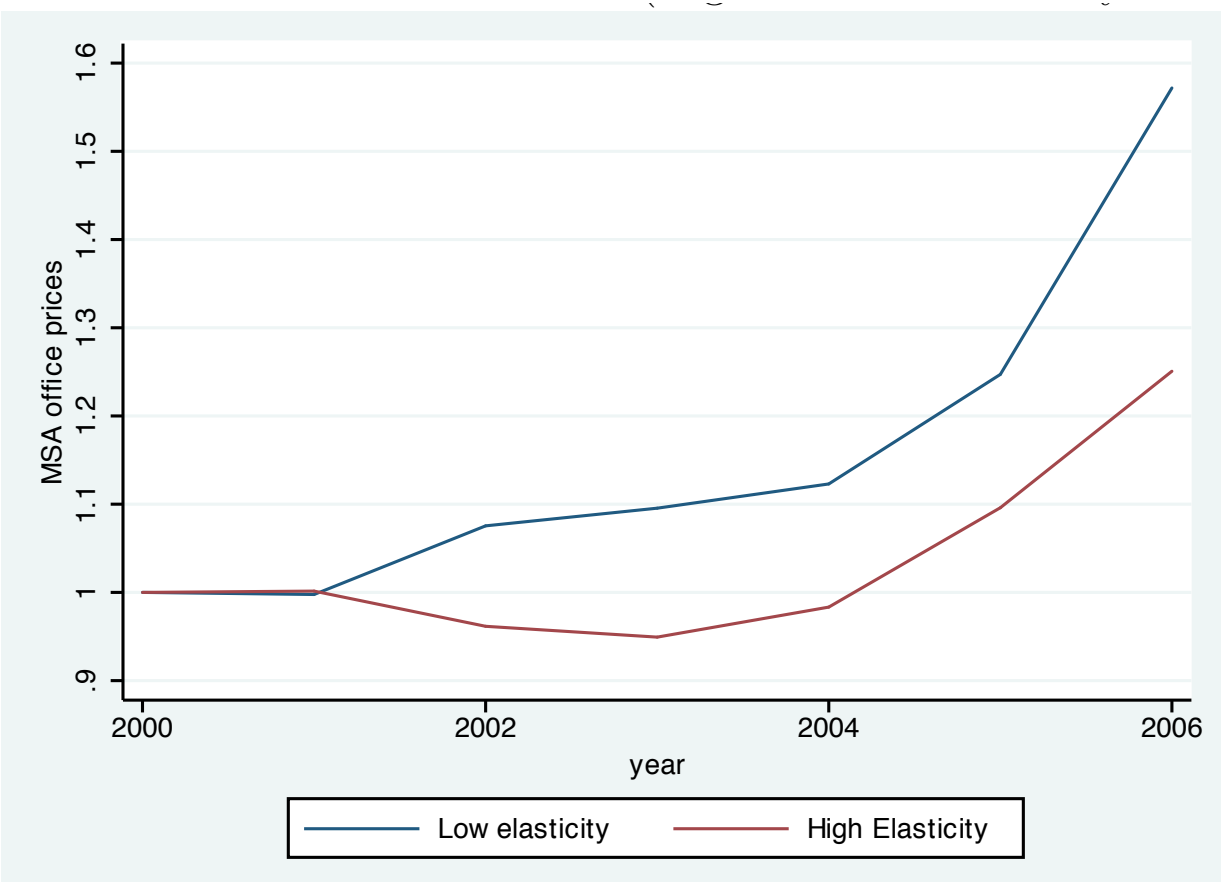
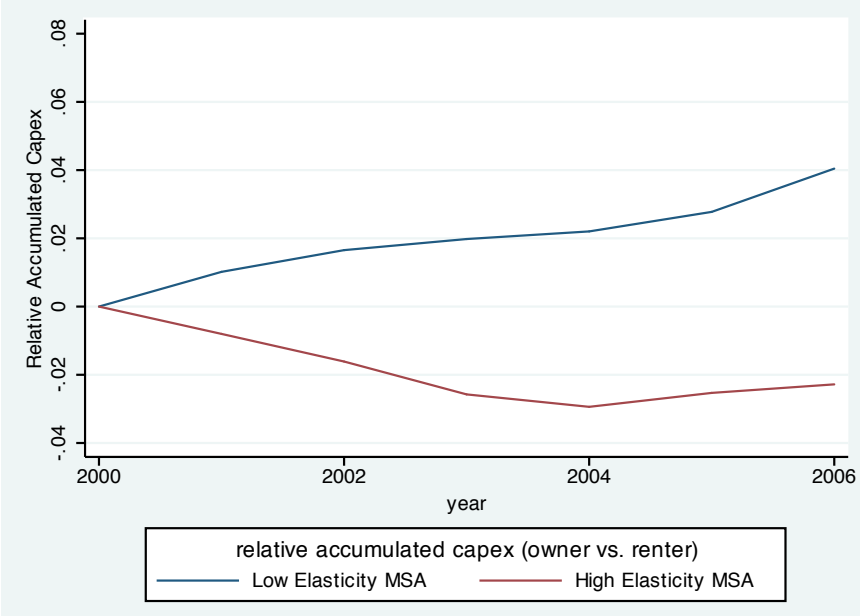
Illustration: price variations during the real estate bubble



CAPEX differential of owners vs. renters in different areas



- Result works mostly through increased debt issuance.
- Low elasticity: 6 cents on the dollar. But: fraction of firms that invest $\times$ redeployability $\times$ fraction of constrained firms.

Endogeneity of ownership?

- Omitted variable bias: firms with larger co-movement of investment and local real estate prices prefer to own their properties.
- Then estimate is upward biased.
- If this omitted variable is fixed in time:
  - Firms before they purchase real estate should already have investment > 0 correlated with local real estate prices.
  - Not the case in the data.
  - However, if omitted variable is time-varying, then no solution.

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Intermediation

- We have focused on the demand side of credit. Variations in firms characteristics (cash/collateral value/etc.) influence firms financial capacity.
- However, most of finance is intermediated ($\sim$ supply side). Frictions in the financial sectors can translate into reduction in financial capacity for corporations.
- Empirical evidence on the role played by the financial sector on firms' investment behavior.

The Japanese Crisis as an experiment

- Bank collateral channel: (1) banks are credit constrained (2) other forms of financing are not readily available (relationship banking).
- Gan [2007] uses the burst of the Japanese real estate bubble as a shock to the health of banks exposed to real estate risk.
- Two endogeneity issues:
  1. Separate demand from supply.
  2. Endogenous matching of firms and banks (firms exposed to real estate borrow from banks exposed to real estate).
- Identification strategy:
  1. Compare within the same firm lending supply from different lenders.
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A shock to lending supply...

$$Lending_{ij} = a_j + b \times RE\ exposure_i + c \times Bank\ controls_i + d \times Relationship\ control_{ij} + \epsilon_{ij}$$

- $Lending_{ij}$ is (1) dummy for continuation of lending relationship (2) log amount borrowed after the crisis period (94-98).
- a_j: firm FE controls for credit demand.
- RE exposure: % real estate loans, land holding.
- Results: $b < 0$ and significant.

. . . that turns into a shock to investment

Dependent variable: Average I/K from 1994-1998.

	(1)	(2)
Top lender's real estate exposure and other characteristics		
% Real estate loans	−0.615**	−0.509*
	(0.249)	(0.305)
% Land holding	−0.07	−0.134
	(0.292)	(0.352)
Top lender's capital ratio	2.520*	2.218
	(1.419)	(1.694)
q	0.025***	0.025***
	(0.000)	(0.000)
Cash flow/K	1.111***	1.116***
	(0.018)	(0.022)
Cash stock/K	0.205***	0.204***
	(0.003)	(0.003)
Land/K^{1989} (firm)	−0.132***	−0.138***
	(0.036)	(0.044)
% Recent purchase	−0.064	−0.07
	(0.118)	(0.145)
Leverage	0.090*	0.116*
	(0.054)	(0.067)
Land/K^{1989} (firm) * high leverage	−0.092***	−0.097***
	(0.018)	(0.022)
Access to the public bond market		−0.014
		(0.014)
Observations	420	420
Pseudo R^2	0.44	0.44

Bank Collateral Channel in normal times

- Issue with previous approach: external validity. Japan is in crisis so other forms of financing not available.
- How do we look at the question in a normal environment?
- Peek and Rosengren [2000] uses Japanese lending for commercial real estate projects in the US and exploits cross-sectional heterogeneity in Japanese banks health.
    1. Japanese branches with affected parents cut lending for CRE.
    2. Number/size of CRE projects financed in a US state depends on health of parents of Japanese banks.
- Large estimated effects: \$100 decline in loans by Japanese banks operating in a given state $\longrightarrow$ \$111 decrease in construction activity in that state.

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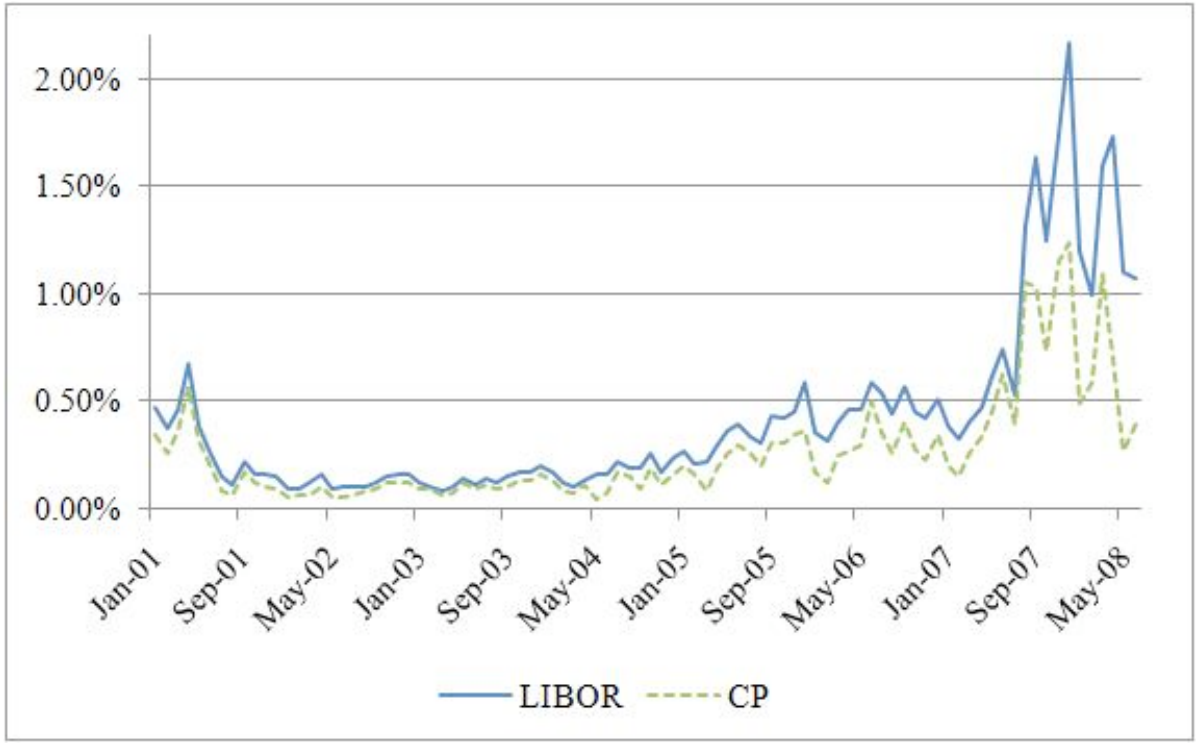
Evidence from the Great Financial Crisis

This figure displays the 3-month LIBOR and commercial paper (CP) spreads over treasuries, for the period of January 2001 to June 2008. The data is from http://www.federalreserve.gov/datadownload/.



- Undoubtedly, the financial crisis was a large shock to bank financing capacities.
- Usual problem: supply vs. demand.

Disentangling supply and demand

- Almeida et al. [2009] slices COMPUSTAT sample by looking at firms with a large fraction ($> 20\%$) of long-term debt maturing during the financial crisis (2008 vs. 2007).
- Identifying assumption: these maturity choices were made a long time ago and are thus $\perp$ to investment opportunities in 2007
- Caveats: good firms actively manage their maturity structure before the crisis?

A difference-in-difference estimation

	Average Quarterly Investment / Capital Stock (in percentage points)		
	2008	2007	Difference
Panel A: Investment Before and After the Fall 2007 Credit Crisis			
Investment in 2008 (Q1 to Q3) vs. Investment in 2007 (Q1 to Q3)			
Treated Firms	5.7***	7.8***	–2.1**
	(0.5)	(0.9)	(0.8)
Control Firms	7.3***	7.3***	0.1
	(0.6)	(0.7)	(0.7)
Difference	–1.6***	0.6	–2.2**
	(0.6)	(1.0)	(1.0)
Matching Estimator (ATT)			–2.5**
			(1.1)
Panel B: The Placebo Test			
Investment in 2007 (Q1 to Q3) vs. Investment in 2006 (Q1 to Q3)			
Treated Firms	6.9***	7.3***	–0.4
	(0.7)	(0.6)	(0.7)
Control Firms	6.9***	7.2***	–0.3
	(0.7)	(0.8)	(0.8)
Difference	0.0	0.1	–0.1
	(0.8)	(0.8)	(1.0)
Matching Estimator (ATT)			0.0
			(1.1)

***, **, * indicate significance at the 1, 5, and 10 percent levels, respectively.

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Beyond CAPEX: precautionary motives and credit constraints

- Problem with CAPEX analysis: unobserved investment opportunity (i.e. demand).
- Almeida et al. [2004] looks at cash saving. If firms are unconstrained, cash saving should have no systematic pattern.
- For constrained firms, cash hoarding should prevail when > 0 cash flow shocks.
- Simple test using Fazzari et al. [1988] methodology.

Cash-to-Cash Sensitivity

Table 3: The Cash Flow Sensitivity of Cash: Baseline Regression Model

This table displays results for OLS estimations of the baseline regression model (Eq. (8) in the text). All data are from the annual COMPUSTAT industrial tapes. The sampled firms include only manufacturers (SICs 2000-3999) and the sample period is 1971 through 2000. The estimations include firm effects and correct the error structure for heteroskedasticity and for within-period error correlation using the White-Huber estimator. t-statistics (in parentheses).

Dependent Variable	Independent Variables			R^2
$\Delta CashHoldings$	$CashFlow$	Q	$Size$	
Financial Constraints Criteria				
1. Payout Ratio				
Constrained Firms	0.0593 (4.53)*	0.0029 (2.41)**	0.0019 (0.61)	0.28
Unconstrained Firms	−0.0074 (−0.28)	0.0001 (0.01)	0.0001 (0.05)	0.28
2. Firm Size				
Constrained Firms	0.0620 (4.12)*	0.0016 (1.65)	−0.0014 (−0.28)	0.26
Unconstrained Firms	0.0099 (0.47)	0.0015 (1.52)	−0.0035 (−1.55)	0.17
3. Bond Ratings				
Constrained Firms	0.0580 (4.80)*	0.0016 (2.31)**	−0.0029 (−1.07)	0.20
Unconstrained Firms	0.0179 (1.35)	0.0025 (1.91)	−0.0022 (−0.92)	0.15
4. Comm. Paper Ratings				
Constrained Firms	0.0505 (4.83)*	0.0017 (2.93)*	−0.0031 (−1.37)	0.17
Unconstrained Firms	0.0108 (0.49)	0.0022 (1.78)	−0.0014 (−0.46)	0.12
5. Kaplan-Zingales Index				
Constrained Firms	0.0045 (0.26)	0.0061 (4.43)*	0.0015 (0.71)	0.33
Unconstrained Firms	0.1066 (3.01)*	0.0003 (0.26)	−0.0026 (−0.61)	0.22

Note: *,** indicate statistical significance at the 1-percent and 5-percent (two-tail) test levels, respectively.

Beyond CAPEX: Labor and Financing constraints

- Labor is not perfectly adjustable – adjustment costs because of organizational frictions. Thus labor needs financing too. Credit constraints may bind. Very little literature on the question.
- Benmelech et al. [2011] use Almeida et al. [2009]'s methodology and find that employment decision reacts significantly to liquidity shocks during the financial crisis.
- Bakke and Whited [Forthcoming] use Rauh [2006]'s methodology and find significant response of employment to pension fund's funding deficits.
- Caveat: what is the counterfactual?
- Important area for future research – especially macro-oriented. Clear case where structure is needed.

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- Important area for future research – especially macro-oriented. Clear case where structure is needed.

Beyond CAPEX: Labor and Financing constraints

- Labor is not perfectly adjustable – adjustment costs because of organizational frictions. Thus labor needs financing too. Credit constraints may bind. Very little literature on the question.
- Benmelech et al. [2011] use Almeida et al. [2009]'s methodology and find that employment decision reacts significantly to liquidity shocks during the financial crisis.
- Bakke and Whited [Forthcoming] use Rauh [2006]'s methodology and find significant response of employment to pension fund's funding deficits.
- Caveat: what is the counterfactual?
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Beyond CAPEX: Working Capital

- Operating Working Capital (maturity mismatch between current assets and current liabilities) need to be financed as well.
- Typical example: exporters have long cash cycle.
- Paravisini et al. [2011] looks at financial crisis in Peru and impact on exporters.
  1. Split banks along exposure to financial crisis (using foreign liabilities).
  2. Identify credit supply shock using within firm attribution of credit (cf. Gan [2007]).
  3. Compare, for given product/destination pair (demand shock), growth rate in exports as a function of top lender's exposure.

$\Rightarrow$ Estimates low relative to rest of the literature. Peruvian exports volume growth was -9.6% after July 2008. Credit supply decline accounts for $\sim$15% of the missing volume of exports.

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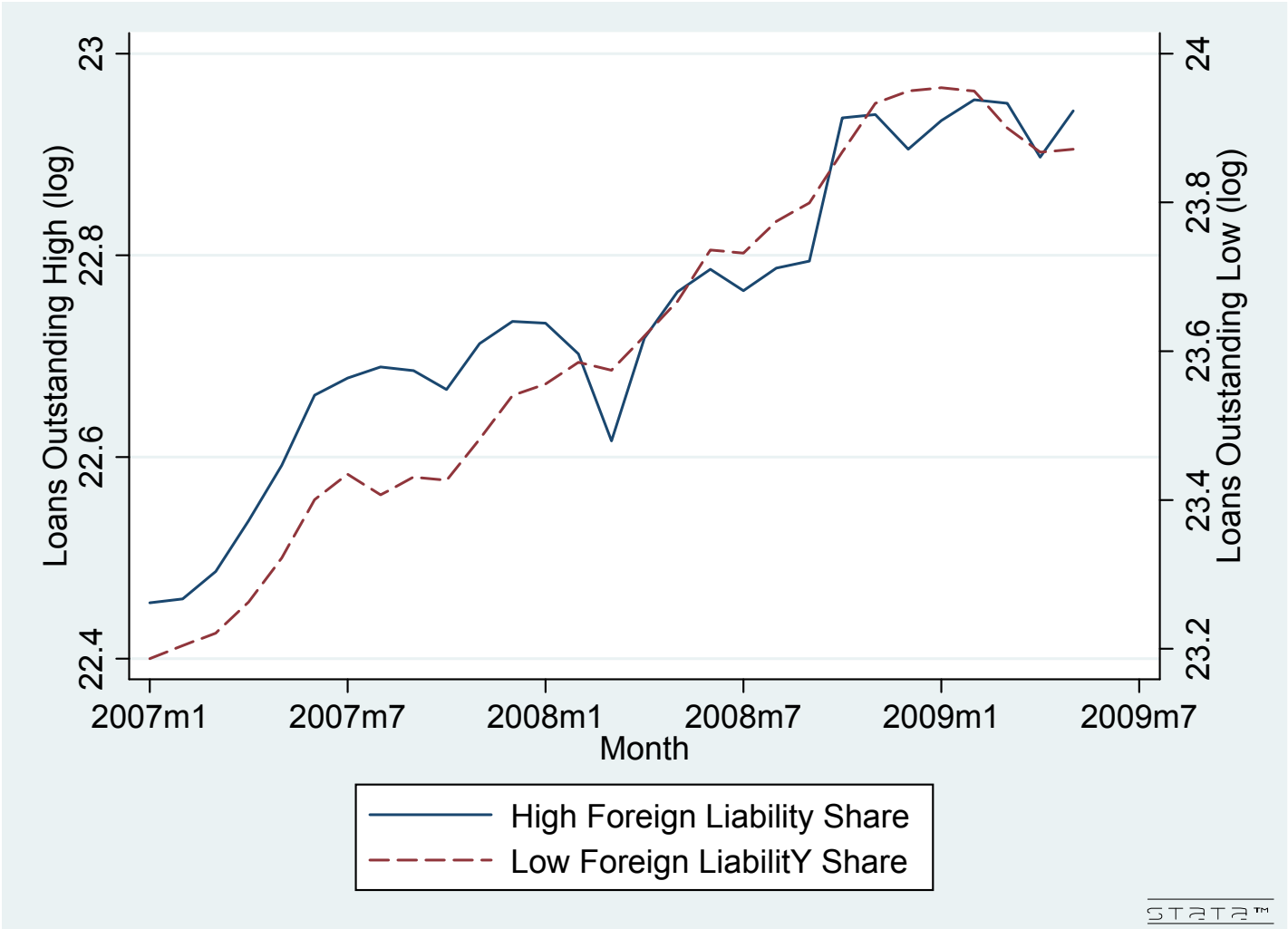
Financing shock



Source: Bank financial statements and credit registry, Superintendencia de Bancos y Seguros de Peru, and SUNAT. Banks with high (low) foreign liability share are those with fraction of foreign liabilities to assets above (below) 9.5% in January-June 2008.

Financial constraints and the intensive margins of export

Dependent Variable:	$\Delta \ln C_i$	$\Delta \ln Vol_{ipd}$			$\Delta \ln FOB_{ipd}$		
	FS	RF	OLS	IV	RF	OLS	IV
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel 1: Products defined at 4-digit HS							
Dummy Affected: $> 50\%$	-0.561***	-0.127**			-0.144**		
	(0.192)	(0.058)			(0.062)		
$\Delta \ln C_i$			0.025	0.227***		0.035*	0.257***
			(0.018)	(0.068)		(0.020)	(0.060)
Product-Destination FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# Product-Destinations	5,997	5,997	5,997	5,997	5,997	5,997	5,997
Observations	14,208	14,208	14,209	14,210	14,210	14,210	14,210
R^2	0.360	0.438	0.438		0.437	0.437	
Panel 2: Products defined at 6-digit HS							
Dummy Affected: $> 50\%$	-0.636**	-0.133*			-0.155**		
	(0.250)	(0.071)			(0.076)		
$\Delta \ln C_i$			0.029	0.209***		0.044**	0.249***
			(0.019)	(0.060)		(0.021)	(0.058)
Product-Destination FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# Product-Destinations	8,567	8,567	8,567	8,567	8,567	8,567	8,567
Observations	16,472	16,472	16,472	16,472	16,472	16,472	16,472
R^2	0.447	0.529	0.528		0.525	0.524	

Estimation of equation (6). In the IV regression, the change in (log of) credit, $\Delta \ln C_i$, is instrumented with F_i, a dummy that takes value 1 if the firm borrows more than 50% from an affected bank. Standard errors clustered at the product-destination level in parenthesis. $^{***}p < 0.01$, $^{**}p < 0.05$, and $^{*}p < 0.1$

Table 5: Export Elasticity to Credit Shocks: Intensive Margin

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Beyond firm-level evidence

- Most evidence so far have been based on firm-level evidence.
- **Growth and Finance** literature. Objective: empirical link between development of financial sector and macro outcome (e.g. growth).
- First pass: cross-country regressions. E.g. King and Levine [1993].
- Obvious causality issue: growth $\longrightarrow$ financial development?
- Obvious omited variable bias. $\longrightarrow$ Need to find right granularity.

TABLE VIII

GROWTH AND INITIAL FINANCIAL DEPTH: 1960–1989

Independent variable	(1)	(2)	(3)	(4)
c	0.042***	0.035***	0.033***	0.035***
	(0.005)	(0.007)	(0.009)	(0.010)
LYO	−0.014***	−0.016***	−0.016***	−0.014***
	(0.003)	(0.003)	(0.003)	(0.003)
LSEC	0.013***	0.013***	0.013***	0.010***
	(0.002)	(0.002)	(0.002)	(0.003)
GOV in 1960		0.070*	0.072*	0.044
		(0.035)	(0.036)	(0.040)
PI in 1960		0.037	0.032	0.040
		(0.031)	(0.033)	(0.033)
TRD in 1960		−0.003	−0.004	0.001
		(0.006)	(0.006)	(0.001)
Index of civil liberties			0.001	0.001
			(0.002)	(0.002)
Number of revolutions			−0.010	−0.010
			(0.009)	(0.009)
Number of assassinations			−0.001	0.001
			(0.004)	(0.003)
Sub-Saharan Africa dummy				−0.011
				(0.007)
Latin American dummy				−0.010*
				(0.005)
LLY in 1960	0.030***	0.028***	0.028***	0.020**
	(0.007)	(0.007)	(0.008)	(0.009)
R^2	0.57	0.61	0.63	0.66

(standard errors in parentheses)

Dependent variable: *GYP* − Real per capita GDP growth, 1960–1989.
Observations: 57
* significant at 0.10 level, ** significant at 0.05 level, *** significant at 0.01 level.
LYO = log of initial real per capita GDP in 1960, *LSEC* = log of secondary school enrollment rate in 1960, *GOV* = government consumption/GDP, *PI* = inflation rate, *TRD* = (imports & exports)/GDP.

Financial depth in 1960

If BANK in Zaire in 1970 goes from 26% to 57% (mean sample value), growth rate in Zaire .9% larger. By 1980, real GDP/ capita $\sim$ 9% larger than realized.

Industry-level/Cross Country Approach

- Rajan and Zingales [1998] looks at industry-level data around the world.
- Assumptions:
  1. Cross-industry heterogeneity in demand for outside finance. Driven by technology (growing vs. mature industry). Proxy by using ratio of outside finance used to fund investment at the industry level **in the US** during the 80s.
  2. Cross-country heterogeneity in financial development. Proxy by using size of stock market and lending market or accounting standards.
- Hypothesis: Industries that rely more on outside finance should have lower growth in countries with low financial development.

$$\underbrace{\frac{\Delta VA}{VA}_{jc}}_{\text{growth in VA in 80s}} = \alpha_j + \delta_c + \mu \underbrace{EF_j}_{\text{Financial dependence}} \times \underbrace{FD_c}_{\text{Financial Development}} + \epsilon_{jc}$$

Illustration

TABLE 5—EFFECT OF FINANCIAL DEVELOPMENT ON ACTUAL GROWTH RATES IN DIFFERENT INDUSTRIES

	Countries below the median in accounting standards	Countries above the median in accounting standards
Least financially dependent industries		
Tobacco	0.53	−0.60
Pottery	0.25	−0.30
Leather	0.77	−0.77
Most financially dependent industries		
Drug	−1.11	1.30
Plastics	−0.21	0.21
Computers	−2.00	1.80

Notes: This table reports the mean residual growth rate (in percentage terms) obtained after regressing the annual compounded growth rate in real value added for the period 1980–1990 on industry and country dummies.

- Regression analysis: Moving from 25^{th} to 75^{th} percentile of financial development & financial dependence increases annual growth rate by 1 ppt.

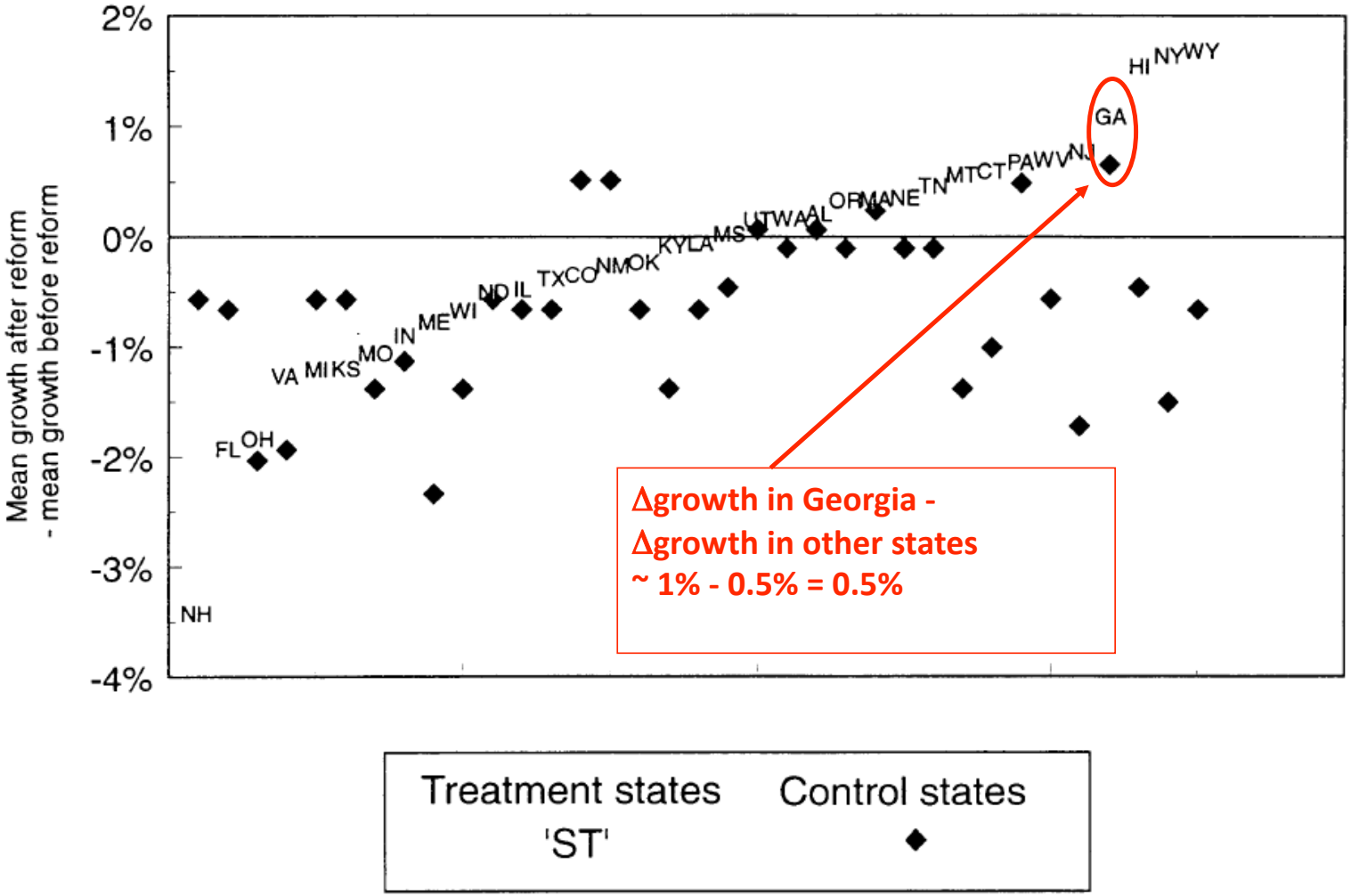
US State-level evidence

- Jayaratne and Strahan [1996] use banking deregulation in US states – staggered in the 70's & 80's – as a > 0 shock to financial development.
- Deregulation allows banks to (1) establish new branches (2) acquire out-of-states banks. Interpretation: significant increase in local competition and takeover threat.
- Simple diff-in-diff strategy: compare growth rate of states after vs. before deregulation relative to states that did not deregulate.

$$\left(\frac{\Delta y}{y}\right)_{it} = \alpha_i + \delta_t + \beta \mathbb{I}_{t>reformdate} + [\gamma_{r,t}] + \epsilon_{it}$$

- Annual growth rates increase by ~ 1 ppt following deregulation.
- Caveats: endogeneity of timing of reforms;

Branching deregulation and state-level growth



Interpretation

- Interpretation: better allocation of capital – fraction of non-performing loans go down in the data by .5/1ppt on a 2% sample mean.
- Deregulation fosters entry of new firms: Cetorelli and Strahan [2006].
  - Especially in industries which depends more on bank finance (cf. Rajan and Zingales [1998])
  - Marginal firm is smaller.

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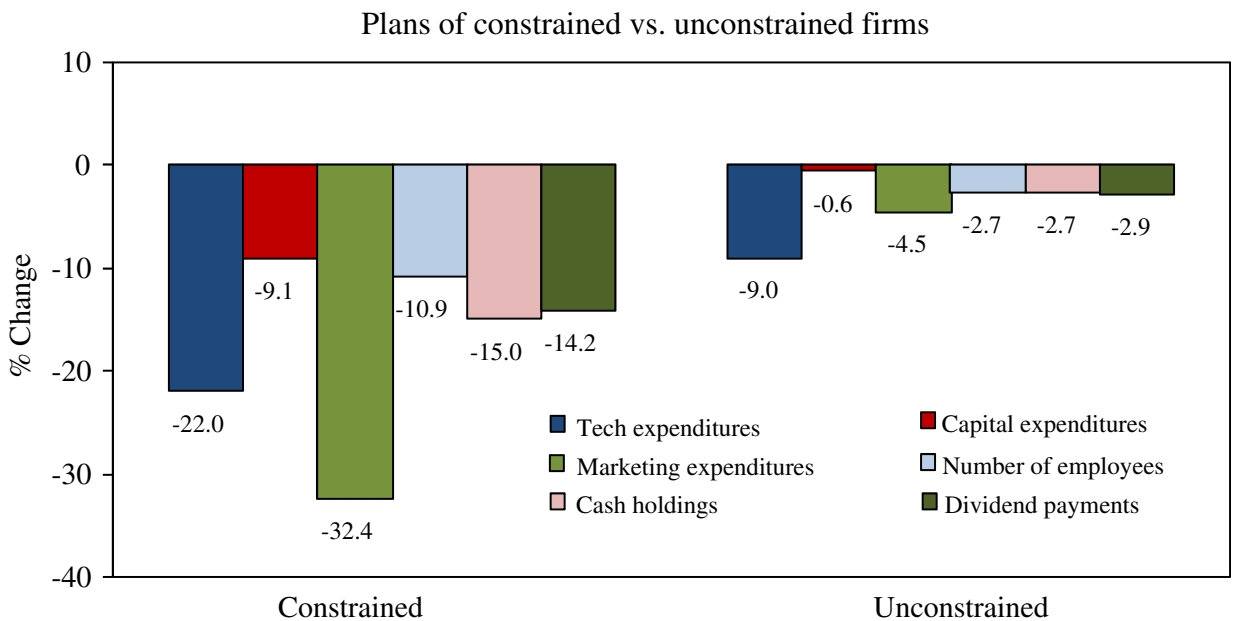
Other empirical approaches on credit frictions (1)

- Large body of survey evidence, best exemplified by Campello et al. [2010].
- 1,500 multinational firms asked during the financial crisis whether operations affected by credit availability.
- Response largely confirmed by actual data.



Other empirical approaches on credit frictions (2)

- Many public policies aim at reducing credit frictions: credit guarantee & subsidized loans. (SBA in the US).
- Clean evaluation of these policies often suggest they have significant effect on firms' investment.
  - Lelarge et al. [2010] use variations in eligibility rule for a guaranteed loan program in France and show that guaranteed loans allow firms to grow more but increase risk-taking (consistent with the existence of ex ante credit constraints).
  - Banerjee and Duflo [2004] use variations in eligibility rule for a targeted lending program in India and show that greater bank credit availability increases eligible firms' output.

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Conclusion

- Vast literature on the empirics of credit constraints. Very difficult task: disentangling supply vs. demand or investment opportunities vs. financing shocks.
- Despite 25 years of research, no smoking gun. But an important number of papers converge toward same conclusion that finance matters, both at the micro- and the macro-level.
- Literature poor on theoretical insights. What model of credit frictions should we use, based on empirical evidence?
  - Moral hazard vs. adverse selection? Welfare implications are very different (over-investment vs. under-investment).
  - Evidence on role of collateral suggests limited commitment (and inalienability of human capital) is important. Hart and Moore [1994] may be a good starting point.
- Important that macro- and empirical micro- research communicate more – what elasticities should we be looking for in the data?

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