Economics 210c/236a
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LECTURE 9

The Effects of Credit Contraction: Credit Market Disruptions

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I. Overview and General Issues

Effects of Credit

- Balance-sheet and cash-flow effects.
- The effects of financial crises (using mainly aggregate time-series evidence).
- The effects of credit disruptions (using mainly micro cross-section evidence).

II. Peek and Rosengren, "Collateral Damage: Effects of the Japanese Bank Crisis on Real Activity in the United States"

Peek and Rosengren's Natural Experiment

- Financial crisis in Japan causes trouble for banks in U.S. related to Japanese banks (such as U.S. branches of Japanese banks).
- Decline in loans by U.S. branches of Japanese banks are almost surely caused by a decline in loan supply not loan demand.

Evaluation of the Natural Experiment

- What is their key assumption?
    - Japan's troubles didn't affect loan supply of American banks.
- What is the importance of the fact that there is large regional variation in the commercial real estate market?
- Other things going on in the U.S. at the same time. Could this cause problems?

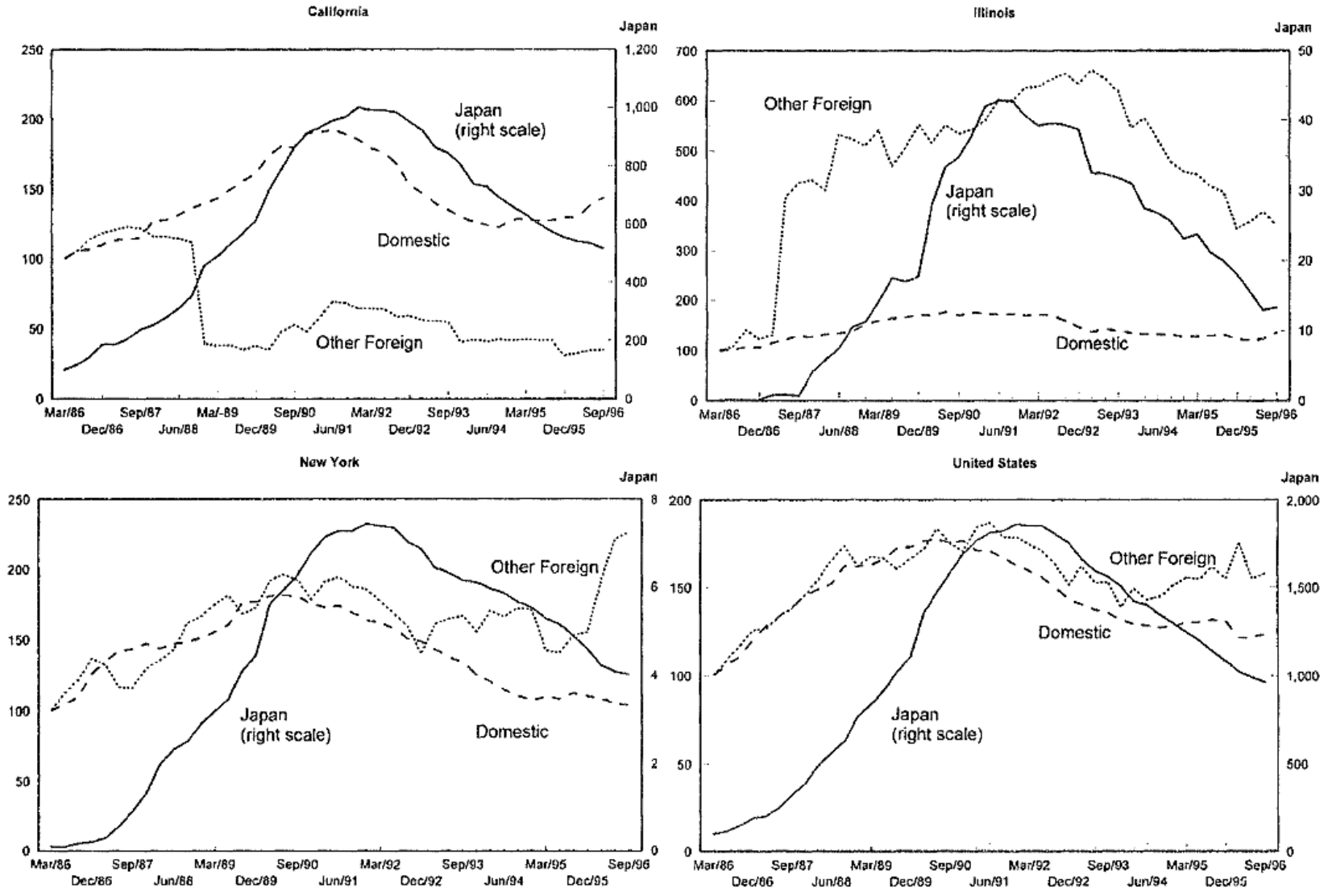

FIGURE 1. COMMERCIAL REAL ESTATE LOANS

Notes: Data are indexed, with March 1986 = 100. For Illinois and New York, the right-hand-side scale is in thousands.

Transmission of Japanese Shocks to U.S. Commercial Real Estate Lending

- Panel data on all domestically-owned commercial banks headquartered in one of the three states and Japanese bank branches.
- Data are semiannual.
- Dependent variable is change in total commercial real estate loans/beginning period assets held by bank in that state.

Testing Whether Conditions at a Japanese Parent Bank Affect Lending

$$(1)\quad \frac{\Delta Loans_{i,j,t}}{Assets_{i,j,t-1}} = \beta_0 + \beta_1 \mathbf{JPARENT}_{i,j,t-1} + \beta_2 \mathbf{JAPAN}_{i,j,t-1} + \beta_3 \mathbf{US}_{i,j,t-1} + \varepsilon_{i,j,t}.$$

TABLE 1—COMMERCIAL REAL ESTATE LENDING BY U.S. COMMERCIAL BANKS AND U.S. BRANCHES OF JAPANESE BANKS, SEMIANNUAL OBSERVATIONS, 1989:1 TO 1996:2
ESTIMATION METHOD: VARIANCE COMPONENTS

	Combined states[a]	New York[b]	California[b]	Illinois[b]
Risk-based capital ratio at Japanese parent	0.335**	0.302*	0.168	0.617*
	(0.113)	(0.120)	(0.235)	(0.251)
Nonperforming loan ratio at Japanese parent	−0.840**	−0.489**	−1.437**	−0.456
	(0.132)	(0.141)	(0.274)	(0.252)
Nonperforming loans availability dummy	−0.432	−0.539	0.144	−1.012
	(0.529)	(0.622)	(1.130)	(0.852)
Japanese dummy	−1.593	−2.087	0.898	−5.209*
	(1.117)	(1.236)	(2.314)	(2.285)
Japanese foreign direct investment growth	0.025**	0.017*	0.026*	0.038**
	(0.006)	(0.008)	(0.013)	(0.009)
U.S. risk-based capital ratio	0.007	−0.046	0.045	−0.029
	(0.020)	(0.031)	(0.032)	(0.034)
U.S. nonperforming commercial real estate loan ratio	−0.414**	−0.438**	−0.476**	−0.266**
	(0.047)	(0.075)	(0.087)	(0.063)
Log (assets)	−0.142	−0.055	−0.334*	−0.132
	(0.082)	(0.095)	(0.169)	(0.104)
U.S. loans-to-assets ratio	0.007	0.002	0.019	0.009
	(0.006)	(0.008)	(0.015)	(0.009)
Sum of squared residuals	16,108	2,671	10,704	2,495
Standard error of the regression	2.991	2.241	3.970	2.092
R^2	0.309	0.310	0.348	0.174
Hausman test p-value	1.000	1.000	0.999	0.265
Number of observations	2,026	607	764	655

Note: Coefficient standard errors are in parentheses.

Real Effects of Declines in Japanese Commercial Real Estate Lending

- Data are now state level (but have expanded to 25 states).
- Data are still semiannual.
- Dependent variable is semiannual change in construction in the state.

Testing Whether Lending Shocks Affect Real Construction Activity

$$(2) \quad CONSTR_j = \alpha_0 + \alpha_1 \mathbf{BANK}_j + \alpha_2 \mathbf{STATE}_j + \alpha_3 \mathbf{NATIONAL} + \eta_j.$$

Bank includes two variables:

- Contemporaneous change in CRE loans held by branches of Japanese banks
- NPL for all banks in the state

Methodology

- TSLS
- Instrument for change in commercial real estate loans by Japanese banks with state-level measure of health of parent banks.
- Also use change in land prices in Japan as instrument.

TABLE 3—COMMERCIAL REAL ESTATE LENDING BY JAPANESE AND NON-JAPANESE BANKS
ESTIMATION METHOD: ORDINARY LEAST SQUARES, 1989:2 TO 1996:2

	Japanese lending	Non-Japanese lending
Excluded exogenous variables		
Risk-based capital ratio Japanese parent$_{-1}$	81.882*	117.631
	(32.783)	(67.489)
Risk-based capital ratio Japanese parent$_{-2}$	99.297**	−103.071
	(29.363)	(66.242)
Nonperforming loan ratio at Japanese parent$_{-1}$	17.170	−177.435
	(30.247)	(169.992)
Nonperforming loan ratio at Japanese parent$_{-2}$	−33.842	247.687
	(25.599)	(194.375)
Nonperforming loans availability dummy$_{-1}$	−14.081	603.579
	(63.272)	(424.340)
Nonperforming loans availability dummy$_{-2}$	−86.744	−660.400
	(57.784)	(468.004)
Change in land prices$_{-1}$	−4.921	−3.554
	(2.647)	(7.565)
Change in land prices$_{-2}$	9.114**	7.029
	(2.773)	(8.295)
Growth in real personal income per capita$_{-1}$	−2.764	13.956
	(2.102)	(9.145)
Growth in real personal income per capita$_{-2}$	−4.930*	14.276
	(2.047)	(7.588)
Mortgage rate$_{-1}$	2.115	86.885
	(11.180)	(70.030)
Mortgage rate$_{-2}$	11.546	−65.487
	(10.606)	(45.082)
Inflation rate$_{-1}$	2.218	−38.043
	(5.513)	(34.576)
Inflation rate$_{-2}$	−11.236	−2.430
	(7.435)	(34.574)
Consumer confidence index$_{-1}$	−3.452**	2.474
	(0.933)	(5.120)
Consumer confidence index$_{-2}$	−3.419**	1.733
	(1.004)	(5.019)
R^2	0.648	0.431
Sum of squared residuals	2,186,730	55,789,200
Standard error of the regression	81.901	413.682
Partial R^2 for excluded exogenous variables	0.368	0.056
F-statistic for set of excluded exogenous variables	41.75**	1.09
n	375	375

TABLE 4—THE DETERMINANTS OF REAL ESTATE CONSTRUCTION CONTRACTS AND EMPLOYMENT GROWTH
ESTIMATION METHOD: TWO-STAGE LEAST SQUARES, 1989:2 TO 1996:2

	Number of construction projects	Square feet of construction projects	Real value of construction projects	State construction employment growth
Change in commercial real estate loans by Japanese banks	0.005**	0.015**	1.113**	0.007**
	(0.002)	(0.005)	(0.365)	(0.002)
Nonperforming commercial real estate loan ratio$_{-1}$	0.048	0.148	28.254	−0.316
	(0.124)	(0.368)	(22.278)	(0.165)
Nonperforming commercial real estate loan ratio$_{-2}$	−0.077	−0.321	−38.976	0.331
	(0.118)	(0.355)	(24.017)	(0.172)
Vacancy rate$_{-1}$	0.013	−0.035	−1.186	0.076
	(0.072)	(0.248)	(16.776)	(0.084)
Vacancy rate$_{-2}$	−0.126	−0.387	−28.328	0.118
	(0.075)	(0.233)	(18.492)	(0.082)
Unemployment rate$_{-1}$	0.576*	1.776*	61.486	−0.190
	(0.257)	(0.707)	(53.028)	(0.327)
Unemployment rate$_{-2}$	0.003	−0.450	−48.808	1.171**
	(0.218)	(0.593)	(46.296)	(0.275)
...				

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Change in commercial real estate loans by Japanese banks	0.005**	0.015**	1.113**	0.007**
	(0.002)	(0.005)	(0.365)	(0.002)

Interpreting the coefficient:

The 1.113 in column (3) implies that a decline in loans by Japanese banks in a state of $100 lowers the real value of construction projects in that state by $111.30.

Evaluation

III. Chodorow-Reich, "The Effect of Credit Market Disruptions: Firm-Level Evidence from the 2008-09 Financial Crisis"

Big Picture

- Measuring the impact of credit disruption on employment.
- 2008-09 financial crisis is used (somewhat) as a natural experiment.
- What sets the paper apart is firm-level data on credit and employment.
- Finds substantial effects of credit disruption on both lending and employment.

Relation to Literature

- Similar in spirit to Peek and Rosengren, but looking at firm-level outcomes (not state employment outcomes).
- Ivashina and Scharfstein look at lending outcomes by banks (so only about 40 observations), not firms. Nothing on employment effects.
- Greenstone and Mas look at employment and small business lending at the county level.

Relationship Lending

- Important starting point is that firms tend to be attached to particular financial institutions.
- Syndicated loan market.
- Testing for a relationship:

$$
\begin{aligned}
Lead_{b,i} = {} & \alpha_b + \gamma_1 [Previous\ lead_{b,i}] \\
& + \gamma_2 [Previous\ participant_{b,i}] \\
& + \gamma_3 [Previous\ lead_{b,i}\ X\ Public\ (Unrated)] \\
& + \gamma_4 [Previous\ lead_{b,i}\ X\ Rated] + \epsilon_{b,i}, \qquad (1)
\end{aligned}
$$

where $Lead_{b,i} = 1$ if bank b serves as the lead bank for borrower i, and $Previous\ lead_{b,i} = 1$ if bank b served as the lead bank for i's previous loan. The estimated value of γ_1 is 0.71.

TABLE I

BANKING RELATIONSHIP REGRESSIONS

	(1) Lender chosen as lead	(2) Lender chosen as lead	(3) Lender chosen as participant	(4) Lender chosen as participant
Explanatory variables				
Previous lead	0.71**	0.67**	0.022**	-0.023**
	(0.011)	(0.012)	(0.0040)	(0.0045)
Previous participant	0.029**	0.020**	0.50**	0.46**
	(0.0014)	(0.0015)	(0.011)	(0.011)
Previous lead × Public (Unrated)	−0.052**	−0.043*		
	(0.016)	(0.017)		
Previous lead × Public (Rated)	−0.058**	−0.086**		
	(0.014)	(0.016)		
Previous participant × Public (Unrated)			0.039*	0.033+
			(0.018)	(0.018)
Previous participant × Public (Rated)			0.012	−0.038*
			(0.014)	(0.015)
Lender FE	Yes	Yes	Yes	Yes
2-digit SIC × lender FE	No	Yes	No	Yes
State × lender FE	No	Yes	No	Yes
Year × lender FE	No	Yes	No	Yes
Public/private × lender FE	No	Yes	No	Yes
All in drawn quartile × lender FE	No	Yes	No	Yes
Sales quartile × lender FE	No	Yes	No	Yes
R^2	0.480	0.504	0.285	0.334
Borrower clusters	3,253	3,253	3,253	3,253
Observations	349,008	349,008	349,008	349,008

Notes. The dependent variable is an indicator for whether the lender serves in the role indicated in the table header. For each loan in which the borrower has previous accessed the syndicated market, the

From: Chodorow-Reich, "The Employment Effects of Credit Market Disruptions"

Data

- Individual loan data from Dealscan.
- Bank characteristics from Federal Reserve reports, Bankscope (for foreign lenders), and CRSP (stock prices).
- Individual firm employment data from BLS Longitudinal Database (LBD).
- Merge loan and employment data (hard!).

TABLE II

SAMPLE SUMMARY STATISTICS

	N	Mean	Std. Dev.	p10	p50	p90
			Panel A: Firm variables			
Loan size (millions of 2005 dollars)						
All lenders	4,791	287	530	23	119	693
Top 43 lenders	4,391	302	542	26	129	720
Merged Dealscan-LDB	2,040	305	544	27	131	703
Sales at close (millions of 2005 dollars)						
All lenders	3,954	1,836	4,059	53	433	4,661
Top 43 lenders	3,623	1,928	4,149	60	478	4,869
Merged Dealscan-LDB	1,721	2,024	4,310	68	551	4,813
Employment growth rate, 2008:3–2009:3	2,040	−0.09	0.23	−0.29	−0.06	0.08
2008 employment level	2,040	2,985	9,993	77	620	6,128
			Panel B: Bank variables			
%Δ number of loans	43	−52.4	29.3	−87.4	−58.8	−7.5
Lehman cosyndication exposure (%)	42	1.15	1.20	0.34	0.72	1.91
ABX exposure	40	1.16	0.46	0.71	1.07	1.77
2007–8 trading revenue/assets (%)	42	−0.08	0.62	−0.72	0.01	0.39
2007–8 real estate net charge-offs/assets (%)	21	0.24	0.23	0.04	0.18	0.49
2007 deposits/assets (%)	43	42.2	25.4	3.0	47.4	68.2

From: Chodorow-Reich, "The Employment Effects of Credit Market Disruptions"

Identification

$$g_{i,s}^{y} = f\left(L_{i,s}, X_i, U_i, \epsilon_i\right). \quad (2)$$

$g_{i,s}^{y}$ is employment growth at firm i, related to bank s

$L_{i,s}$ is an indicator for whether firm i receives a loan from bank s

X_i are observable firm characteristics

U_i are unobservable firm characteristics

$$L_{i,s} = h\left(R_s, X_i, U_i, \eta_i\right). \quad (3)$$

R_s is the internal cost of funds at bank s

If we knew R_s we could regress employment growth on whether the firm got a loan, instrumenting with R_s.

For this to work, it is essential that R_s be uncorrelated with U_i.

Problems with this Approach

- Don't observe R_S.
- Other characteristics of loans besides whether firm got one matter (for example, the interest rate and other terms).
- So Chodorow-Reich considers the reduced form:

$$g_{i,s}^{y} = g\left(M_s, X_i, U_i, \epsilon_i, \eta_i\right). \qquad (4)$$

where M_S is a measure of loan supply.

How does the idea of the financial crisis as a natural experiment enter the analysis?

- In that period, it is likely that M_S and U_i are relatively uncorrelated.
- Problems leading to the crisis did not involve the corporate loan portfolio.

What is Chodorow-Reich's measure of M_S?

- Percent change in the number of loans to other firms between the periods October 2005 to June 2007 and October 2008 and June 2009.

- Is this a good measure? Other options?

M_S is not a perfect measure of loan supply, so C-R instruments with:

- Exposure to Lehman Brothers
- ABX Exposure
- Bank statement items (2007-08 trading revenue/assets; real estate charge-offs flag, etc.)

TABLE III

DETERMINANTS OF BANK LENDING

	(1)	(2)	(3)
	Change in lending during the crisis		
Explanatory variables			
Lehman cosyndication exposure	−0.14**		
	(0.049)		
ABX exposure		−0.11*	
		(0.041)	
2007–8 trading revenue/assets			0.046
			(0.040)
Real estate charge-offs flag			0.012
			(0.050)
2007–8 real estate net charge-offs/assets			−0.092+
			(0.051)
2007 Bank Deposits/Assets			0.19**
			(0.059)
Joint test p-value	0.008	0.013	0.002
R^2	0.16	0.15	0.35
Observations	42	40	42

Notes. The dependent variable is the change in the annualized number of loans made by the bank between the periods October 2005 to June 2007 and October 2008 to June 2009, with each loan scaled by the importance of the lender in the loan syndicate as described in Section IV.C of the text. Observations

From: Chodorow-Reich, "The Employment Effects of Credit Market Disruptions"

Also include firm characteristics:

- Industry
- State
- Employment change in county
- Interest rate spread over Libor charged on last pre-crisis loan
- Nonpublic; public w/o access to bond market; public with access to bond market

Testing Whether Measure of Lender Health is Uncorrelated with Unobserved Firm Characteristics:

- Khwaja and Mian (2008)
- Limit sample to firms that got a loan during the crisis and had multiple lenders before crisis.
- Regress change in lending in each borrower-lender pair during the crisis on the bank health measure and a full set of borrower fixed effects.
- See if results are different from same regression leaving out the borrower fixed effects.

TABLE V

TESTING FOR UNOBSERVED CHARACTERISTICS OF BORROWERS

	(1)	(2)
	Δ Log (lending in borrower-lender pair)	
Explanatory variables		
%Δ loans to other borrowers ($\Delta\tilde{L}_i$)	1.05**	1.07**
	(0.33)	(0.32)
1-digit SIC, loan year FE	No	Yes
Bond market access/public/private FE	No	Yes
Additional Dealscan controls	No	Yes
Borrower FE	Yes	No
R^2	0.423	0.088
Borrowers	432	432
Banks	43	43
Observations	2,005	2,005

Notes. The sample contains only borrowers that signed a new loan between October 2008 and June 2009. The sample contains one observation per member of the borrower's last precrisis syndicate. The dependent variable is the log change in the dollar amount of lending from that lender to the borrower. The variable $\Delta\tilde{L}_i$ equals the change in the annualized number of loans made by the bank between the periods October 2005 to June 2007 and October 2008 to June 2009, and has been normalized to have unit variance. Estimation is via OLS. Standard errors in parentheses and clustered by the precrisis lender (column

From: Chodorow-Reich, "The Employment Effects of Credit Market Disruptions"

Loan Market Outcomes

- Specification:

$$P\left(Borrow_{i,s}=1\right) = G\left(\pi_0+\pi_1\Delta\tilde{L}_{i,s}+\gamma X_i+\eta_{i,s}\right), \quad (7)$$

- Can think of this as a 1st stage (but it's not).

Loan Market Outcomes

- Sample Period: October 2008-June 2009

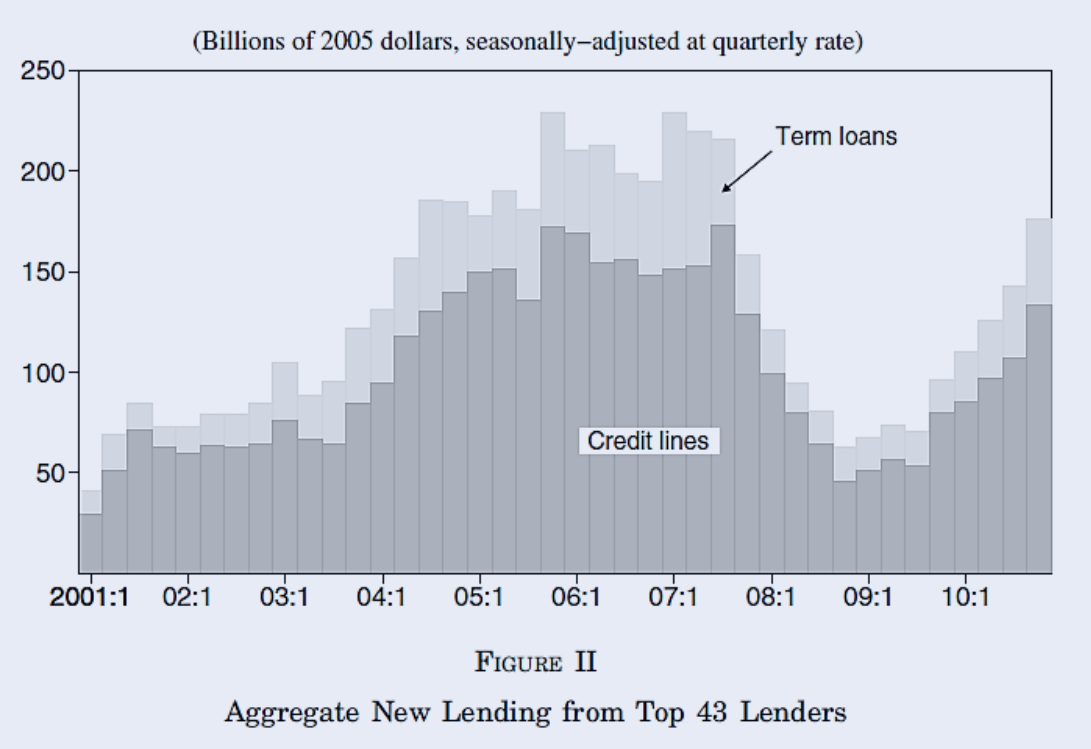

FIGURE II

Aggregate New Lending from Top 43 Lenders

- Uses full Dealscan sample (4000+ observations)

TABLE VI

THE EFFECT OF BANK HEALTH ON THE LIKELIHOOD OF OBTAINING A LOAN

	(1)	(2)	(3)	(4)	(5)	(6)
	Firm obtains a new loan or positive modification					
	Probit		$\Delta\tilde{L}_{i,s}$ instrumented using			
			Lehman exposure	ABX exposure	Bank statement items	All
Explanatory variables						
%Δ loans to other firms ($\Delta\tilde{L}_{i,s}$)	2.19**	2.00**	3.65**	2.33*	2.28**	2.32**
	(0.79)	(0.53)	(1.28)	(1.12)	(0.64)	(0.63)
2-digit SIC, state, loan year FE	No	Yes	Yes	Yes	Yes	Yes
Bond access/public/private FE	No	Yes	Yes	Yes	Yes	Yes
Additional Dealscan controls	No	Yes	Yes	Yes	Yes	Yes
First stage F-statistic			14.0	8.2	18.2	19.8
J-statistic p-value			.	.	.	0.206
$E[borrow]$	0.134	0.134	0.134	0.134	0.134	0.134
$E[\widehat{borrow}:\Delta\tilde{L}_{p90} - \Delta\tilde{L}_{p10}]$	0.052	0.048	0.087	0.055	0.054	0.055
Lead lender 1 clusters	43	43	43	40	43	40
Lead lender 2 clusters	43	43	43	40	43	40
Observations	4,391	4,391	4,391	4,354	4,391	4,354

From: Chodorow-Reich, "The Employment Effects of Credit Market Disruptions"

Employment Outcomes

- Specification:

$$g^{y}_{i,s,t-k,t} = \beta_0 + \beta_1 \Delta \tilde{L}_{i,s} + \gamma X_i + \epsilon_{i,s,t-k,t}. \qquad (10)$$

- Estimating the reduced form.

- Now using just the matched sample (so that he knows what bank the firm is attached to).

Many More Firm-level Controls:

- Dependent variable for 2 yrs. before the crisis.
- Average change in employment in the county where the firm operates.
- Fixed effect for 3 size bins.
- Fixed effect for 3 bond access bins.
- Firm age.

TABLE IX

THE EFFECT OF LENDER CREDIT SUPPLY ON EMPLOYMENT

	(1)	(2)	(3)	(4)	(5)	(6)
	Employment growth rate 2008:3–2009:3					
	OLS		$\Delta\tilde{L}_{i,s}$ instrumented using			
			Lehman exposure	ABX exposure	Bank statement items	All
Explanatory variables						
%Δ loans to other firms ($\Delta\tilde{L}_{i,s}$)	1.17*	1.67**	2.49*	3.17*	2.13*	2.38**
	(0.58)	(0.61)	(1.00)	(1.35)	(0.88)	(0.77)
Lagged employment growth		0.0033	0.0039	0.0045	0.0036	0.0039
		(0.019)	(0.019)	(0.019)	(0.019)	(0.019)
Emp. change in firm's county		0.89*	0.85+	0.86+	0.87+	0.89+
		(0.43)	(0.46)	(0.48)	(0.45)	(0.46)
2-digit SIC, state, loan year FE	No	Yes	Yes	Yes	Yes	Yes
Firm size bin FE	No	Yes	Yes	Yes	Yes	Yes
Firm age bin FE	No	Yes	Yes	Yes	Yes	Yes
Bond access/public/private FE	No	Yes	Yes	Yes	Yes	Yes
Additional Dealscan controls	No	Yes	Yes	Yes	Yes	Yes
First-stage F-statistic			15.5	8.5	18.5	23.1
J-statistic p-value			.	.	.	0.190
$E[g_j^y]$	−0.092	−0.092	−0.092	−0.093	−0.092	−0.093
$E[\hat{g}_j^y: \Delta\tilde{L}_{p90} - \Delta\tilde{L}_{p10}]$	0.027	0.039	0.058	0.074	0.050	0.055
Lead lender 1 clusters	43	43	43	40	43	40
Lead lender 2 clusters	43	43	43	40	43	40
Observations	2,040	2,040	2,040	2,015	2,040	2,015

From: Chodorow-Reich, "The Employment Effects of Credit Market Disruptions"

Heterogeneous Treatment Effects:

- Interact loan supply variable with size and bond-market access.

$$\begin{aligned} g^{y}_{i,s,t-k,t} &= \beta_0 + \beta_{1,small}\left[\Delta\tilde{L}_{i,s} * Small\right] + \beta_{1,med}\left[\Delta\tilde{L}_{i,s} * Medium\right] + \beta_{1,large}\left[\Delta\tilde{L}_{i,s} * Large\right] \\ &+ \gamma X_i + \epsilon_{i,s,t-k,t}; \end{aligned} \tag{11}$$

$$\begin{aligned} g^{y}_{i,s,t-k,t} &= \beta_0 + \beta_{1,bond\,access}\left[\Delta\tilde{L}_{i,s} * bond\,market\,access\right] \\ &+ \beta_{1,no\,access}\left[\Delta\tilde{L}_{i,s} * no\,access\right] + \gamma X_i + \epsilon_{i,s,t-k,t}. \end{aligned} \tag{12}$$

TABLE X

THE EFFECT OF LENDER CREDIT SUPPLY ON EMPLOYMENT WITH HETEROGENEOUS TREATMENT EFFECTS

	(1)	(2)	(3)
	Employment growth rate 2008:3–2009:3		
Explanatory variables			
$\Delta\tilde{L}_{i,s}$ * Large	0.54		
	(0.97)		
$\Delta\tilde{L}_{i,s}$ * Medium	1.84+		
	(0.97)		
$\Delta\tilde{L}_{i,s}$ * Small	2.16**		
	(0.79)		
$\Delta\tilde{L}_{i,s}$ * Bond market access		1.04	
		(1.00)	
$\Delta\tilde{L}_{i,s}$ * No access		2.01**	
		(0.60)	
Lagged employment growth	Yes	Yes	Yes
Emp. change in firm's county	Yes	Yes	Yes
2-digit SIC, state, loan year FE	Yes	Yes	Yes
Firm size and age bin FE	Yes	Yes	Yes
Bond access/public/private FE	Yes	Yes	Yes
Additional Dealscan controls	Yes	Yes	Yes
Observations (Access & large)	483	483	483
Observations (Access & small/medium)	434	434	434
Observations (No access & large)	315	315	315
Observations (No access & small/medium)	808	808	808
Observations	2,040	2,040	2,040

From: Chodorow-Reich, "The Employment Effects of Credit Market Disruptions"

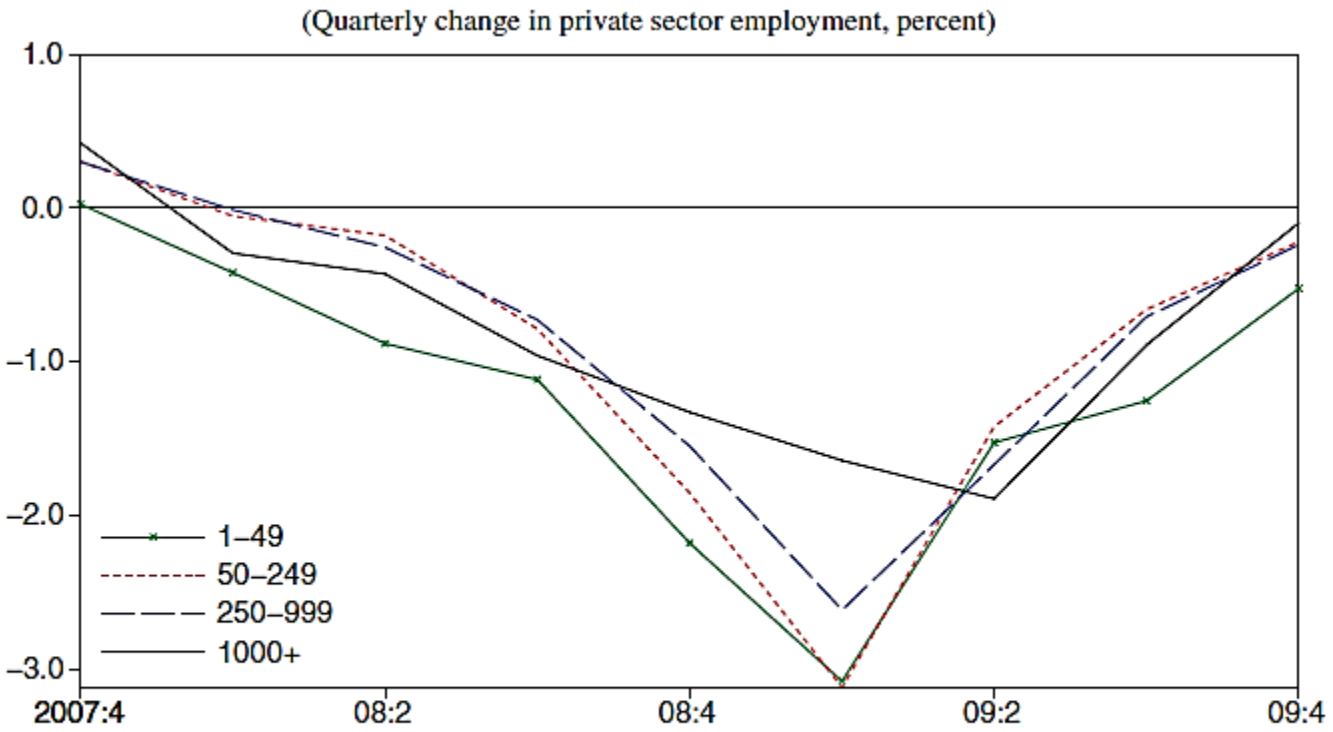

FIGURE III

Employment Losses by Firm Size

From: Chodorow-Reich, "The Employment Effects of Credit Market Disruptions"

Other Time Periods:

- 2007Q4 – 2008Q3
- 2008Q3 – 2010Q3

TABLE XI

THE EFFECT OF LENDER CREDIT SUPPLY ON EMPLOYMENT PRE-LEHMAN AND IN THE MEDIUM RUN

	(1)	(2)	(3)	(4)	(5)
	Employment growth rate				
	OLS	$\Delta\tilde{L}_{i,s}$ instrumented using			
		Lehman exposure	ABX exposure	Bank statement items	All
	Panel A: 2007:4–2008:3				
Explanatory variables					
%Δ loans to other firms ($\Delta\tilde{L}_{i,s}$)	0.55+		1.26		
	(0.31)		(0.81)		
Lagged employment growth	0.052**		0.053**		
	(0.015)		(0.015)		
Emp. change in firm's county	0.59+		0.52		
	(0.32)		(0.32)		
First-stage *F*-statistic			9.4		
Observations	1,895		1,872		
	Panel B: 2008:3–2010:3				
Explanatory variables					
%Δ loans to other firms ($\Delta\tilde{L}_{i,s}$)	1.94**	3.40**	5.18**	2.14*	2.67**
	(0.63)	(1.26)	(1.94)	(1.00)	(0.90)
Lagged employment growth	0.049**	0.051**	0.052**	0.050**	0.050**
	(0.018)	(0.018)	(0.017)	(0.017)	(0.017)
Emp. change in firm's county	−0.17	−0.21	−0.25	−0.17	−0.19
	(0.49)	(0.52)	(0.52)	(0.50)	(0.50)
First-stage *F*-statistic		15.4	8.4	18.5	23.0
Observations	2,013	2,013	1,988	2,013	1,988

What happens when C-R does 2SLS? (FN 46)

- That is, regress employment growth on whether a firm got a loan, instrumenting for loan outcome with a measure of bank health?
- Enormous effect.
- Possible explanations? Does this make you nervous?

Placebo Tests

- Use the same loan supply measure (that is from 2008-09)
- But change sample of dependent variable.
- Consider 2005Q2−2007Q2 and 2001Q3−2002Q3.

TABLE XII

THE EFFECT OF LENDER CREDIT SUPPLY ON EMPLOYMENT IN TWO PLACEBO PERIODS

	(1)	(2)	(3)	(4)	(5)
	Employment growth rate				
	OLS	$\Delta\tilde{L}_{i,s}$ instrumented using			
		Lehman exposure	ABX exposure	Bank statement items	All
	Panel A: 2005:2–2007:2				
Explanatory variables					
%Δ loans to other firms ($\Delta\tilde{L}_{i,s}$)	−0.19	−0.67	−1.57	1.63	0.92
	(0.74)	(1.63)	(1.72)	(1.24)	(1.15)
Lagged employment growth	0.028+	0.027+	0.028+	0.028+	0.028+
	(0.014)	(0.014)	(0.014)	(0.015)	(0.015)
Emp. change in firm's county	0.80	0.80	0.78	0.79	0.77
	(0.49)	(0.49)	(0.50)	(0.48)	(0.49)
First-stage *F*-statistic		15.6	8.8	18.9	23.8
Observations	1,879	1,879	1,854	1,879	1,854
	Panel B: 2001:3–2002:3				
Explanatory variables					
%Δ loans to other firms ($\Delta\tilde{L}_{i,s}$)	−0.80	−0.74	1.30	−0.93	−0.72
	(0.59)	(1.44)	(1.89)	(0.93)	(0.85)
Lagged employment growth	0.024	0.024	0.024	0.024	0.024
	(0.020)	(0.020)	(0.020)	(0.020)	(0.020)
Emp. change in firm's county	1.53**	1.53**	1.62**	1.53**	1.59**
	(0.51)	(0.50)	(0.51)	(0.51)	(0.50)
First-stage *F*-statistic		16.5	7.7	17.8	26.3
Observations	1,675	1,675	1,653	1,675	1,653

Aggregating the Effects

- First, consider within sample.
- Assume every firm faced the bank health of the lender in the τ'th percentile.

TABLE XIII

TOTAL EFFECT OF CREDIT AVAILABILITY AT SMALL AND MEDIUM FIRMS IN THE SAMPLE

	2008:3–2009:3 (%)
Total employment decline	7.0
Share of losses due to credit availability, $\tau = 90$	34.4
Share of losses due to credit availability, $\tau = 95$	47.3

Notes. The table reports the fraction of employment losses due to credit availability at small and medium firms, as described in the text. τ refers to the percentile of the lending syndicate identified as the most liberal syndicate.

Aggregating the Effects (Continued)

- To move to the population, need to consider that only 2/3 of employment decline came from firms with fewer than 1000 employees. So that decreases contribution of credit disruption.

- Also need to consider general equilibrium effects. Chodorow-Reich has a model to spell out the issues in an appendix.

Evaluation

IV. Schularick and Taylor, "Credit Booms Gone Bust: Monetary Policy, Leverage Cycles, and Financial Crises, 1870–2008"

Three Questions

- Are there long-run trends in money and credit?
- How have the responses of money and credit to financial crises changed over time?
- What role do credit and money play as a cause of financial crises?

Data

- 14 advanced countries, 1870-2008, annual data.
- Series:
  - Aggregate bank loans
  - Total balance sheet size of the banking sector (assets)
  - Narrow money (M0 or M1); broad money (M2 or M3)
  - Macro variables: real GDP, stock prices, I
- Sources?

Systemic financial crises (0-1- dummy)

1870-1872; 1874-1879; 1998-2013: Reinhart, Carmen M., and Kenneth S. Rogoff. 2009. “This Time Is different: Eight Centuries of Financial Folly.” Princeton, NJ: Princeton University Press.

1873: Dimsdale, Nicholas and Hotson, Anthony. 2014. “British Financial Crises Since 1825”. Oxford University Press 2014.

1880-1990; 1992-1997: Bordo, Michael D., Barry Eichengreen, Daniela Klingebiel, and Maria Soledad Martinez–Peria. 2001. “Is the Crisis Problem Growing More Severe?” Economic policy: A European Forum 32: 51–75.

1991: Bank of England, “Financial stability review, Issue Nº1, Autumn of 1996”

From: Jordà-Schularick-Taylor Macrohistory Database, Documentation

Stylized Bank Balance Sheet

Assets	Liabilities and Owners' Equity
Loans	Deposits
Securities	Bank Debt
Cash Reserves	Capital

Question 1: What are long-run trends in money and credit?

TABLE 1—ANNUAL SUMMARY STATISTICS BY PERIOD

	Pre-World War II			Post-World War II		
	N	Mean	SD	*N*	Mean	SD
Loans/money	665	0.4217	0.3582	831	0.5470	0.4239
Assets/money	617	0.7132	0.4453	828	1.0135	0.6688
Broad money/GDP	742	0.5343	0.2070	834	0.6458	0.2405
Loans/money	642	0.7581	0.4382	833	0.8380	0.4942
Assets/money	586	1.2790	0.5642	831	1.5758	0.7525
Δ log Real GDP	868	0.0148	0.0448	854	0.0270	0.0253
Δ log CPI	826	−0.0002	0.0568	852	0.0452	0.0396
Δ log Narrow money	787	0.0278	0.0789	825	0.0780	0.0717
Δ log Money	741	0.0365	0.0569	833	0.0857	0.0552
Δ log Loans	652	0.0416	0.0898	833	0.1094	0.0749
Δ log Assets	607	0.0433	0.0691	825	0.1048	0.0678
Δ log Loans/money	626	0.0017	0.0729	825	0.0222	0.0643
Δ log Assets/money	573	0.0043	0.0452	820	0.0182	0.0595

Notes: Money denotes broad money. Loans denote total bank loans. Assets denote total bank assets. The sample runs from 1870 to 2008. War and aftermath periods are excluded (1914–1919 and 1939–1947), as is the post-WW1 German crisis (1920–1925). The 14 countries in the sample are the United States, Canada, Australia, Denmark, France, Germany, Italy, Japan, the Netherlands, Norway, Spain, Sweden, Switzerland, and the United Kingdom.

How do Schularick and Taylor calculate trends?

That is, for any variable x_{it} we estimate the fixed effects regression $x_{it} = a_i + b_t + e_{it}$ and then plot the estimated year effects b_t to show the average global level of x in year t.

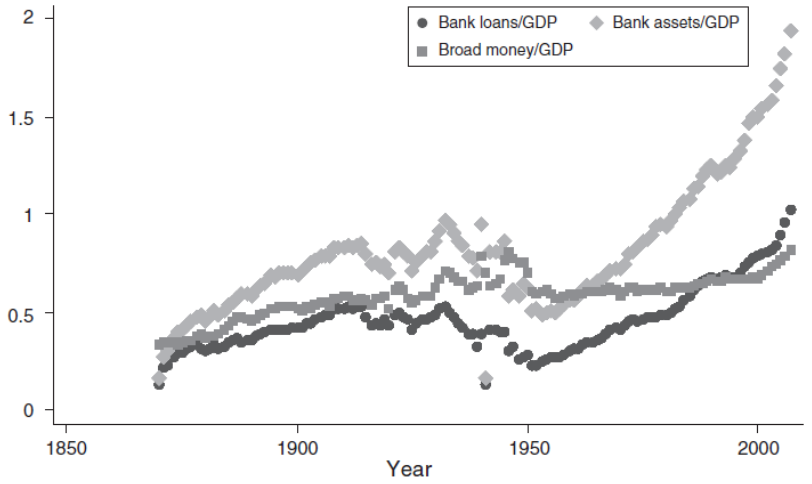

FIGURE 1. AGGREGATES RELATIVE TO GDP (*Year Effects*)

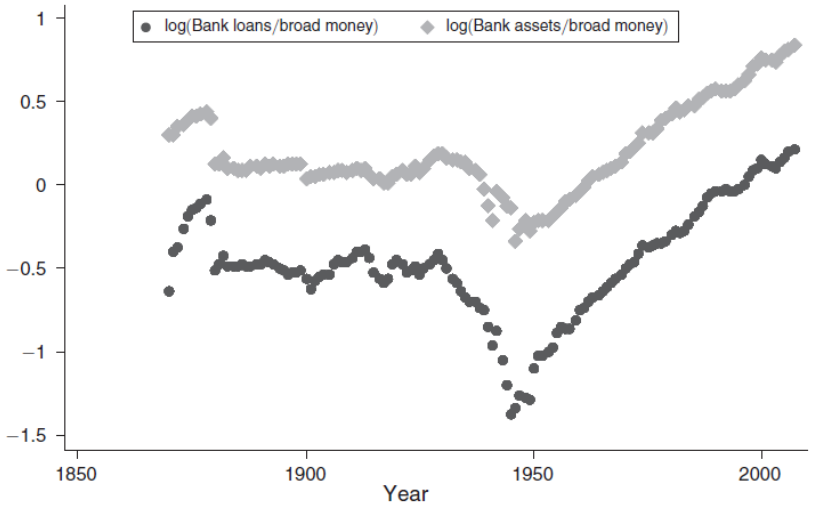

FIGURE 2. AGGREGATES RELATIVE TO BROAD MONEY (*Year Effects*)

Stylized Bank Balance Sheet

Assets	Liabilities and Owners Equity
Loans	Deposits
Securities	Bank Debt
Cash Reserves	Capital

Stylized Facts

- Credit rose faster than money (deposits) post-World War II.
- Driven by an increase in funding through bank debt.
- Implications? Evaluation?

Question 2: What happens to money, credit, and output after financial crises?

TABLE A1: CRISIS DATES BY COUNTRY, 1870–2008

Australia	1893	1989							
Canada	1873	1907	1923						
Switzerland	1870	1910	1931	2008					
Germany	1873	1891	1901	1907	1931	2008			
Denmark	1877	1885	1902	1907	1921	1931	1987		
Spain	1883	1890	1913	1920	1924	1931	1978	2008	
France	1882	1889	1907	1930	2008				
U.K.	1873	1890	1974	1984	1991	2007			
Italy	1873	1887	1891	1907	1921	1930	1935	1990	2008
Japan	1882	1900	1904	1907	1913	1927	1992		
Netherlands	1893	1907	1921	1939	2008				
Norway	1899	1922	1931	1988					
Sweden	1878	1907	1922	1931	1991	2008			
USA	1873	1884	1893	1907	1929	1984	2007		

Sources: Bordo et al. (2001); Reinhart and Rogoff (2009); Laeven and Valencia (2008); Cecchetti et al. (2009). See text.

How do they choose dates? Questions or qualms?

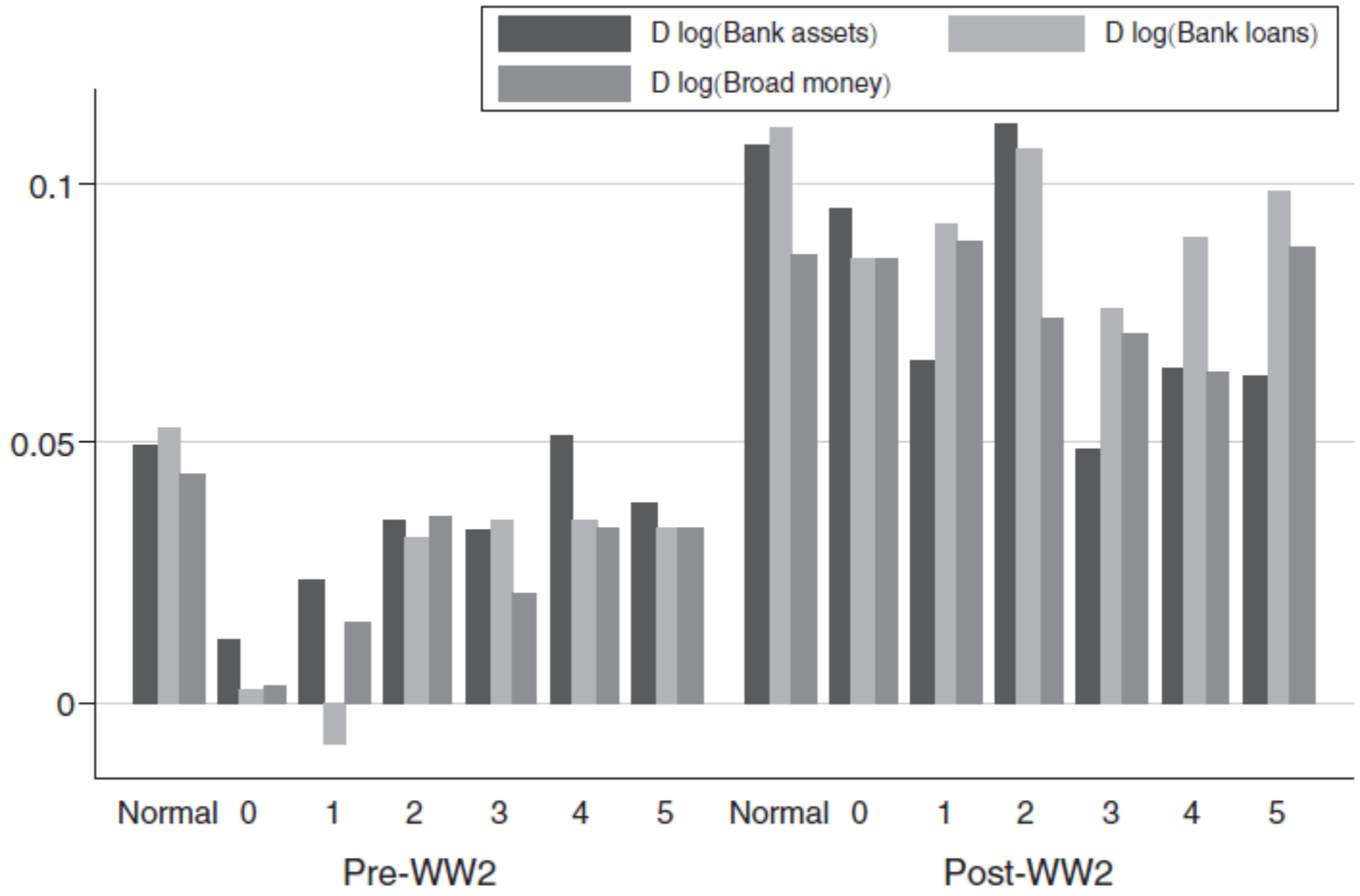

FIGURE 4. AGGREGATES (*Postcrisis Periods Relative to Normal*)

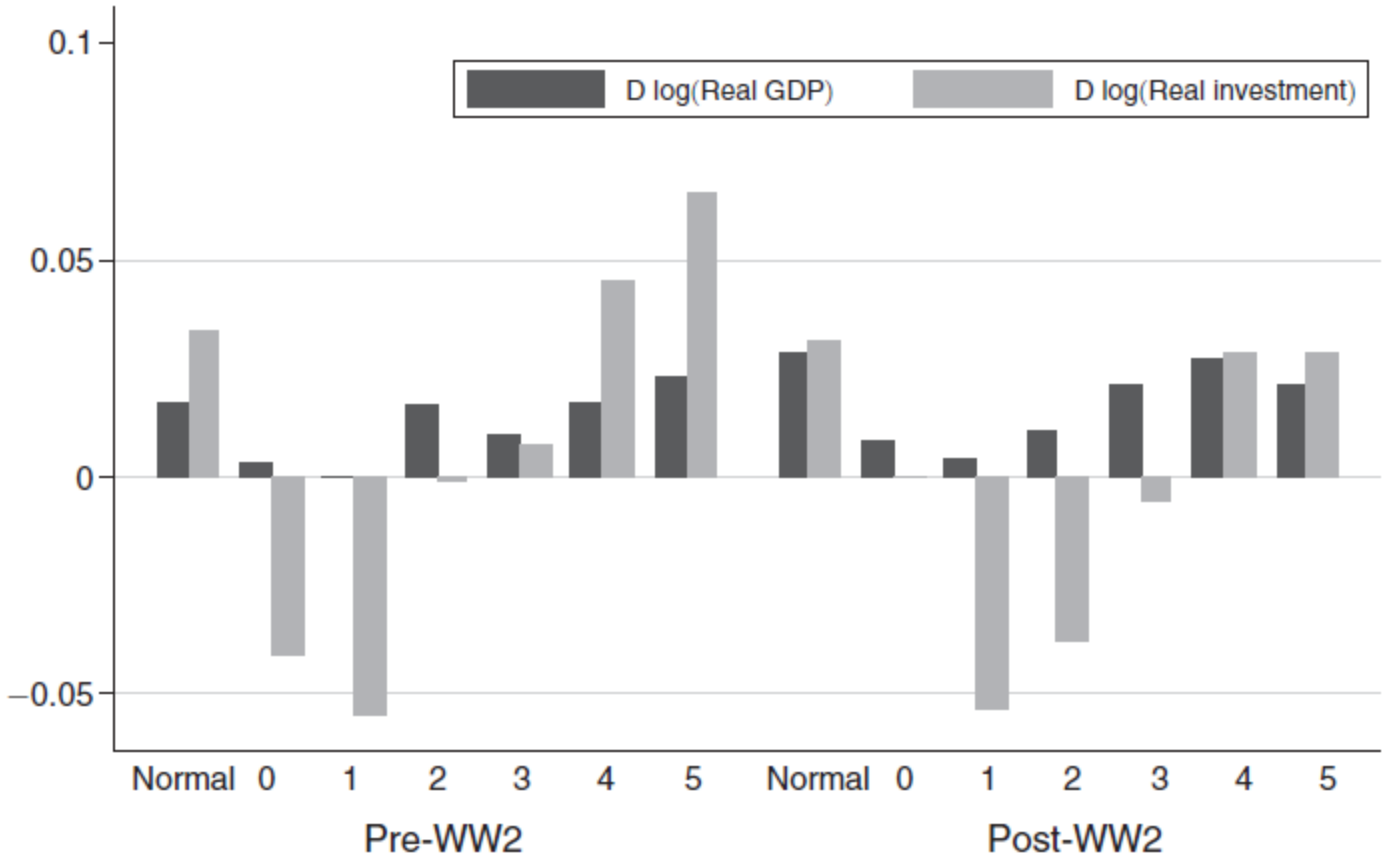

FIGURE 5. REAL VARIABLES (*Postcrisis Periods Relative to Normal*)

Discussion

Question 3: Do credit booms lead to financial crises?

Specification

$$\text{OLS Linear Probability:} \quad p_{it} = b_{0i} + b_1(L)D\log CREDIT_{it} + b_2(L)\mathbf{X}_{it} + e_{it},$$

$$\text{Logit:} \quad \text{logit}\,(p_{it}) = b_{0i} + b_1(L)D\log CREDIT_{it} + b_2(L)\mathbf{X}_{it} + e_{it},$$

where $\text{logit}(p) = \ln(p/(1-p))$ is the log of the odds ratio and L is the lag operator. The *CREDIT* variable will usually be defined as our total bank loans variable deflated by the CPI. The lag polynominal $b_1(L)$, which contains only lag orders greater than or equal to one, will be the main object of study and the goal will be to investigate whether the lags of credit growth are informative. The lag polynominal $b_2(L)$ will, if present, allow us to control for other possible causal factors in the form of additional variables in the vector $\mathbf{X}$. The error term e_{it} is assumed to be well behaved.

Is this a convincing test of the importance of credit in causing crises?

- Calling this a forecasting exercise doesn't get around issues of OVB.

Possible Omitted Variable Bias Stories

- Rapid money growth leads to inflation which leads to monetary contraction and crises.
- House price rises lead to credit expansion and bursting bubbles. Bursting bubbles could cause crises directly.
- Financial innovation leads to both credit expansion and irresponsible behavior. Perhaps it is the irresponsible behavior that causes crises.

TABLE 4—BASELINE MODEL AND ALTERNATIVE MEASURES OF MONEY AND CREDIT

Specification (Logit country effects)	Baseline (6)	Replace loans with broad money (7)	Replace loans with narrow money (8)	Replace real loans with loans/GDP (9)	Replace real loans with loans/broad money (10)
L. Δ log (loans/P)	−0.398	−1.051	−2.504	2.091	0.601
	−2.11	−2.771	−1.806	−2.235	−2.383
L2. Δ log (loans/P)	7.138***	5.773***	2.303	7.627***	5.842**
	−2.631	−2.181	−1.781	−2.135	−2.327
L3. Δ log (loans/P)	0.888	3.515	1.768	3.569	2.092
	−2.948	−2.329	−1.664	−2.386	−2.048
L4. Δ log (loans/P)	0.203	−1.535	−2.880*	2.333*	1.613
	−1.378	−2.287	−1.51	−1.405	−1.766
L5. Δ log (loans/P)	1.867	3.077	1.373	3.164**	0.497
	−1.64	−2.256	−1.63	−1.583	−2.37
Marginal effects	−0.0124	−0.0350	−0.0888	0.0598	0.0196
at each lag	0.222	0.192	0.0817	0.218	0.190
evaluated at the means	0.0276	0.117	0.0627	0.102	0.0681
	0.00629	−0.0511	-0.102	0.0668	0.0525
	0.0580	0.102	0.0487	0.0905	0.0162
Sum	0.301	0.326	0.00211	0.538	0.346
Observations	1,272	1,348	1,381	1,245	1,224
Groups	14	14	14	14	14
Sum of lag coefficients	9.697***	9.779***	0.0596	18.78***	10.65***
Standard error	2.920	3.400	3.240	3.651	4.053
Test for all lags = 0, χ^2	17.23***	17.77***	6.557	29.85***	10.62*
p-value	0.00408	0.00324	0.256	0.000016	0.0594
Test for country effects = 0, χ^2	7.674	8.755	8.834	8.012	9.140
p-value	0.864	0.791	0.785	0.843	0.762
Pseudo R^2	0.0659	0.0487	0.0381	0.0923	0.0497
Pseudolikelihood	−205.8	−224.6	−237.4	−198.9	−201.5
Overall test statistic, χ^2	36.21***	36.81***	17.37	47.77***	19.82
p-value	0.00663	0.00555	0.498	0.000163	0.343
Predictive ability, AUROC	0.717***	0.681***	0.631***	0.743***	0.680***
Standard error	0.0349	0.0294	0.0339	0.0337	0.0378

TABLE 4—BASELINE MODEL AND ALTERNATIVE MEASURES OF MONEY AND CREDIT

Specification (Logit country effects)	Baseline (6)	Replace loans with broad money (7)	Replace loans with narrow money (8)	Replace real loans with loans/GDP (9)	Replace real loans with loans/broad money (10)
L. Δ log (loans/P)	−0.398	−1.051	−2.504	2.091	0.601
	−2.11	−2.771	−1.806	−2.235	−2.383
L2. Δ log (loans/P)	7.138***	5.773***	2.303	7.627***	5.842**
	−2.631	−2.181	−1.781	−2.135	−2.327
L3. Δ log (loans/P)	0.888	3.515	1.768	3.569	2.092
	−2.948	−2.329	−1.664	−2.386	−2.048
L4. Δ log (loans/P)	0.203	−1.535	−2.880*	2.333*	1.613
	−1.378	−2.287	−1.51	−1.405	−1.766
L5. Δ log (loans/P)	1.867	3.077	1.373	3.164**	0.497
	−1.64	−2.256	−1.63	−1.583	−2.37
Marginal effects	−0.0124	−0.0350	−0.0888	0.0598	0.0196
at each lag	0.222	0.192	0.0817	0.218	0.190
evaluated at the means	0.0276	0.117	0.0627	0.102	0.0681
	0.00629	−0.0511	-0.102	0.0668	0.0525
	0.0580	0.102	0.0487	0.0905	0.0162
Sum	0.301	0.326	0.00211	0.538	0.346
Observations	1,272	1,348	1,381	1,245	1,224
Groups	14	14	14	14	14
Sum of lag coefficients	9.697***	9.779***	0.0596	18.78***	10.65***
Standard error	2.920	3.400	3.240	3.651	4.053
Test for all lags = 0, χ^2	17.23***	17.77***	6.557	29.85***	10.62*
p-value	0.00408	0.00324	0.256	0.000016	0.0594
Test for country effects = 0, χ^2	7.674	8.755	8.834	8.012	9.140
p-value	0.864	0.791	0.785	0.843	0.762
Pseudo R^2	0.0659	0.0487	0.0381	0.0923	0.0497
Pseudolikelihood	−205.8	−224.6	−237.4	−198.9	−201.5
Overall test statistic, χ^2	36.21***	36.81***	17.37	47.77***	19.82
p-value	0.00663	0.00555	0.498	0.000163	0.343
Predictive ability, AUROC	0.717***	0.681***	0.631***	0.743***	0.680***
Standard error	0.0349	0.0294	0.0339	0.0337	0.0378

TABLE 5—BASELINE MODEL WITH PRE-WW2 AND POST-WW2 SAMPLES

Specification (Logit country effects)	Baseline pre-WW2 sample using loans (11)	Baseline post-WW2 sample using loans (12)	Pre-WW2 sample replace loans with broad money (13)	Post-WW2 sample replace loans with broad money (14)
L. Δ log (loans/P)	2.249	−0.316	−0.227	2.705
	(2.362)	(3.005)	(3.014)	(4.438)
L2. Δ log (loans/P)	7.697**	8.307***	7.393**	4.719**
	(3.221)	(2.497)	(3.004)	(2.375)
L3. Δ log (loans/P)	2.890	2.946	4.077	4.060*
	(3.056)	(2.687)	(2.915)	(2.170)
L4. Δ log (loans/P)	2.486	0.755	−0.249	−0.838
	(1.587)	(2.623)	(1.982)	(5.359)
L5. Δ log (loans/P)	4.260**	−1.749	4.844*	0.808
	(1.735)	(3.204)	(2.647)	(4.016)
Observations	510	706	585	708
Groups	13	14	13	14
Marginal effects	0.0873	−0.00642	−0.0102	0.0617
at each lag	0.299	0.169	0.332	0.108
evaluated at the means	0.112	0.0598	0.183	0.0926
	0.0965	0.0153	−0.0112	−0.0191
	0.165	−0.0355	0.218	0.0184
Sum	0.760	0.202	0.711	0.261
Sum of lag coefficients	19.58***	9.943	15.84***	11.45*
Standard error	4.921	6.056	5.119	6.022
Test for all lags = 0, χ^2	19.20***	12.44**	13.53**	12.13**
p-value	0.00176	0.0292	0.0189	0.0330
Test for country effects = 0, χ^2	6.369	5.348	11.74	5.917
p-value	0.932	0.945	0.549	0.920
Pseudo R^2	0.130	0.0771	0.0855	0.0476
Pseudolikelihood	−106.4	−83.97	−126.2	−86.71
Overall test statistic, χ^2	40.21***	36.44***	35.95***	19.89
p-value	0.00195	0.00401	0.00716	0.280
AUROC	0.763***	0.718***	0.728***	0.659***
Standard error	0.0391	0.0691	0.0361	0.0600

TABLE 7—CREDIT, ASSET PRICES, AND FINANCIAL DEVELOPMENT

Specification (Logit country effects)	Baseline plus 5 lags of nominal stock price change (20)	Baseline plus 5 lags of real stock price change (21)	Baseline plus Loans over GDP (22)	Baseline plus 5 lags of real stock prices plus loans/GDP (23)
L. Δ log (loans/P)	−2.491	−2.540	−0.755	−3.392
	(2.324)	(2.312)	(2.293)	(2.470)
L2. Δ log (loans/P)	7.316**	7.165**	7.599***	7.848**
	(2.910)	(2.915)	(2.871)	(3.215)
L3. Δ log (loans/P)	3.405	3.185	0.720	3.297
	(2.899)	(2.864)	(3.307)	(3.171)
L4. Δ log (loans/P)	−1.352	−1.684	0.0933	−1.747
	(1.521)	(1.539)	(1.497)	(1.669)
L5. Δ log (loans/P)	1.678	1.771	2.326	2.460
	(1.835)	(1.784)	(1.784)	(1.994)
L1. Δ log (stock prices)	−1.046**	−0.865**		−0.768*
	(0.464)	(0.434)		(0.455)
L2. Δ log (stock prices)	0.535	0.563		0.550
	(0.644)	(0.673)		(0.666)
L3. Δ log (stock prices)	0.272	0.715		0.691
	(0.651)	(0.692)		(0.690)
L4. Δ log (stock prices)	0.954	1.098		1.024
	(0.822)	(0.811)		(0.814)
L5. Δ log (stock prices)	0.0844	0.467		0.438
	(0.631)	(0.703)		(0.627)
Loans/GDP (log)			1.100*	1.601**
			(0.624)	(0.703)
Observations	1,061	1,062	1,271	1,061
Groups	14	14	14	14
Sum of lag coefficients	8.557**	7.898**	9.984***	8.466**
Standard error	3.468	3.443	2.918	3.460
Test for all lags = 0, χ^2	22.04***	20.65***	17.45***	21.19***
p-value	0.000515	0.000944	0.00371	0.000747
Test lags of added vbl. = 0, χ^2	8.664	13.28**		11.89**
p-value	0.123	0.0209		0.0363
Test for country effects = 0, χ^2	5.499	5.433	11.43	10.33
p-value	0.939	0.942	0.575	0.587
Pseudo R^2	0.0882	0.0901	0.0749	0.108
Pseudolikelihood	−169.8	−169.5	−203.8	−166.2
Overall test statistic, χ^2	39.65**	46.84***	41.48***	47.20***
p-value	0.0119	0.00154	0.00208	0.00212
AUROC	0.727***	0.731***	0.731***	0.764***
Standard error	0.0399	0.0383	0.0379	0.0358

TABLE 8—CREDIT, ASSET PRICES, AND FINANCIAL DEVELOPMENT—INTERACTIONS

Specification (Logit country effects) 5-year moving average of:	Baseline (24)	Baseline plus (25)	Baseline plus (26)	Baseline plus (27)	Baseline plus (28)	Baseline plus (29)
Δ log (loans/P)	5.340***	5.012**	7.526***	6.752***	6.632***	7.370***
	(2.069)	(2.288)	(2.464)	(2.012)	(2.243)	(2.368)
Δ log (stocks/P)		0.524	2.704			0.236
		(1.391)	(2.103)			(1.464)
Δ log (loans/P) × Δ log (stocks/P)			−22.77			
			(14.19)			
Loans/GDP (log)				1.432***	1.515**	1.704***
				(0.530)	(0.751)	(0.615)
Δ log (loans/P) × loans/ GDP (log)					−1.243	
					(8.516)	
Δ log (stocks/P) × loans/ GDP (log)						4.661
						(3.401)
Observations	1,278	1,278	1,278	1,437	1,437	1,278
Groups	14	14	14	14	14	14
Test for country effects = 0, χ^2	7.447	7.528	7.980	15.58	14.58	16.21
p-value	0.878	0.873	0.845	0.272	0.334	0.238
Pseudo-R^2	0.0348	0.0351	0.0407	0.0456	0.0457	0.0652
Pseudolikelihood	−203.7	−203.7	−202.5	−246.8	−246.8	−197.3
Overall test statistic, χ^2	17.58	18.47	22.95	35.78***	35.71***	30.92**
p-value	0.227	0.239	0.115	0.00190	0.00317	0.0205
AUROC	0.663***	0.662***	0.669***	0.689***	0.689***	0.714***
Standard error	0.0392	0.0385	0.0369	0.0368	0.0367	0.0371

Evaluation

- There is a correlation between crises and credit expansion.
- It doesn’t go away when obvious controls are included.
- We are a long way still from proving credit expansion causes crises.

Concluding Comments