

Household Credit Markets, Business Cycles, and Crises

Emil Verner
MIT

15.474

February 2020

Big Picture

- Empirical macro and finance
- How does finance matter for the macroeconomy?
 - How does the financial sector (i.e., banks, mortgages, bonds, stock market) interact with the real economy (i.e., GDP, household spending, employment, investment)?
- Tools and ideas from macroeconomics, applied micro, time series economics, and finance
- Emphasis on exploiting large datasets to answer important questions at the intersection of macro and finance

Household Credit Cycles, Business Cycles, and Crises

- Today:
 - What is the role of household credit markets in the business cycle?
 - Do credit market conditions and household debt positions amplify fluctuations in employment and output, or are they passive reflections of the state of the real economy?
 - What drives credit cycles?
 - How do household debt positions transmit to the real economy?

Plan

- Three papers:
 1. Mian, Sufi, and Verner, "Household Debt and Business Cycles Worldwide," *QJE* (2017)
 2. Mian, Sufi, and Verner, "How Does Credit Supply Expansion Affect the Real Economy? The Productive Capacity and Household Demand Channels," *JF* (2020)
 3. Verner and Gyongyosi, "Household Debt Revaluation and the Real Economy: Evidence from a Foreign Currency Debt Crisis" (2020)
- Background reading/literature review: Verner, "Private Debt Booms and the Real Economy: Do the Benefits Outweigh the Costs?" (2019)

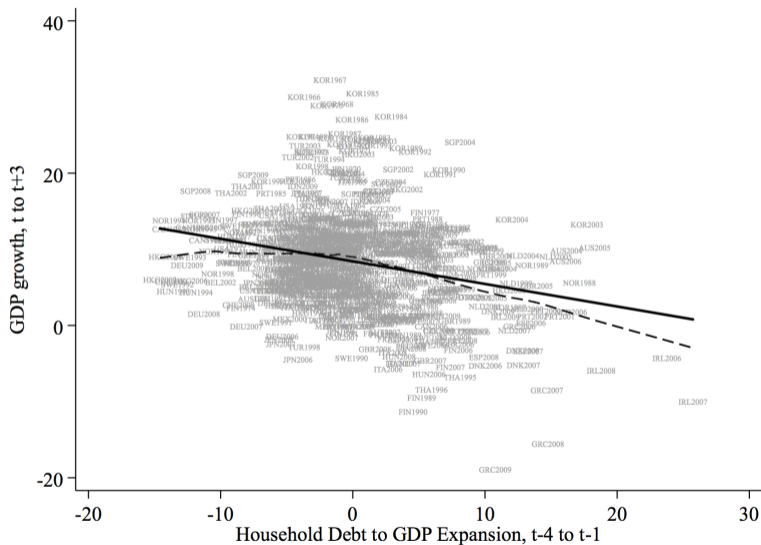
Household Debt and Business Cycles Worldwide

Mian, Sufi, and Verner (QJE 2017)

Motivation: Household Debt and Output Growth

- Great Recession highlighted a connection between **household debt** and **GDP/consumption growth**
 - Cross-country evidence from IMF (2012); Glick and Lansing (2010)
 - Across-U.S. evidence from Mian and Sufi (2010, 2014)
- In a panel of 30 mostly advanced economies from 1960 to 2012, we show that a **rise in household debt predicts lower growth** and higher unemployment in medium run
- Rise in global household debt predicts a **decline in global growth**, highlighting importance of trade linkages

Increase in Household Debt Predicts Lower Growth



What Model Best Fits the Facts?

- We group theories into **credit-demand-shock** versus **credit-supply-shock** based explanations of the initial rise in household debt that leads to subsequently lower growth
- We explore the role of potential behavioral biases within both categories
- PIH-based credit demand-based models are firmly rejected in the data, and even theories of behavioral bias-driven credit demand shocks difficult to reconcile with facts
- Results more consistent with models where **credit-supply shocks** driven in part by **behavioral biases of lenders** play an important role, and **macro frictions** help explain severity of recession

Related Literature

- **Empirical:** Jordà et al (2013, 2014), Schularick and Taylor (2012), Dell’Ariccia et al (2012), Cecchetti, et al (2011), Krishnamurthy and Muir (2016), Lopez-Salido, Stein & Zakrajsek (2016), Mian & Sufi (2014), IMF (2012)
- **Nominal rigidities with monetary policy constraints:** Eggertsson & Krugman (2012), Guerrieri & Lorenzoni (2015), Farhi & Werning (2015), Korinek & Simsek (2014), Martin & Philippon (2014), and Schmitt-Grohé & Uribe (2015)
- **Real rigidities:** Huo and Ríos-Rull (2016)
- **Pecuniary externalities associated with debt financing:** Shleifer & Vishny (1992), Kiyotaki & Moore (1997), Lorenzoni (2008), Dávila (2015)
- **Macro-behavioral models:** Laibson (1997), Barro (1999), Gennaioli, Shleifer, & Vishny (2012), Bordalo, Gennaioli, and Shleifer (2015), Greenwood, Hanson, and Jin (2016); Landvoigt (2016)

Data and Summary Statistics

Data

- Unbalanced panel of 30 mainly OECD countries, 1960-2012
- Annual, 900 country-years
- Credit series (BIS)
 - Total credit to private non-financial sector, $PD = HHD + FD$
 - Credit to households, HHD
 - Credit to non-financial firms, FD
 - Credit = loans and debt securities
- Sovereign, Corporate, Mortgage and Consumer Credit Spreads: Global Financial Data and National Sources.
- National accounts data, professional economic forecasts, micro trade data from standard sources

Sample

Country	Years	Average $\Delta(HHD/Y)$	Average $\Delta(FD/Y)$	Std. dev. $\Delta(HHD/Y)$	Std. dev. $\Delta(FD/Y)$
Australia	1977-2012	2.23	1.00	2.55	4.40
Austria	1995-2012	0.71	1.98	1.26	2.91
Belgium	1980-2012	0.82	3.09	1.13	6.47
Canada	1969-2012	1.42	1.00	2.37	3.54
Czech Republic	1995-2012	1.24	-0.85	1.71	5.46
Denmark	1994-2012	3.72	2.52	3.96	5.96
Finland	1970-2012	1.12	0.87	3.04	7.55
France	1977-2012	1.08	1.10	1.20	2.41
Germany	1970-2012	0.51	0.23	1.79	1.65
Greece	1994-2012	3.22	1.98	2.25	2.43
Hong Kong	1990-2012	1.21	1.88	2.68	10.40
Hungary	1989-2012	0.52	2.06	3.41	5.34
Indonesia	2001-2012	0.96	-0.22	0.77	1.83
Ireland	2002-2012	5.02	14.11	7.97	15.63
Italy	1960-2012	0.70	0.52	1.55	2.98
Japan	1964-2012	0.92	0.14	1.77	4.39
Korea, Rep.	1962-2012	1.71	1.74	2.22	5.83
Mexico	1994-2012	0.20	-1.07	0.86	2.12
Netherlands	1990-2012	3.62	0.95	2.75	4.10
Norway	1975-2012	1.17	1.37	3.42	5.89
Poland	1995-2012	1.91	1.37	2.03	2.59
Portugal	1979-2012	2.57	1.18	2.51	7.22
Singapore	1991-2012	1.78	-0.21	2.88	5.28
Spain	1980-2012	1.78	1.64	2.64	5.01
Sweden	1980-2012	1.11	3.66	2.66	8.47
Switzerland	1999-2012	0.95	0.76	3.27	4.01
Thailand	1991-2012	1.99	-0.85	3.32	7.86
Turkey	1986-2012	0.72	0.66	1.19	3.51
United Kingdom	1976-2012	1.73	1.66	2.44	4.27
United States	1960-2012	0.75	0.54	2.14	1.76

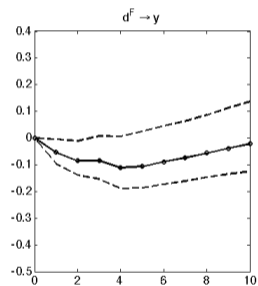
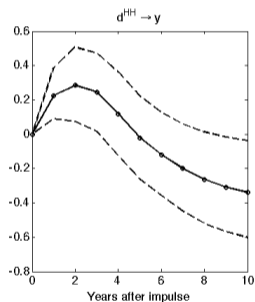
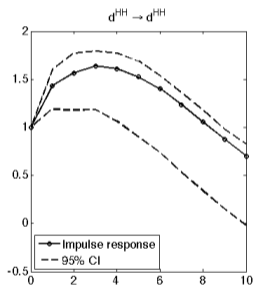
Summary Statistics

	N	Mean	Median	SD	$\frac{SD}{SD(\Delta y)}$	Ser. Cor.
Δy	695	2.90	3.08	2.98	1.00	0.29
$\Delta_3 y$	695	8.40	8.65	6.56	2.21	0.71
$\Delta(PD/Y)$	695	3.11	2.52	6.96	2.34	0.39
$\Delta_3(PD/Y)$	695	8.52	7.28	16.04	5.39	0.74
$\Delta(HHD/Y)$	695	1.62	1.33	2.56	0.86	0.43
$\Delta_3(HHD/Y)$	695	4.58	3.68	6.24	2.10	0.79
$\Delta(FD/Y)$	695	1.48	1.04	5.66	1.90	0.30
$\Delta_3(FD/Y)$	695	3.89	3.11	12.21	4.10	0.69
Δc	678	2.81	2.90	2.84	0.95	0.33
Δc^{dur}	469	4.91	5.35	9.27	3.12	0.21
Δc^{nondur}	469	1.53	1.47	2.53	0.85	0.26
$\Delta C/Y$	690	-0.06	-0.01	1.17	0.39	0.04
Δi	678	2.66	3.67	10.79	3.63	0.15
Δg	688	2.84	2.60	2.79	0.94	0.26
Δx	695	8.64	9.30	12.29	4.13	0.15
Δm	695	8.08	9.55	13.87	4.66	0.12
$\Delta NX/Y$	695	0.14	-0.01	2.11	0.71	0.03
$\Delta CA/Y$	648	0.08	-0.02	2.29	0.77	-0.01
Δs^{XC}	695	-0.15	-0.07	1.80	0.61	0.04
Δs^{MC}	695	0.16	0.15	1.67	0.56	0.00
$\Delta reer$	614	-0.03	0.59	6.75	2.27	0.05
Δu	669	0.08	-0.01	1.08	0.36	0.34
$\Delta_3 u$	662	0.19	-0.01	2.43	0.82	0.67
$\Delta_3 y_{t+3 t}^{WEO}$	484	9.41	8.60	3.76	1.26	0.50
$\Delta_3(y_{t+3} - y_{t+3 t}^{WEO})$	484	-2.53	-1.79	5.35	1.80	0.54
$\Delta_3 hpi$	514	6.56	7.16	17.42	5.85	0.72
$\Delta_3(GD/Y)$	627	1.73	1.16	9.92	3.33	0.71
spr^{real}	622	0.43	0.40	2.11	0.71	0.42
spr^{MS}	517	1.15	0.99	1.52	0.51	0.45
spr^{corp}	460	0.76	0.65	1.03	0.35	0.42

Basic Facts

Basic Facts from a VAR

- Three variable recursive VAR in levels: $(y_{it}, d_{it}^{Firm}, d_{it}^{HH})$



Household Debt and Output Growth

	Dependent variable: $\Delta_3 y_{it+k}, k = 0, \dots, 6$						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	$\Delta_3 y_{it}$	$\Delta_3 y_{it+1}$	$\Delta_3 y_{it+2}$	$\Delta_3 y_{it+3}$	$\Delta_3 y_{it+4}$	$\Delta_3 y_{it+5}$	$\Delta_3 y_{it+6}$
$\Delta_3 d_{it}^{HH}$	0.176* (0.0793)	0.121 (0.0810)	-0.0136 (0.0680)	-0.178** (0.0629)	-0.337** (0.0779)	-0.410** (0.0905)	-0.405** (0.102)
$\Delta_3 d_{it}^F$	-0.0430 (0.0556)	-0.140* (0.0550)	-0.159** (0.0437)	-0.108** (0.0362)	-0.0411 (0.0349)	0.0327 (0.0395)	0.0876* (0.0373)
R^2	0.026	0.063	0.100	0.103	0.128	0.138	0.128
Country fixed effects	✓	✓	✓	✓	✓	✓	✓
Observations	815	785	755	725	695	665	635

Rise in Household Debt Predicts Lower Subsequent Growth

- One standard deviation increase in $\Delta_3(HHD/Y)$ (6.2%) predicts **2.2 percentage points lower GDP** 3 years out

	Dependent variable: $\Delta_3 y_{it+3}$							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\Delta_3 d_{it-1}^{Private}$	-0.119** (0.0313)							
$\Delta_3 d_{it-1}^{HH}$		-0.366** (0.0772)		-0.337** (0.0779)	-0.333** (0.0771)	-0.340** (0.0868)	-0.325** (0.0839)	-0.192* (0.0959)
$\Delta_3 d_{it-1}^F$			-0.0978* (0.0391)	-0.0411 (0.0349)	-0.0464 (0.0354)	-0.0235 (0.0437)	-0.0519 (0.0395)	-0.0498 (0.0380)
$\Delta_3 d_{it-1}^{Gov}$						0.0534 (0.0430)		
$\Delta_3 d_{it-1}^{Netforeign}$							0.00793 (0.0523)	
$\mathbf{1}(\Delta_3 d_{it-1}^{Netforeign} > 0)$								0.736 (1.005)
$\Delta_3 d_{it-1}^{HH} * \mathbf{1}(\Delta_3 d_{it-1}^{Netforeign} > 0)$								-0.235+ (0.140)
Country fixed effects	✓	✓	✓	✓	✓	✓	✓	✓
Distributed lag in Δy					✓	✓	✓	✓
Test for equality of β_{HH} and β_F , p-value				.002	.003	.003	.007	
R^2	0.0869	0.123	0.0364	0.128	0.131	0.126	0.168	0.181
Observations	695	695	695	695	695	627	636	636

Models

Credit Demand-Shock Models

- Rational models:
 - Borrowing households expand borrowing in anticipation of higher future income or productivity (Aguiar & Gopinath, 2007)
 - Removal of borrowing constraints (Justiniano, et al, 2015; Favilukus, et al, 2016)
 - Prediction: A rise in debt presages higher growth (which we already know is counter-factual)
 - Prediction: Rise in debt should be associated with higher interest rates
- Behavioral biases (over-optimism) driving credit demand (Laibson, 1997; Barro, 1999)
 - May lead to lower future growth if “bubble” leads to bad investment or if over-optimism naturally followed by reversion of beliefs
 - But if credit supply fixed, rise in debt should be associated with higher interest rates

Credit Supply-Shock Models

- Credit expansion driven by shock to credit supply
- What is the source of credit supply shocks?
 - Influx of foreign capital (Justiniano, et al, 2015; Favilukus, et al, 2016; Schmitt-Grohé & Uribe, 2015)
 - Deregulation of the financial sector
 - Behavioral biases of creditors: underestimation of default risk, “credit market sentiment” (Gennaioli, et al, 2012; Bordalo, et al, 2015; Landvoigt (2016); Greenwood, et al, 2016)
- Prediction: expansion of debt associated with low interest rates, increased credit to low credit quality borrowers, financial deregulation
- Shock to credit supply eventually reverts, and macroeconomic frictions such as wage rigidities and monetary policy constraints lead to more severe recession (Farhi & Werning, 2015; Korinek & Simsek, 2014; Schmitt-Grohé & Uribe, 2015)

Interest Spreads and Riskier Borrowers

Mortgage Spread as Instrument: Proxy-SVAR First Stage

- Mortgage-sovereign spread, Z_{it} , as “imperfect” *external instrument* for household credit supply shock (Mertens & Ravn 2013)

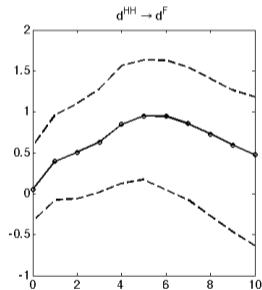
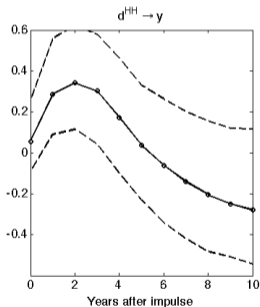
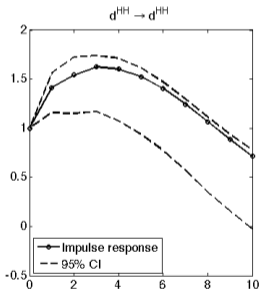
$$\hat{u}_{it}^{HH} = \pi_{HH} + \gamma_{HH} * Z_{it} + \nu_{it}^{HH}$$

$$\hat{u}_{it}^F = \pi_F + \gamma_F * Z_{it} + \nu_{it}^F$$

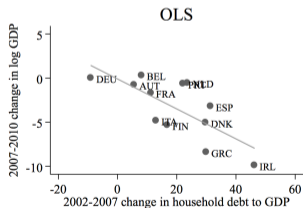
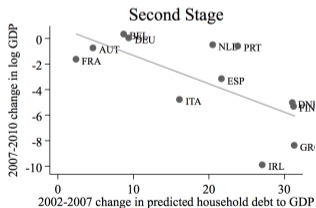
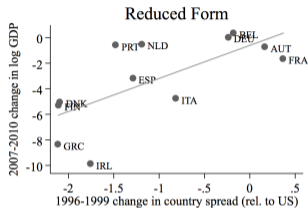
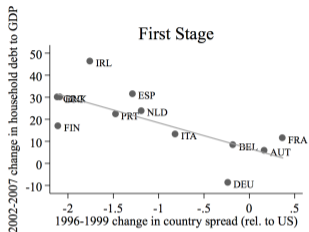
	Residual from VAR Household Debt Equation		Residual from VAR Firm Debt Equation	
	(1) $\hat{u}_{it}^{d^{HH}}$	(2) $\hat{u}_{it}^{d^{HH}}$	(3) $\hat{u}_{it}^{d^F}$	(4) $\hat{u}_{it}^{d^F}$
MS Spread, residual	-0.341** (0.101)		-0.0182 (0.267)	
Low MS Spread Indicator, residual		0.689** (0.220)		0.0347 (0.588)
F statistic	11.372	9.834	.005	.003
R^2	.024	.021	0	0
Observations	580	580	580	580

Mortgage Spread as Instrument: Proxy-SVAR

- Low mortgage-sovereign spread as external instrument for household debt shock predicts expansion in household debt and output
- Followed by strong reversal in GDP

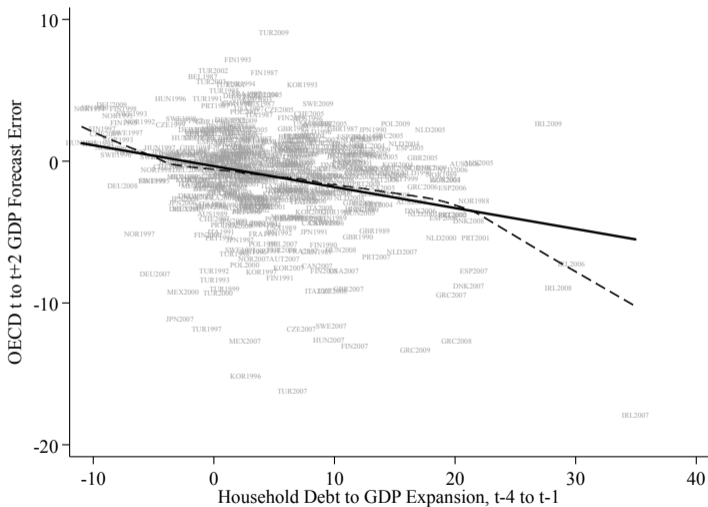


Credit Spread as Instrument: The Eurozone



Rational or Biased Expectations?

HH Debt Expansion Predicts Overoptimistic Forecasts



HH Debt Expansion Predicts Overoptimistic Forecasts

	Growth Forecast		Forecast Error					Forecast Error Sample up to 2006	
	(1) $\Delta_2 y_{t+2 t}^{IMF}$	(2) $\Delta_2 y_{t+2 t}^{OECD}$	(3) $e_{t+1 t}^{IMF}$	(4) $e_{t+2 t}^{IMF}$	(5) $e_{t+3 t}^{IMF}$	(6) $e_{t+1 t}^{OECD}$	(7) $e_{t+2 t}^{OECD}$	(8) $e_{t+1 t}^{IMF}$	(9) $e_{t+1 t}^{OECD}$
$\Delta_3 d_{it-1}^{HH}$	0.0016 (0.023)	0.0013 (0.028)	-0.060** (0.020)	-0.17** (0.057)	-0.31** (0.091)	-0.070** (0.023)	-0.17* (0.071)	-0.035+ (0.021)	-0.042** (0.015)
$\Delta_3 d_{it-1}^F$	-0.029 (0.021)	-0.041* (0.017)	-0.019 (0.027)	-0.026 (0.045)	-0.031 (0.051)	-0.013 (0.015)	-0.0084 (0.029)	-0.029 (0.020)	-0.020* (0.0080)
Country fixed effects	✓	✓	✓	✓	✓	✓	✓	✓	✓
Sample	Full	Full	Full	Full	Full	Full	Full	Pre 2006	Pre 2006
Test for equality of β_{HH} and β_F , p-value	.367	.227	.311	.089	.02	.053	.07	.863	.29
R^2	0.034	0.064	0.026	0.063	0.13	0.040	0.073	0.026	0.027
Observations	484	471	590	484	484	594	471	469	490

Who is Over-Optimistic? Borrowers or Lenders?

- Credit spreads fall during household debt booms, so difficult to imagine it is only the beliefs of borrowers changing
- Consumption booms in general do not predict subsequently lower growth – debt seems critical
- Growing body of evidence on importance of investor beliefs during credit booms
 - Baron and Xiong (2016)
 - Fahlenbrach, et al (2016)
 - Lopez-Salido, et al (2016); Krishnamurthy and Muir (2016)
- A shift in lender beliefs about downside risk or volatility most easily explains results

Role of Macroeconomic Frictions

Role of Macroeconomic Frictions

- Non-linearity in basic result: an increase in household debt predicts lower subsequent growth, but a decline in household debt does not predict higher subsequent growth
- Heterogeneity by exchange rate regime and zero lower bound constraint exposure: effect of household debt particularly strong in fixed exchange rate regimes or when economy hits zero lower bound
- HH credit also predicts rise in unemployment, suggesting lack of utilization

Exchange Rate Heterogeneity and Zero Lower Bound

	Non-linearity	Fixed	Intermediate	Freely floating	
	(1)	(2)	(3)	(4)	(5)
	$\Delta_3 y_{it+3}$	$\Delta_3 y_{it+3}$	$\Delta_3 y_{it+3}$	$\Delta_3 y_{it+3}$	$\Delta_3 y_{it+3}$
$\Delta_3 d_{it-1}^{HH} * \mathbf{1}(\Delta_3 d_{it-1}^{HH} > 0)$	-0.44** (0.11)				
$\Delta_3 d_{it-1}^{HH} * \mathbf{1}(\Delta_3 d_{it-1}^{HH} \leq 0)$	0.066 (0.16)				
$\Delta_3 d_{it-1}^F * \mathbf{1}(\Delta_3 d_{it-1}^F > 0)$	-0.054 (0.037)				
$\Delta_3 d_{it-1}^F * \mathbf{1}(\Delta_3 d_{it-1}^F \leq 0)$	-0.040 (0.063)				
$\Delta_3 d_{it-1}^{HH}$		-0.53** (0.13)	-0.31** (0.072)	-0.067 (0.13)	0.016 (0.073)
$\Delta_3 d_{it-1}^F$		-0.11* (0.049)	-0.012 (0.043)	0.052 (0.12)	0.074 (0.12)
$\Delta_3 d_{it-1}^{HH} * ZLB_{it}$					-0.59** (0.14)
Country fixed effects	✓	✓	✓	✓	✓
Distributed lag in Δy	✓	✓	✓	✓	✓
Test for equality of β_{HH} and β_F , p-value		.008	.004	.535	
R^2	0.15	0.28	0.11	0.032	0.088
Observations	695	221	341	120	120

Conclusion

- Household debt expansion driven by credit supply shocks predicts slower growth in medium run
 - Interest spread evidence difficult to reconcile with most credit demand-based explanations
 - Decision to lend aggressively appears related to flawed expectations
 - Macro frictions translate decline in spending into lower output
 - Cross-border spillovers and global household credit cycle
- Caveats
 - Analysis focuses on recent period of increased “financialization” (Jordà, Schularick & Taylor 2014) and may be recent phenomenon
 - Results speak to short-to-medium run frequency, not to cross-country difference in financial development and long-run growth
- Open questions: What explains shifts in lender beliefs? How does monetary policy relate to shifts in credit supply? (Bruno & Shin 2014, Rey 2015)

How Does Credit Supply Expansion Affect the Real Economy?
The Productive Capacity and Household Demand Channels

Mian, Sufi, and Verner (JF 2020)

Credit supply and business cycles

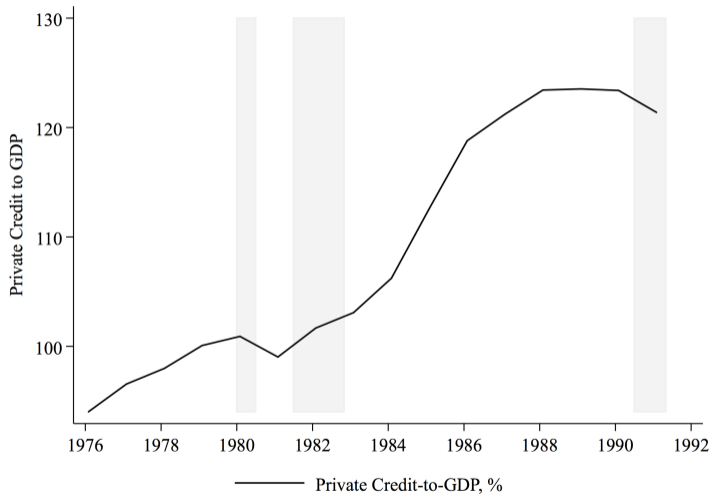
- Close connection between **credit supply** expansions and **economic fluctuations**
 - Theory: Schmitt-Grohé and Uribe (2016), Justiniano et al (2016), Bordo et al (2016)
 - Empirical: Krishnamurthy and Muir (2016), Lopez-Salido et al (2016)
- Less is known about the exact **channels**
 1. Improving firms' **productive capacity**?
 2. Boosting **demand**, especially by households?
- Macro implications may be very different
 - Risks of household debt booms (Mian et al 2017)

What we do

- Develop a **simple empirical test** to disentangle the **productive capacity** and **household demand** channels
 - Based on movements in sectoral employment and prices
- Implement test on **natural experiment** for credit supply expansion in the US during the 1980s
 - **Banking deregulation** generates state-level credit supply shocks
- Provide **broader evidence** in panel of 56 countries going back to the 1960s and validation on U.S. 2000s boom

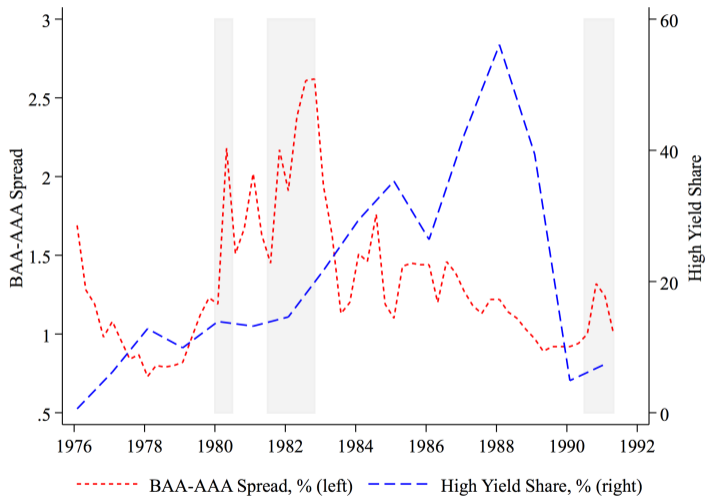
Aggregate credit supply in the 1980s

Private credit

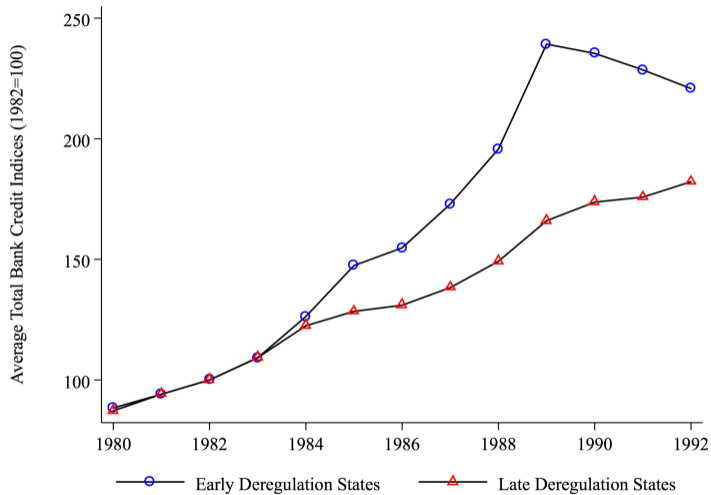


Aggregate credit supply in the 1980s

Corporate credit spread and high yield share



Credit expansion in early and late deregulation states



Main results

1. On net, **credit supply expansion boosts household demand** rather than improving productive capacity
 - Rise in non-tradable employment, no change in tradable employment
 - Rise in non-tradable goods prices
2. Credit supply expansions that work through demand **amplify the business cycle**, leading to more severe recessions
 - Banking sector losses
 - Household debt overhang
 - Downward wage and price rigidities

Empirical Framework

Empirical framework

- Small open economy inhabited by **households** and **tradable** and **non-tradable** production sectors
 - All sectors potentially constrained
- Study positive **credit supply shock**, modeled as a relaxation in borrowing constraints
- *Can we deduce the sector through which credit supply shocks operate?*

Households

- Spend α on non-tradables; $1 - \alpha$ on tradables
- Subject to sequential budget constraint

$$c_{T,t} + p_{N,t}c_{N,t} + d_t = \frac{d_{t+1}}{1+r} + w_t n_t + \Pi_t$$

and borrowing constraint

$$d_{t+1} \leq \theta_H y_{T,t}$$

- Supply labor as an increasing function of real wage

$$n_t = \frac{w_t}{p_t}$$

Non-tradable and tradable firms

- Produce renting labor and capital, subject to a collateral constraint

$$\max_{k_i, n_i} p_i (z_i k_i)^\phi n_i^{1-\phi} - w_i n_i - (r + \delta) k_i \quad \text{s.t. } k_i \leq \theta_i$$

- Assume constraint is binding, $k_i = \theta_i$, then labor demand is increasing in constraint

$$n_i = \left(\frac{p_i (1 - \phi)}{w} \right)^{\frac{1}{\phi}} \tilde{\theta}_i$$

and relative labor demand is

$$\frac{n_N}{n_T} = \frac{\tilde{\theta}_N}{\tilde{\theta}_T} p_N^{\frac{1}{\phi}}$$

Credit expansion and relative employment

- Combining relative labor demand with non-tradable market clearing,

$$y_N = \frac{1 - \alpha}{\alpha} \frac{1}{p_N} [\tilde{\theta}_H + 1] y_T,$$

implies

$$\frac{n_N}{n_T} = \frac{1 - \alpha}{\alpha} [\tilde{\theta}_H + 1]$$

Result 1

The non-tradable to tradable employment ratio is increasing in θ_H and independent of θ_N and θ_T

Credit expansion and relative prices

- Using relative labor demand $\frac{n_N}{n_T} = \frac{\tilde{\theta}_N}{\tilde{\theta}_T} p_N^{\frac{1}{\phi}}$ to substitute out prices in the previous condition yields

$$p_N = h(\tilde{\theta}_H)^\phi \left(\frac{\tilde{\theta}_T}{\tilde{\theta}_N} \right)^\phi$$

Result 2

The price of non-tradables is increasing in θ_H and θ_T , but decreasing in θ_N

Credit expansion: Demand or productive capacity?

1. Credit shock that works through **tradable sector** firms θ_T
 - Boosts productivity of tradable firms
 - Price of non-tradable goods \uparrow ; fixed relative employment
2. Credit shock that works through **non-tradable** sector firms θ_N
 - Boosts productivity of non-tradable firms
 - Price of non-tradable goods \downarrow ; fixed relative employment
3. Credit shock that works through **households** θ_H
 - Boosts household demand
 - Can import tradable goods, but need to produce more non-tradables
 - Price of non-tradable goods \uparrow ; non-tradable relative employment \uparrow

U.S. 1980s Banking Deregulation Natural Experiment

State banking deregulation in the 1980s

- Clean test of dominant channel requires exogenous shock to credit supply
- U.S. 1980s **staggered deregulation of banking restrictions** provides such an experiment
 1. **Intra-state** branching through M&A and *de novo* branching
 2. **Inter-state** banking through M&A
- Boosted competition and passed through aggregate credit supply increase in the 1980s

Deregulation measure

- Focus on how more deregulated banking system transmits aggregate credit supply increase in 1980s
- Construct state deregulation index using **intra-state branching** and **inter-state banking** deregulation dates:

$$DEREG_s = \frac{1}{2} \sum_{j \in \{inter, intra\}} \min\{\max\{1989 - DeregYear_{j,s}, 0\}, 10\}$$

- Connecticut deregulated intra and inter-state banking in 1980 and 1983, respectively, giving it a high $DEREG_s$ score
- Robust to using indicator for whether deregulated by 1983

Table: Deregulation dates

Specifications

- First difference cross-sectional regressions in the “boom” and “bust”

$$\Delta_{82,89} Y_s = \alpha^{boom} + \beta^{boom} \cdot DERE G_s + \Gamma^{boom} \cdot Z_s + \epsilon_s^{boom}$$

$$\Delta_{89,92} Y_s = \alpha^{bust} + \beta^{bust} \cdot DERE G_s + \Gamma^{bust} \cdot Z_s + \epsilon_s^{bust}$$

- Turning points are defined using NBER/credit cycle turning points, but we also present results from the full state-year panel:

$$Y_{st} = \alpha_s + \gamma_t + \sum_{y \neq 1982} \mathbb{1}_{t=y} \cdot DERE G_s \cdot \beta_y + \epsilon_{st}$$

Is this a valid natural experiment?

- Did deregulation occur earlier in states with better income prospects?
 - Kroszner and Strahan (2014): “There is no correlation between rates of bank failures or the state-level business cycle conditions and the *timing* of branching reform.”
 - “States did *not* deregulate their economies in *anticipation* of future good growth prospects.”
- State deregulation timing driven by interest group politics and political ideology (Kroszner and Strahan 1999)
- We show pre-trends, placebo tests, and control for other shocks
- Harder for spurious deregulation timing to explain the tradable/non-tradable dynamics or boom-bust pattern

Credit Expansion: Demand or Productive Capacity?

Stronger loan growth in early deregulation states

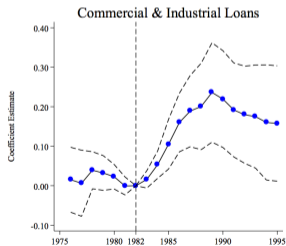
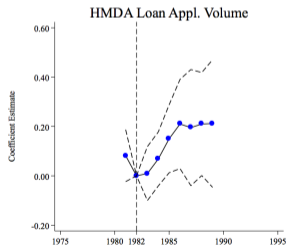
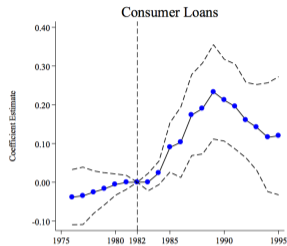
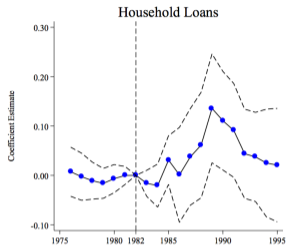
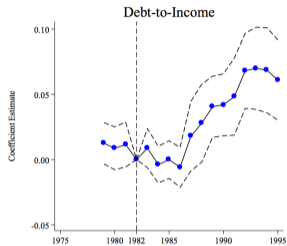
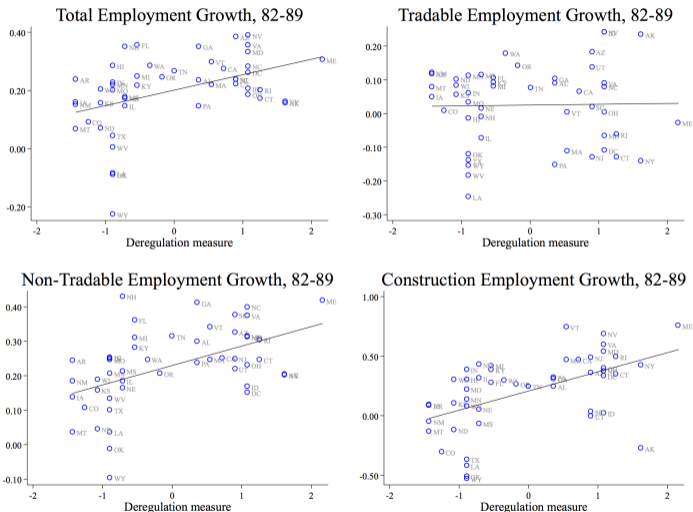


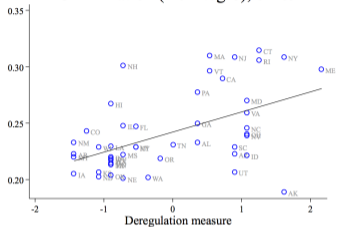
Table: Leverage Growth

Job gains concentrated in non-tradable sector

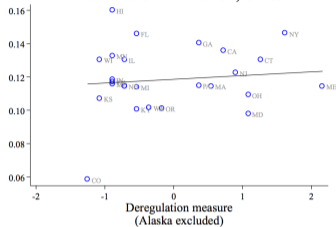


Real appreciation

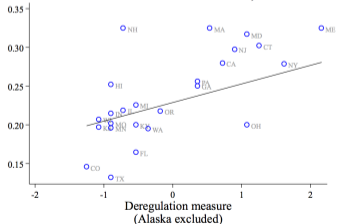
CPI Inflation (Del Negro), 82-89



Tradable CPI Inflation, 84-89



Non-tradable CPI Inflation, 84-89



Business Cycle Amplification

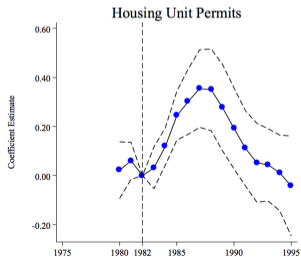
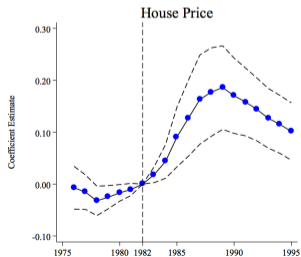
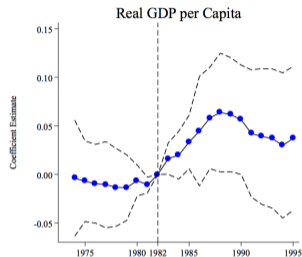
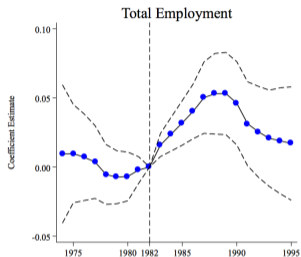
Business cycle amplification

- Credit expansions that boost household demand may lead to worse downturn, **amplifying the business cycle** (Schmitt-Grohé and Uribe 2016, Korinek and Simsek 2016, Farhi and Werning 2015)

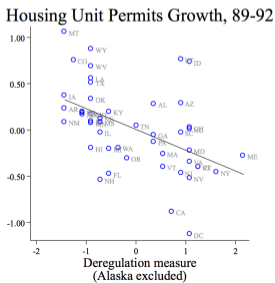
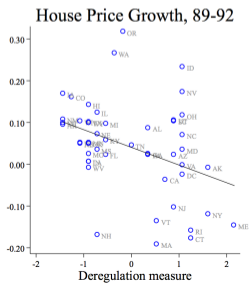
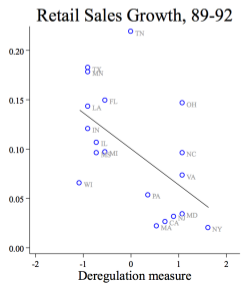
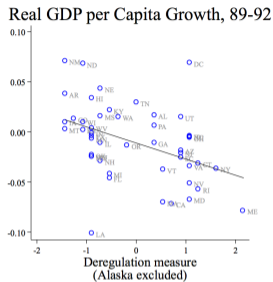
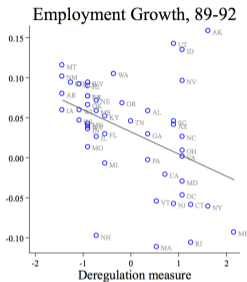
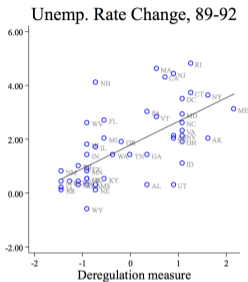
Why a worse downturn?

- **Banking sector losses:** leads to a reversal of credit supply
- **Household debt overhang:** depresses demand when net flows between debtors and creditors reverse
- **Downward price and wage rigidity:** translates declines in spending into lower employment

Amplified business cycle in early deregulation states



Worse recession in early deregulation states



Conclusion

- Sectoral employment and prices can help disentangle whether credit expansion primarily operates through demand or productive capacity
- Applying this test to the U.S. in the 1980s and a broader panel suggests that demand has played dominant role in recent decades
 - These expansions are associated with worse downturns
- Methodology can be used in other settings and in real time
 - Eurozone example
 - Credit supply shocks may operate through productivity channel in other settings

Household Debt Revaluation and the Real Economy: Evidence from a Foreign Currency Debt Crisis

Verner and Gyöngyösi (2020)

Household Debt and Recessions

- Many severe recessions are preceded by rapid expansions in household debt
- Prominent interpretation: **household debt-deflation channel**
 - Debt constrains spending and leads to fire-sales
- Contractionary effects may propagate and have spillover effects on other agents through **financial externalities**
 - Role for macro-prudential policies

Challenges in Assessing Debt-Deflation Channel

- **Limited evidence** isolating the debt-deflation channel and the importance of externalities
- **Identification challenge:** HH debt varies as part of a broader cycle
- **Ideal experiment:** compare two otherwise identical economies, but different *ex post* household debt burden
 - Capture spillovers using variation across individuals within economy

What We Do

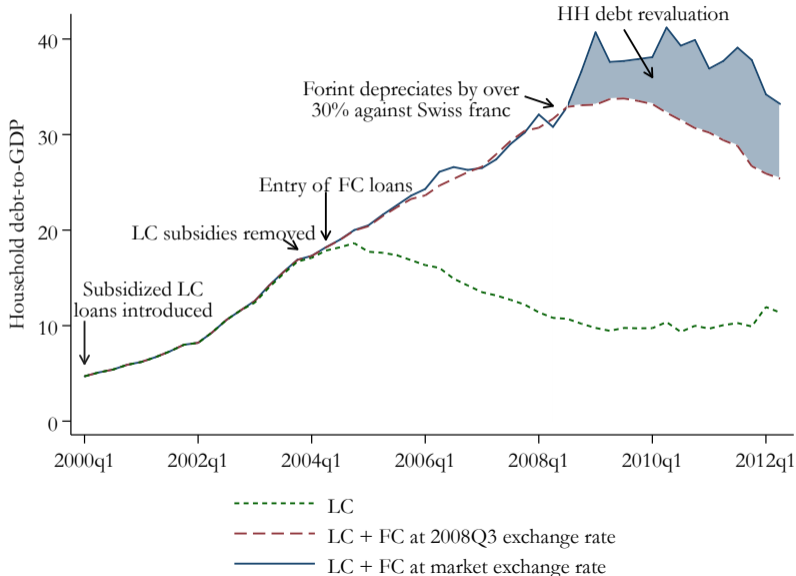
- **Foreign currency debt crisis** in Hungary as a natural experiment
 - Large household FC debt exposures
 - Unanticipated 30%+ depreciation
 - Major aspect of European financial crisis
- Use detailed micro data and exploit **variation in exposure to FC debt** across individuals and local labor markets
 - Variation driven by timing of borrowing and differences in local banking markets
- **Trace effect of debt revaluation** on consumption, real activity, house prices, and LC borrowers

Key Results

1. Household debt revaluation increases household **default** rates, depresses **consumption**, and leads to a **worse local recession**, driven by a decline in local demand
 - 29k USD-PPP increase in debt service destroys one job year
 - Output multiplier on debt service of 1.67
2. **Financial spillovers** of household debt revaluation that make everyone worse off
 - Consistent with presence of demand externality
3. Consequences of foreign currency debt revaluation are especially severe when debt is on **household**, rather than **firm**, balance sheets

Background

Household Credit Expansion in the 2000s



Why an Expansion in Foreign Currency Loans?

- **Lower interest rates**

- Cutback LC loan subsidies \Rightarrow 400bp+ spread between LC and FC
- UIP failure \Rightarrow carry trade

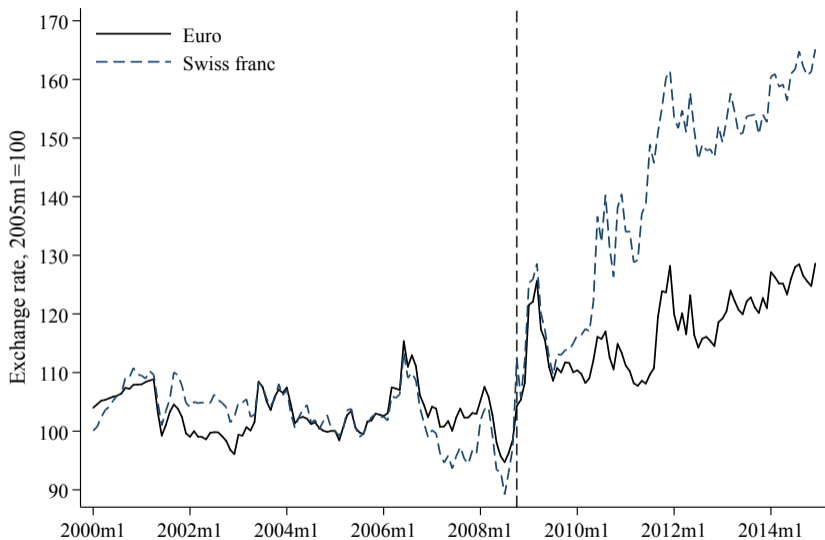
- **Stable exchange rate** environment

- Crawling band between HUF-EUR and EUR-CHF
- Professional forecasters and majority of FC borrowers forecasted stable exchange rate Borrowers Consensus Forecasts
- Expectation of joining euro

- Broader phenomenon in Emerging Markets

- *“While currency mismatch was an important aspect of the Mexico crisis and the East Asian crisis, it reached unprecedented levels in Eastern Europe before the recent crisis”* (Ranciere, Tornell, Vamvakidis 2010)
- \$230bn (19% of GDP) in 2007

Stable Exchange Rate Followed by Depreciation



Theory and Empirical Framework

Theory

- Output response exchange rate shock, Δe , in an economy with household FC debt D^*

$$y_t = \underbrace{\beta_t \Delta e D^*}_{\text{Debt revaluation}} + \gamma_t \Delta e$$

Model details

- Complete markets $\Rightarrow \beta = 0$
- Incomplete markets, no nominal/real frictions $\Rightarrow \beta \geq 0$
 - Labor supply expansion
- Nominal rigidities $\Rightarrow \beta < 0$
 - Demand externality affecting all households
 - Potentially amplified by house price declines
- Wealth effect (Transfer Problem) and leverage effect (Fisher channel)

Identification

- Empirical specification isolates debt revaluation channel by comparing regions with different exposure to FC debt

$$y_{zt} = \alpha_z + \gamma_t + \sum_{j \neq 2008} \beta_j \cdot (\text{FC Debt Exposure}_{z08} \cdot \mathbf{1}_{j=t}) + \epsilon_{zt}$$

- Identifying assumption: **parallel trends**
- Baseline measure of exposure: **FC debt share**, s_{z08}^{FC}
 - Robust to alternative measures

Data

- Loan-level data from Hungarian **household credit registry** with information on debt balances, new borrowing, and default [Details](#)
- Merge household credit registry to **local outcomes**
 - 3124 settlements (city/municipality) \subset 175 subregions \subset 7 regions
 - Standard errors clustered at 175 subregion level based on Ibragimov and Müller (2016) test
 - Weight by population
- Combine with **firm tax records** and **firm credit registry**
 - Comprehensive coverage of private sector FC exposures
 - Control for bank lending channel and alternative firm-specific hypotheses

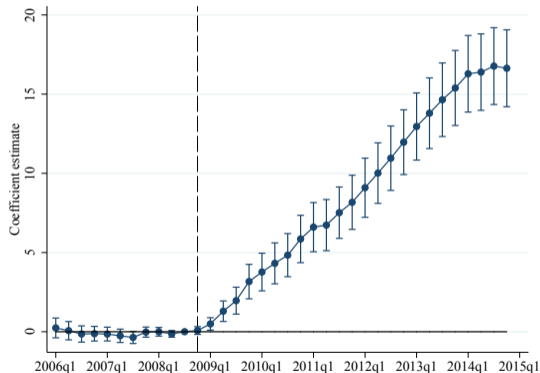
Variation in FC Exposure

- Variation of course not random, but sign of selection is ambiguous
- Roughly balanced at *borrower* level
 - Based on timing of borrowing
- Correlated with lower education at *regional* level
 - Balanced conditional on education
- Supply-side factors
 - Regions with greater historical presence of domestic banks saw larger growth in subsidized LC credit
 - Foreign banks enter less saturated markets after cutback of LC subsidies in 2004 Evidence on banking density

Household Response to Debt Revaluation

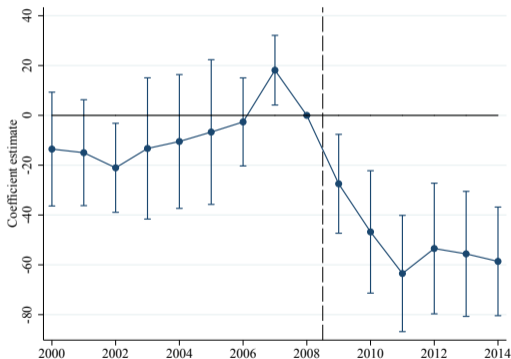
Household Defaults

$$\text{Default}_{zt} = \alpha_z + \gamma_t + \sum_j \beta_j (s_{z08}^{FC} \cdot \mathbf{1}_{j=t}) + \sum_j \Gamma_j (X_z \cdot \mathbf{1}_{j=t}) + \epsilon_{zt}$$



Durable Spending

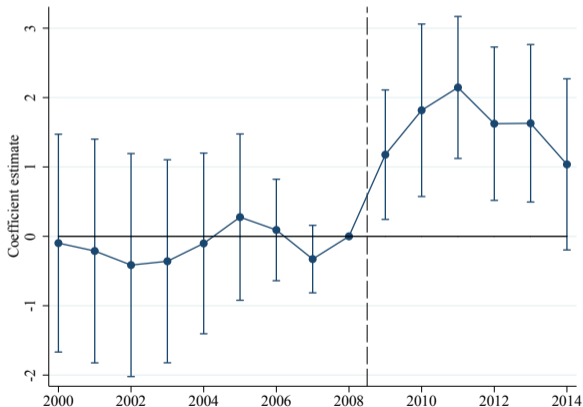
$$\ln(1 + \text{Auto registrations})_{zt} = \alpha_z + \gamma_t + \sum_j \beta_j (s_{z08}^{FC} \cdot \mathbf{1}_{j=t}) + \sum_j \Gamma_j (X_z \cdot \mathbf{1}_{j=t}) + \epsilon_{zt}$$



Debt Revaluation and Real Activity

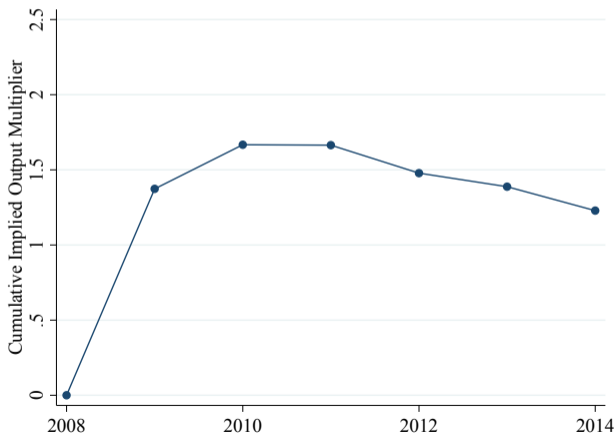
Debt Revaluation Leads to Worse Local Recession

$$[\text{Unemployment rate}]_{zt} = \alpha_z + \gamma_t + \sum_j \beta_j (s_{z08}^{FC} \cdot \mathbf{1}_{t=j}) + \sum_j \Gamma_j (X_z \cdot \mathbf{1}_{t=j}) + \epsilon_{zt}$$



Magnitude: Output Multiplier on Debt Service Shock

$$M_h^Y = \frac{\sum_{j=2009}^h \text{OutputLoss}_j}{\sum_{j=2008:9}^h \text{DebtServiceShock}_j}$$



Mechanisms Behind the Worse Recession

Employment Declines Driven by Demand-Dependent Firms

$$\ln(E_{it}) = \alpha_i + \gamma_t + \beta(s_{z08}^{FC} \times \text{Post}_t) + (X_{iz} \times \text{Post}_t)\Gamma + \epsilon_{it}$$

	All Firms		Non-Exporters	Exporters	Non-Tradable
	(1)	(2)	(3)	(4)	(5)
HH FC debt share, $s_{z08}^{FC} \times \text{Post}$	-8.28 (3.04)	-9.78 (2.77)	-10.6 (3.01)	-1.35 (7.16)	-11.1 (4.76)
Firm and Year FE	Yes	Yes	Yes	Yes	Yes
Firm Controls		Yes	Yes	Yes	Yes
Settlement Controls		Yes	Yes	Yes	Yes
R^2	0.0092	0.071	0.078	0.062	0.081
Number of Firms	66267	66267	53336	12931	16761
Observations	463869	463869	373352	90517	117327

Bank lending channel control

Settlement level

Lagged DV control

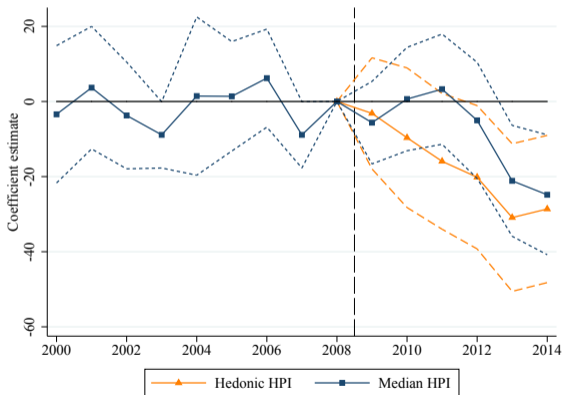
Limited Labor Market Adjustment

- Limited reallocation toward exporters, sluggish wage declines, and lack of out-migration

	Log Payroll Per Worker		Log Nominal Wages		In-Migration Rate	
	(1)	(2)	(3)	(4)	(5)	(6)
HH FC debt share, $s_{208}^{FC} \times \text{Post}$	-3.07 (3.40)	-4.13 (3.64)	7.18 (4.63)	7.27 (5.64)	0.0055 (0.0032)	0.0063 (0.0027)
Unit of Obs.	Firm	Firm	Settl.	Settl.	Settl.	Settl.
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes				
Settlement FE			Yes	Yes	Yes	Yes
Firm Controls		Yes				
2-Digit Industry FE		Yes				
Settlement Controls		Yes		Yes		Yes
Region (7 units) FE		Yes		Yes		Yes
R^2	0.027	0.033	0.63	0.64	0.0013	0.074
Observations	461682	461682	8321	8321	17488	17488

Amplification through House Price Declines

$$p_{zt}^H = \alpha_z + \gamma_t + \sum_j \beta_j (s_{z08}^{FC} \cdot \mathbf{1}_{j=t}) + \sum_j \Gamma_j (X_{z08} \cdot \mathbf{1}_{j=t}) + \epsilon_{st},$$



Financial Spillovers

Financial Spillovers

- Foreign currency debt revaluation causes more severe local recession and fall in house prices
- Models with demand and fire-sale channels imply that financing decisions have **negative financial externalities** on other agents
 - Farhi and Werning (2016); Korinek and Simsek (2016)
- Loan level data on defaults allows us to disentangle **direct** and **indirect effects** through spillovers

Financial Spillovers

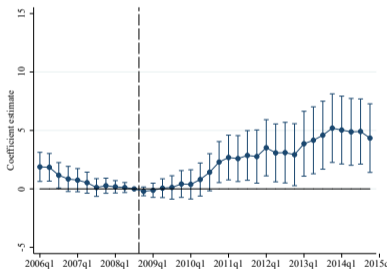
Borrower-level evidence

$$\text{Default}_{ibzt} = \alpha_i + \gamma_t + \underbrace{\beta_1(FC_i \times \text{Post}_t)}_{\text{Direct effect}} + \underbrace{\beta_2(s_{z,-b,08}^{FC} \times \text{Post}_t)}_{\text{Spillover effect}} + \epsilon_{ibzt},$$

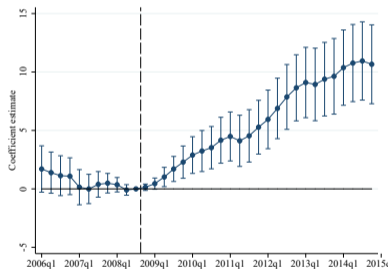
	All Borrowers		LC Borrower	FC Borrower
	(1)	(2)	(3)	(4)
Foreign currency loan, FC_i	2.61** (0.16)	2.59** (0.17)		
Local HH FC debt share, $s_{z,-b,08}^{FC}$		2.30** (0.82)	1.96* (0.96)	3.15** (1.00)
Loan Controls	Yes	Yes	Yes	Yes
Borrower Controls	Yes	Yes	Yes	Yes
Settlement Controls	Yes	Yes	Yes	Yes
R^2	0.012	0.012	0.014	0.0068
Observations	650193	650193	215394	434799

Financial Spillovers Over Time

$$\text{Default}_{i,b,z,t} = \alpha_i + \gamma_t + \sum_q \beta_q \cdot (s_{z,-b,08}^{FC} \mathbf{1}_{q=t}) + \epsilon_{izt}$$



(a) LC Borrowers



(b) FC Borrowers

Household and Firm Foreign Currency Debt

- Large literature has emphasized role of **firm FC balance sheet effects** on investment
- 48% of firm debt in FC
 - *Uncorrelated* with HH exposure across space, even for small firms [show](#)
- Firm FC borrowing driven by: [show](#)
 - Growth opportunities
 - Exporters
 - Majority of firm FC debt is in euro, not franc

Household and Firm Foreign Currency Debt

	Log Invest.	Invest./ Capital	Log Sales	Log Real Val. Added	Log Empl.
	(1)	(2)	(3)	(4)	(5)
Firm FC debt share \times Post	-38.5 (2.44)	-16.6 (1.31)	9.91 (1.14)	10.2 (1.10)	4.21 (0.49)
HH FC debt share, $s_{208}^{FC} \times$ Post	-32.9 (16.7)	3.68 (4.06)	-14.3 (7.42)	-18.9 (7.70)	-9.38 (2.82)
Firm and Year FE	Yes	Yes	Yes	Yes	Yes
Firm Controls	Yes	Yes	Yes	Yes	Yes
Settlement Controls	Yes	Yes	Yes	Yes	Yes
R^2	0.052	0.047	0.037	0.064	0.067
Number of Firms	66263	66267	66267	66259	66267
Observations	418239	463869	463869	461860	463869

Conclusion

- Provide **direct evidence** on relevance of contractionary household **debt-deflation** channel
- Uncover **spillovers of FC debt financing**, consistent with presence of demand externalities
- Supports role for macro-prudential policies, especially in emerging markets where unhedged FC financing is widespread

Open Questions

- What are the drivers of changes in credit supply and financial conditions more broadly?
- What about flawed expectation-formation? Why do lenders (and borrowers) suddenly become (over)-optimistic?
- What role does monetary policy play in driving the financial cycle?
- Should policy lean against the cycle? If so, should it be done by monetary or macro-prudential policy?
- Why are there differences in the severity of credit cycles across sectors?
- How do we reconcile the literature emphasizing the benefits of finance and credit (“finance-growth”) with this evidence on the negative consequences of credit cycles?