FINM 35000: Topics in Economics

Week 5: International Finance, Emerging Markets, Business Cycles and Financial Crises

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Logistics

- Next week we will have a guest lecture from Lisheng and one of his colleagues at the Chicago Fed
- Homework 3 is due on **Friday November 10** so that you can ask Lisheng questions on Wednesday (he wrote this homework)
- We will extend the deadline of homework 4 as well to **Friday November 17** so that you have a full week to work on it after finishing homework 3

CAPM and Fama-French Factors

What is the CAPM?

- The Capital Asset Pricing Model (CAPM) says that:

$$\mathbb{E}[R_i] = R_f + \beta_i \mathbb{E}[R_m - R_f],$$

where $\mathbb{E}[R_i]$ is the expected return of security i, R_f is the risk free rate, R_m is the return of the market portfolio and $\beta_i = \frac{\sigma_{i,m}}{\sigma_m^2}$ is the covariance of R_i with R_m divided by the variance of R_m.

- Deriving the CAPM requires the following assumptions:
  1. No transaction costs
  2. Assets are all tradable and are all infinitely divisible
  3. No taxes
  4. No individual can effect security prices (perfect competition)
  5. Decisions are made solely in terms of expected returns and variances
  6. Unlimited short sales and borrowing and lending at the risk-free rate of return
  7. Homogeneous expectations

CAPM Intuition

- Since the CAPM is an equilibrium statement, every investor must be content with their portfolio holdings; if this were not the case than the prices of the securities would have to change. For example, if some investors want to buy IBM, and no one wants to sell, prices will have to change (move up)
- Since under the CAPM assumptions, investors only care about mean and variance, in equilibrium no one can do anything to increase the Sharpe-ratio of their portfolio
- For all securities, what a security adds to the risk of a portfolio will be just offset by what it adds in terms of expected return. The ratio of marginal return to marginal variance must be the same for all assets
  - What a security adds in expected return is its expected excess return
  - What a security adds in risk is proportional to its covariance with the portfolio
  - This is the intuition for the standard form of the CAPM, which relates β to expected return

Testing the CAPM

- Run the regression:

$$\tilde{R}_{it} = \alpha_i + \beta_i \tilde{R}_{mt} + \varepsilon_{it},$$

  where $\tilde{R}_{it}$ and $\tilde{R}_{mt}$ are the excess returns of asset i and of the market respectively.
- Under the CAPM, α_i would be equal to zero. This is not the case in practice, which led to the creation of richer factor models.
- $\beta_i \tilde{R}_{mt}$ is the systematic or market risk of asset i and ε_{it} is the idiosyncratic risk
- Under the CAPM, investors do not care about idiosyncratic risk because it can be diversified away

Multifactor Models (Arbitrage Pricing Theory)

- APT starts from a characterization that there are multiple common components to stock returns (not just their exposure to the market):

$$R_i = \alpha_i + \sum_{j=1}^{N} \beta_{ij} \tilde{f}_j + \varepsilon_i$$

- In other words, for the residuals to actually be completely idiosyncratic (or asset-specific), we need to consider more than a single factor
- If the firm specific risk is uncorrelated across firms then it can be diversified away by holding large portfolios. The factors, however cannot be avoided. Let's think of the factors as the return to portfolios that are sensitive to the real economic risks (like oil price shocks, announcements about interest rates and so on). Exposure to these portfolios must earn risk-premia

Fama-French Factors

- The Fama-French model is a specific multifactor model
- In the Fama-French three factor model, the three factors are market, size and value
  1. Market is the same as in the CAPM
  2. Size measures market capitalization
  3. Value measures book-to-market ratio (high B/M is value and low B/M is growth)
- Fama-French five factor model adds two additional factors:
  4. Profitability
  5. Investment
- It is also common to include a sixth factor, called momentum, which measures recent performance

Estimating the Fama French Model

- Construct portfolios for each factor (details here):
  - Small minus big (SMB) is long small stocks and short large stocks
  - High minus low (HML) is long value stocks (high B/M) and short growth stocks (low B/M)
  - Robust minus weak (RMW) is long stocks with high profitability and short those with low profitability
  - Conservative minus aggressive (CMA) is long stocks with low investment and short stocks with high investment
- Kenneth French has done this step for you: https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html#Research
- To calculate the β of a given stock to each of the factors, simply regress the excess returns of that stock on the returns of the factor portfolios
- Then, the α is the regression intercept

Overview of International Finance

What is International Finance?

- International finance studies the monetary and macroeconomic relationships between countries as well as the considerations of investors who own assets in foreign countries
- Some important topics in international finance:
  - International institutions (e.g. the IMF and the World Bank)
  - Exchange rates
  - Trade balances and policy
  - International investment

How Are Exchange Rates Determined?

- **Floating:** exchange rates are determined purely by supply and demand
- **Managed Floating:** the countries' central banks will sometimes allow the currency to float freely, but sometimes will step in
- **Currency Board:** explicit legislative commitment to exchange domestic currency for a specified foreign currency at a fixed exchange rate
- **Fixed Peg:** the country maintains the peg by having its monetary authority ready to maintain the fixed parity through direct or indirect intervention
- **Crawling Peg:** currency is adjusted periodically in small amounts at a fixed rate or in response to changes in selective quantitative indicators, such as past inflation differentials with major trading partners, differentials between the inflation target and expected inflation in major trading partners, etc.

Details at https://www.imf.org/external/np/mfd/er/2004/eng/0604.htm

Background on International Financial Institutions I

- Prior to the Great Depression, most countries maintained a gold standard (e.g. the US fixed the dollar at $20.67 per ounce of gold and the UK fixed the pound at £4.24 per ounce, which implies an exchange rate of 4.875 USD to one GBP)
- During the Depression, most countries dropped the gold standard because a loss of confidence threatened a depletion of gold reserves
- In 1944, experts assembled in Bretton Woods, New Hampshire in order to establish an effective international monetary system and prevent a repeat of the catastrophes that followed World War I (such as hyperinflation in Germany)
- The Bretton Woods Conference led to the creation of the International Monetary Fund (IMF) and the International Bank for Reconstruction and Development (IBRD), which would later become part of the World Bank

Background on International Financial Institutions II

- The purpose of the IMF was to monitor and maintain the stability of the fixed exchange rate system that was established at Bretton Woods
- The fixed exchange rate system that arose from Bretton Woods was not a revival of the pre-Depression gold standard, but instead a "gold-exchange standard." What is the difference?
  - USD is the international reserve currency
  - 44 out of 45 ratifying countries agreed to have their currency fixed to the dollar, which was in turn fixed to gold at \$35/ounce
  - The IMF was tasked with "bailing out" countries that run out of dollar reserves
- This fixed exchange rate system collapsed in 1973 when President Nixon cancelled the convertibility of USD to gold
- Now, the IMF is a "lender of last resort" to national governments

Trade Balances I

- Terminology:
  - Trade surplus: exports>imports
  - Trade balance: exports=imports
  - Trade deficit: exports<imports
- How are trade deficits financed? Sale of domestic assets to foreigners
- It is a common misconception that trade surpluses are a good sign for a country's economy and trade deficits are a bad sign
- Important observation: a trade deficit implies an equal financial account trade surplus (to finance the trade deficit)
- One argument in favor of trade deficits is that the investment used to finance them is good for growth

Trade Balances II

- Example of financing the trade deficit:
  - Two countries in the world, A and B. A produces oranges and B produces pears. Oranges and pears can be exchanged one for one.
  - Country A exports 10 oranges and imports 20 pears, which means A has a trade deficit. In other words, it owes B the value of 10 oranges/pears.
  - A serves this debt by either promising to pay B back later (foreign debt) or by giving B shares in its production (foreign investment)
- In this example, there was no currency. Could introducing foreign exchange be another way to serve the debt? No. Why? Because the currency market wouldn't clear if trade wasn't balanced.

Considerations for Investors in International Markets

- Foreign exchange risk
  - A given investment might be riskier for a foreign investor because they are not only exposed to the risk associated with uncertain cash flows, but also with foreign exchange rates
- Legal/policy risk
  - It might be more difficult to liquidate assets held in foreign countries, especially following geopolitical events
- Geographic diversification (and how it relates to home bias)
  - Geographic diversification is generally thought to be a positive, but investors do not diversify internationally as much as they should (this is called home bias)

Emerging Markets: Non-Convertible Currencies and Capital Controls

- Some countries choose to make their currencies non-convertible, which means that it cannot be freely exchanged for another currency. This is a form of capital control.
- The main reasons that countries do this are to prevent a flight of capital and to protect the currency from experiencing undesired volatility

Emerging Markets: Non-Deliverable Forwards (NDFs)

- In order to conduct business in countries with non-convertible currencies, non-deliverable forward (NDF) contracts must be used
- NDFs are OTC derivatives that specify an amount of the non-convertible currency, a maturity date and a forward rate. At maturity, the forward rate is compared against the reference rate of that day (like a spot rate) and the difference is settled in the convertible currency
- These contracts are executed offshore (i.e. not in the country with the non-convertible currency)
- Example:
  - Buy 6 month USDBRL NDF for BRL 10 million at 5.3
  - No money is exchanged now
  - In 6 months, the Brazilian central bank sets the "fixing rate" at 5.4
  - NDF payout is (10 million)$\times$(5.3-5.4) BRL, settled in USD
  - The buyer of the NDF (long USD short BRL) would pay this amount to the seller

Emerging Markets Example: Onshore/Offshore Spread in Brazil

- In general, NDFs and offshore interest rate forwards are a good hedge for their onshore counterparts. However, there is a spread between the offshore products and their onshore counterparts and this spread can fluctuate
- If offshore investors want to receive the fixed leg of a Brazilian swap, then dealers with onshore accounts will pay fixed offshore and receive fixed onshore. The onshore fixed rate will be higher. This is called the on-off spread.
- In 2011, the Brazilian government instituted a tax that led this spread to widen. This tax was reversed three years later and the spread reverted
- Exposure to fluctuations in this spread is a type of basis risk and illustrates one of the difficulties of investing in a market with a non-convertible currency

Covered Interest Rate Parity (CIP)

CIP Overview

- Covered interest rate parity is a no-arbitrage relationship:

$$e^{spot}(1 + i^d) = e^{forward}(1 + i^f),$$

  where e^{spot} and $e^{forward}$ are the spot and forward exchange rates, respectively and i^d and i^f are the domestic and foreign interest rates respectively.
- A forward rate is the exchange rate that an investor can lock in at a certain amount of time (for example, a one year USDCAD forward at 1.40 is a contract to exchange USD for CAD at a rate of 1.40 in one year)

Why Must CIP Hold in Theory?

- Consider a one year forward between USD and CAD
- If e^{spot} is 1.37 (meaning 1.37 CAD buys 1 USD), i^d, which in this case is the interest rate in the US is 4.66% and i^f (the interest rate in Canada) is 4.38%, then to satisfy this relationship, the forward rate e^{foward} must be equal to 1.3737
- What if e^{foward} is 1.3? This means that one could enter into a contract to buy 1 USD for 1.3 CAD. An arbitrageur could:
  1. Borrow 1 USD for one year at 4.66%.
  2. Exchange the borrowed 1 USD on the spot market for CAD (sell 1 USD and get 1.37 CAD).
  3. Lend the CAD at 4.38%.
  4. Buy the USDCAD future (agreeing to buy USD and sell $1.37 \times 1.0438 = 1.430006$ CAD) at 1.3
  5. In one year, get 1.430006 CAD (from the loan in 3 being paid back)
  6. Convert the CAD back to USD at 1.3 using the forward (get $1.430006/1.3 = 1.1$ USD)
  7. Pay back 1.0466 from the original loan.
  8. Pocket 1.1-1.0466=0.0534 USD

CIP Deviations

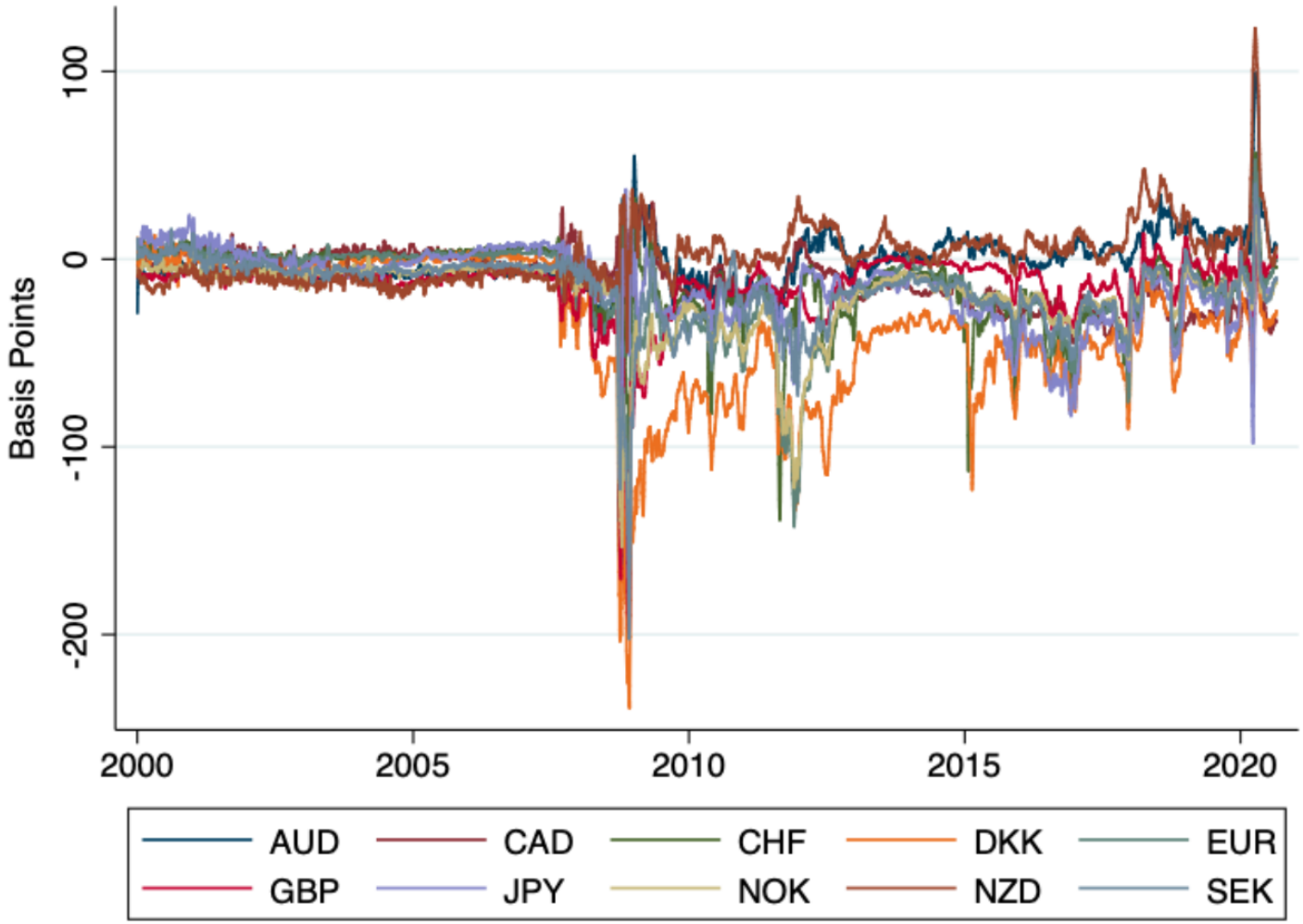
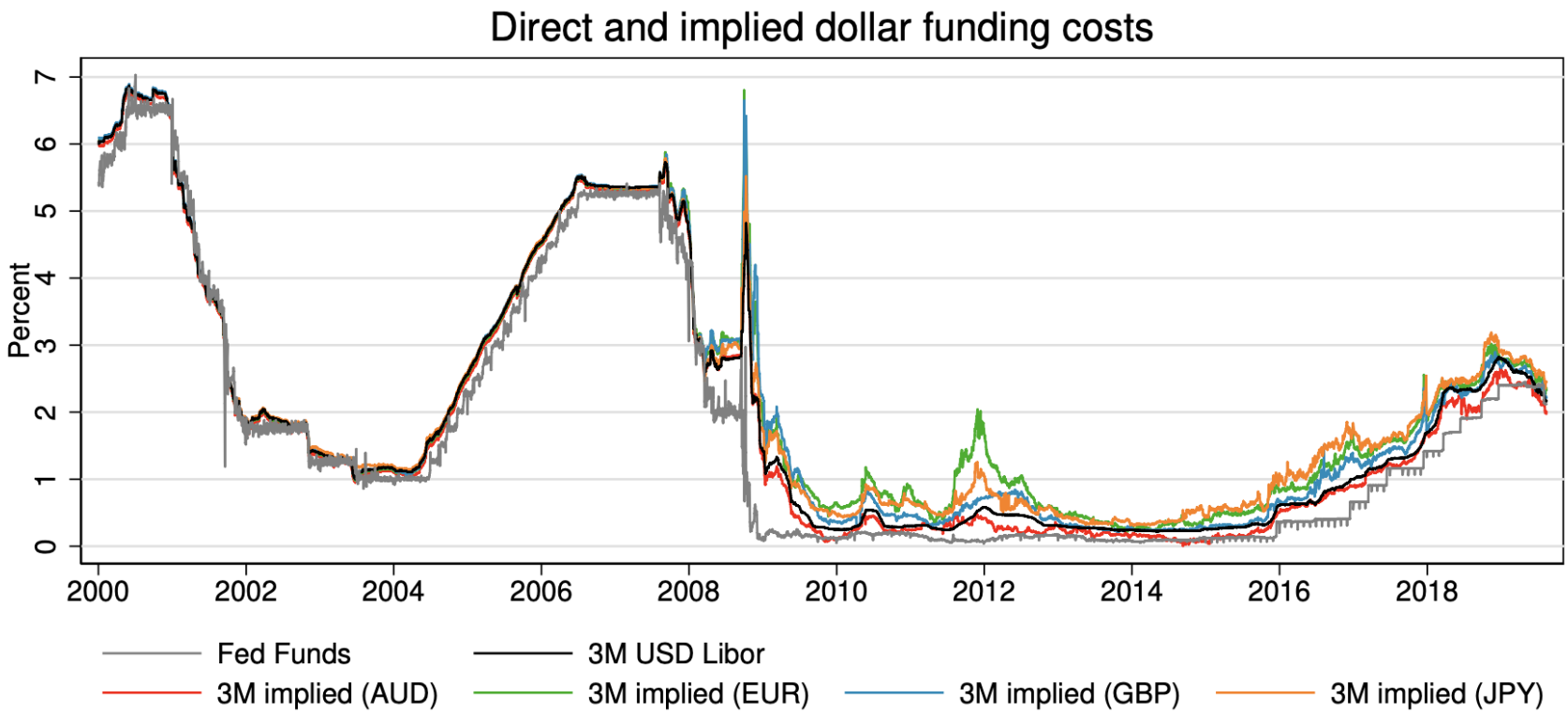


Figure: Cross-currency basis over time.

Why Do CIP Deviations Matter?

- CIP deviations measure offshore dollar funding conditions
- The more negative the cross-currency basis, the tighter the dollar funding condition for market participants who need to borrow from the FX swap markets
- Matters for external transmission of U.S. monetary policy



CIP Deviations as Shadow Cost of Balance Sheet Constraints

- CIP violations represent failure of textbook no-arbitrage
- Usual culprits (such as credit risk, transaction costs) cannot explain away the arbitrage profits
- Since arbitrage exists at very short horizon (e.g. overnight), the classical limits to arbitrage due to "convergence risk" do not apply
- CIP deviations reflect shadow costs of balance sheet constraints on financial intermediaries post-GFC

Empirical Papers Related to International Finance and Emerging Markets

Chang et al. (2022): Overview

- Research question: how do economic shocks propagate across countries?
- Finding 1: trade links are an important source of shock transmission
- Finding 2: news about country fundamentals flows primarily from importers to exporters, depends on both direct and indirect links in the trade network, and is magnified by the exporting country's financial vulnerability
- Key contribution of this paper: past literature has struggled to differentiate between the transmission of idiosyncratic country-level shocks and common exposure to global shocks

Chang et al. (2022): Natural Experiment Setup

- The paper uses two examples of idiosyncratic shocks to look at how these shocks propagate through trade networks:
  1. Japanese triple-disasters (earthquake, tsunami, and radioactive fallout) in March 2011
  2. Wuhan COVID-19 lockdown in January 2020.
- Focuses on the three weeks surrounding each event
- For each week or day, run cross sectional regressions of a countries sovereign CDS return on its closeness to Japan or China in the trade network (measured as country's export to the shocked country as a fraction of the country's aggregate exports measured in 2010) and controls
- Alternative specification replaces the export share for a dummy variable indicating whether the country's share of export to the shocked country is in the top 20% of the sample

Chang et al. (2022): Natural Experiment Results

Table 2
Spillover in the trade network during disaster events.

This table reports the ripple effect in the SCDS market using two exogenous events. The first event is the March 2011 Japanese triple-disasters (earthquake, tsunami, and radioactive fallout). The second event is the January 2020 Wuhan lockdown driven by COVID-19 in China. We conduct event studies both on a daily (columns 1–5) and weekly basis (columns 6–8). *T0/W0* represents the day / week when the event occurred. We focus on the effects during days and weeks following the event. We restrict our sample to countries that export to the country where events take place. For each week (day), we run a cross-sectional regression explaining exporting countries' SCDS returns. Our main independent variable, *ExpShare*, is the total export share of a country's bilateral export to the event country measured in the previous year. $ExpShare_{DUM}$ is a dummy variable that takes the value of 1 if the exporting country's export share falls into the top 20%, and takes the value of 0 otherwise. Other control variables include the country's own lagged sovereign CDS return, the inflation rate measured in previous month, bilateral geographical distance measured as the inverse of the logarithm of distance, and the export-to-GDP ratio measured in the previous year. Panels A1 and A2 report results for the 2011 Japanese tsunami. Panels B1 and B2 report results for the COVID-19 Wuhan lockdown. We report *t*-statistics based on bootstrapped standard errors in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

	Daily returns					Weekly returns		
	T0	*T1*	*T2*	*T3*	*T4*	*W0*	*W1*	*W2*
Panel A1: Japanese tsunami, continuous export share								
ExpShare	0.106**	0.173***	0.041	0.000	−0.012	0.221***	−0.001	−0.012
	(2.03)	(2.64)	(0.91)	(0.01)	(−0.39)	(2.61)	(−0.01)	(−0.21)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. Obs.	71	71	71	71	71	71	71	71
Adj. R^2	0.50	0.23	0.30	0.17	0.02	0.08	0.11	0.21
Panel A2: Japanese tsunami, dummy variable								
$ExpShare_{DUM}$	0.025***	0.029***	0.000	−0.001	0.001	0.048***	−0.005	0.010
	(2.98)	(2.56)	(0.02)	(−0.14)	(0.16)	(2.98)	(−0.36)	(0.91)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. Obs.	71	71	71	71	71	71	71	71
Adj. R^2	0.54	0.28	0.29	0.17	0.02	0.13	0.11	0.22
Panel B1: COVID-19 Wuhan lockdown, continuous export share								
ExpShare	0.082**	0.079***	0.158***	−0.061	−0.030	0.205***	−0.029	−0.041
	(2.08)	(3.17)	(3.23)	(−1.12)	(−0.91)	(2.73)	(−0.56)	(−1.06)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. Obs.	60	60	60	60	60	60	60	60
Adj. R^2	0.01	0.25	0.24	0.24	0.03	0.12	0.08	0.07
Panel B2: COVID-19 Wuhan lockdown, dummy variable								
$ExpShare_{DUM}$	0.022***	0.017***	0.044***	−0.009	−0.012	0.059***	−0.008	−0.008
	(2.67)	(2.59)	(3.36)	(−0.62)	(−1.45)	(3.15)	(−0.58)	(−0.91)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. Obs.	60	60	60	60	60	60	60	60
Adj. R^2	0.01	0.16	0.26	0.22	0.07	0.14	0.08	0.06

Doerr and Schaz (2021): Overview

- Research question: how does the geographic diversification of a bank's syndicated loan portfolio affect loan supply during banking crises?
- Finding 1: diversified banks maintain higher loan supply during banking crises in borrower countries, which leads to higher firm investment and employment growth
- Finding 2: diversified banks are stabilizing due to their ability to raise additional funding during times of distress
- These findings suggest that declining financial integration makes countries more vulnerable to local financial shocks

Doerr and Schaz (2021): Background on Syndicated Lending

- Syndicated loans are issued jointly by a group of banks to a single borrower
- The group of banks is called the lending syndicate and includes at least one lead bank (called the lead arranger) and other participant banks
- The lead arranger negotiates terms and conditions of deals, performs due diligence, and organizes participants. It is in direct contact with the borrower and usually retains a larger loan share
- Syndicated loans are generally larger in size and issued to larger borrowers than other types of bank loans
- For the average country in the sample used in this paper, syndicated lending equals 4.4% of GDP and around 9% of total credit to nonfinancial corporations. It averages 6% of banks' total assets and 20% of their commercial and industrial lending. For the average listed firm, around 45% of total long-term debt is comprised of syndicated loans (higher for smaller firms and firms headquartered in high income countries)

Doerr and Schaz (2021): Measuring Geographic Diversification

- The authors measure geographic diversification as a banks' distribution of cross-border loans by destination country of their borrowers:

$$DIV_{b,t} = 1 - \sum_{j=1}^{J^b} s_{b,j,t}^2,$$

  where $s_{b,j,t}$ is the share a bank b's outstanding loans to borrowers in country j relative to its total outstanding loans in year t. Bank b is active in J^b countries.
- Interpretation: $DIV_{b,t} = 0$ means that all credit of bank b at time t goes to borrowers from one country, whereas higher values reflect more geographic diversification

Doerr and Schaz (2021): Measuring Firm-Level Exposure

- The authors want to measure how exposed a given firm is to geographically diversified banks:

$$exposure_{f,t} = \frac{\sum_{b=1}^{B} DIV_{b,t} \times loan_{f,b,t}}{\sum_{b=1}^{B} loan_{f,b,t}},$$

  where B is the total number of banks with outstanding loans to firm f in year t
- Interpretation: $exposure_{f,t} = 0$ means that firm f borrows exclusively from concentrated banks, whereas higher values indicate lending relationships with more diversified banks

Doerr and Schaz (2021): Empirical Strategy (Bank-Firm Level)

- Test whether bank diversification has an effect on loan supply during financial turmoil in the borrower country:

$$\log(loan_{f,b,t}) = \beta_1 BC_{c,t} + \beta_2 DIV_{b,t-1} + \beta_3 BC_{c,t} \times DIV_{b,t-1} + \phi_{f,b} + \tau_t + \psi_{b,t} + \varepsilon_{f,b,t},$$

  where $\log(loan_{f,b,t})$ denotes the log of outstanding loan volume to firm f by bank b in year t. Banking crisis dummy $BC_{c,t}$ varies at the country level and takes the value one during a crisis in country c in year t. $\phi_{f,b}$ denotes firm$\times$bank fixed effects and τ_t are either firm$\times$year or country$\times$industry$\times$year fixed effects.
- Interpretation: β_3 reflects the change in loan supply by diversified banks minus the change in loan supply by concentrated banks to a given firm

Doerr and Schaz (2021): Bank-Firm Fixed Effects Explanation

- I want to highlight the description in the paper of what the fixed effects are accomplishing (page 9)

The key identification challenge is to absorb loan demand and isolate loan supply. Firms borrowing from diversified banks are on average bigger, so loan demand is likely to be correlated with banks' geographic diversification. Due to the granularity of our data, we can overcome this issue. First, with firm*bank fixed effects we exploit the variation within the same firm-bank combination over time and control for unobservable and time-invariant bank and firm heterogeneity (such as industry or location), as well as for unobservable time-invariant characteristics at the bank-firm level, such as relationship or distance. Second, firm*time fixed effects allow shocks to affect each firm at each point in time heterogeneously. Thereby we control for unobservable time-varying firm fundamentals (such as profitability, risk, and other balance sheet characteristics) to identify credit supply. Essentially, we are comparing the same firm borrowing from different banks in a given year, while using only the within variation of each bank-firm combination for estimation (Jiménez et al., 2014). To miti-

Doerr and Schaz (2021): Empirical Strategy (Firm Level)

- This specification is intended to account for the possibility that the above specification might be picking up firms that substitute away from less diversified banks following a crisis. If this were the case, diversification wouldn't matter for aggregate lending quantity.
- To test this:

$$\Delta y_{f,t} = \gamma_1 BC_{c,t} + \gamma_2 exposure_{f,t-1} + \gamma_3 BC_{c,t} \times exposure_{f,t-1} + \phi_f + \tau_t + u_{f,t},$$

where $\Delta y_{f,t}$ is the log difference of outstanding syndicated loan volume of firm f across all its lenders in year t (alternate specifications use all long-term debt, investment or employment instead of syndicated debt), ϕ_f denotes firm fixed effects and τ_t denotes time-varying country$\times$year or country$\times$industry$\times$ year fixed effects

- Interpretation: γ_3 is the change in loan growth for high-exposure firms minus the change in loan growth for low-exposure firms

Doerr and Schaz (2021): Results (Bank-Firm Level)

Table 5
Diversified banks supply more credit during local crises.

dep. var.:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	log(loan vol)						Δ vol	
banking crisis (BC)	0.011							
	(0.011)							
diversification (DIV)	0.321*	−0.021	−0.020	0.059				
	(0.191)	(0.062)	(0.070)	(0.101)				
DIV × BC	0.287***	0.158***	0.223***	0.187***	0.247***	0.176**	0.295***	0.275***
	(0.025)	(0.016)	(0.017)	(0.053)	(0.073)	(0.086)	(0.082)	(0.082)
log(assets) × BC						0.018		0.000
						(0.011)		(0.011)
WS deposits × BC						0.133***		0.039
						(0.043)		(0.046)
Tier 1 capital ratio × BC						0.001		0.000
						(0.001)		(0.002)
leverage ratio × BC						0.007		−0.001
						(0.006)		(0.007)
return on equity × BC						−0.000		0.000
						(0.000)		(0.000)
Observations	1,621,124	1,621,124	1,621,124	393,763	393,760	393,760	485,107	485,107
R-squared	0.955	0.977	0.966	0.979	0.979	0.979	0.851	0.851
Firm*Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm*Year FE	–	Yes	–	Yes	Yes	Yes	Yes	Yes
Country*Industry*Year FE	–	–	Yes	–	–	–	–	–
Bank*Year FE	–	–	–	–	Yes	Yes	Yes	Yes

Doerr and Schaz (2021): Results (Firm Level)

Table 6
Firms exposed to diversified banks grow faster during crises.

	(1)	(2)	(3)	(4)	(5)	(6)
dep. var.:		Δ loan volume		Δ long-term debt	Δ employment	Δ investment
banking crisis	−0.142***					
	(0.006)					
exposure	−0.475***	−0.185***	−0.182***	−0.261***	−0.074***	−0.163***
	(0.019)	(0.021)	(0.022)	(0.049)	(0.014)	(0.038)
exposure × BC	0.055***	0.050***	0.039**	0.105*	0.029**	0.119***
	(0.014)	(0.017)	(0.019)	(0.057)	(0.014)	(0.042)
Observations	196,337	196,337	196,038	49,340	47,496	51,845
R-squared	0.138	0.172	0.317	0.233	0.349	0.231
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Country*Year FE	–	Yes	–	Yes	Yes	Yes
Country*Industry*Year FE	–	–	Yes	–	–	–

Jagannathan et al. (2022): Overview

- Research question: international equity mutual funds increasingly hire managers from countries linked to their geographic mandate. What effect does this have on holdings, flows and performance?
- Finding 1: funds with "home-linked managers" exhibit a strong bias to invest in stocks of the managers' home countries and attract more flows
- Finding 2: portfolios of stocks from countries in which a fund has a home-field advantage outperform those of funds without "home-linked managers"

Jagannathan et al. (2022): Do Home-Linked Managers Exhibit a Preference Toward Investing in Their Home Country's Securities?

- Regress the percentage allocated by a fund to firms domiciled in a given country on the fraction of managers from that country

Table 2
Home-country biased weights of home-linked managers' portfolios.
This table presents measures of the extent of overweighting of home-country stocks by home-linked managers (*HLMgr*) of active U.S. international equity mutual funds from 1991 to 2014. Results shown are from the following regression: $w_{i,c,t} = \beta\ HLMgr_{i,c,t} + \delta' Z_{i,t} + \eta_i + \zeta_{i,t} + \theta_{c,t} + \varepsilon_{i,c,t}$. The dependent variable $W_{i,c,t}$ is the fraction of the fund *i*'s assets (total equity investments) invested in firms headquartered in country *c* during a quarter *t*. If a fund does not invest in firms headquartered in a country during a quarter, we set the corresponding $w_{i,c,t}$ as missing. $HLMgr_{i,c,t}$ is the ratio of the number of home-linked managers of fund *i* from country *c* to the total number of managers of fund *i* during quarter *t*. Following is a hypothetical example. During a quarter, Fund A in the World Stock Category has three managers in the management team. Suppose that one manager is educated in Canada, the second in Brazil, and the third in the U.S. Fund A invests 40% of its portfolio in Canada ($w_{A,Canada,t} = 40\%$), 30% in Brazil, 20% in Japan, and 10% in the U.S. In this case, there are two home-linked managers - Canada ($HLMgr_{A,Canada,t} = 1/3$) and Brazil ($HLMgr_{A,Brazil,t} = 1/3$). All other fund-quarter control variables, $Z_{i,t}$, are as defined in Table 1 and measured at the end of the previous quarter. Fund size, Turnover, Fund age, and No. of managers are transformed into natural logs. FE denotes fixed effects at the fund level (η_i), at the fund category-quarter level ($\zeta_{i,t}$), and at the country-quarter level ($\theta_{c,t}$). Standard errors are clustered at the country and year level. *t*-statistics are reported in parentheses. *, **, and ***, represent significance at the 10%, 5%, and 1% levels, respectively.

	Global Funds				Regional Funds				Country Funds			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
HLMgr	0.174***	0.139***	0.138***	0.121***	0.338***	0.221***	0.221***	0.203***	0.499***	0.307***	0.323***	0.096***
	(16.1)	(18.1)	(17.3)	(9.46)	(12.9)	(12.9)	(12.4)	(11.3)	(10.37)	(11.23)	(10.73)	(5.40)
Fund size		−0.002***	−0.001	−0.001***		−0.003***	−0.001	−0.004***		−0.002	−0.003	−0.000
		(−13.9)	(−0.73)	(−6.24)		(−8.72)	(−1.43)	(−8.57)		(−1.33)	(−0.70)	(−0.23)
Expense ratio		0.021	0.126	0.858***		0.185	−0.087	1.182***		−0.171	−0.496	0.677
		(0.43)	(0.41)	(6.38)		(1.61)	(−0.22)	(4.53)		(−0.44)	(−0.30)	(1.19)
Turnover		−0.002***	−0.001	−0.003***		−0.001**	−0.003**	−0.007***		−0.002	−0.007	−0.004
		(−6.36)	(−1.27)	(−7.04)		(−2.25)	(−2.21)	(−9.44)		(−0.70)	(−1.40)	(−1.36)
Fund age		0.001***	−0.003	−0.000		0.001*	−0.001	0.008***		−0.004	0.003	−0.006
		(2.62)	(−1.30)	(−0.05)		(1.70)	(−0.25)	(5.41)		(−0.91)	(0.30)	(−1.27)
No. of managers		−0.001***	−0.001	−0.002***		−0.000	−0.001	−0.004***		−0.006	0.002	0.000
		(−4.71)	(−1.17)	(−4.20)		(−0.29)	(−0.73)	(−4.30)		(−1.52)	(0.21)	(0.09)
Constant	0.051***				0.062***				0.110***			
	(25.7)				(27.7)				(17.64)			
Observations	464,578	401,785	401,785	401,785	91,384	79,002	79,002	79,002	14,755	12,664	12,664	12,664
Adj R^2	0.027	0.151	0.203	0.337	0.088	0.403	0.431	0.443	0.141	0.509	0.537	0.828
Category × Qtr FE	NO	YES	NO	NO	NO	YES	NO	NO	NO	YES	NO	NO
Fund FE	NO	NO	YES	NO	NO	NO	YES	NO	NO	NO	YES	NO
Country × Qtr FE	NO	NO	NO	YES	NO	NO	NO	YES	NO	NO	NO	YES

Jagannathan et al. (2022): Do Home-Linked Funds Outperform in Their Managers' Home-Country Stocks?

	Home-country stocks of home-linked managers (HLMgr)						Non-home-country stocks of home-linked managers		
	Long holdings of home-linked managers (HLMgr) only			*Long holdings of home-linked managers (HLMgr), Short holdings of unlinked managers*			*Long holdings of home-linked managers (HLMgr), Short holdings of unlinked managers*		
	(1) Global Funds	(2) Regional Funds	(3) Country Funds	(4) Global Funds	(5) Regional Funds	(6) Country Funds	(7) Global Funds	(8) Regional Funds	(9) Country Funds
Panel A. Performance of funds of home-linked managers by holdings.									
Mean Rets	0.0092***	0.0112**	0.0073	0.0023	0.0049*	0.0044*	−0.0003	0.0022	0.0029
(*t*-stat)	(2.77)	(2.43)	(1.63)	(1.34)	(1.69)	(1.80)	(−0.46)	(1.37)	(1.54)
Alpha	0.0054***	0.0072**	0.0047*	0.0031*	0.0065**	0.0059**	0.0000	0.0029	0.0049**
	(2.67)	(2.33)	(1.89)	(1.69)	(2.21)	(2.29)	(0.05)	(1.62)	(2.46)
Mkt-R_f	0.9677***	1.1568***	1.1183***	−0.0001	−0.0098	0.0256	−0.0276*	−0.1034***	−0.0932**
	(18.1)	(16.9)	(17.3)	(−0.00)	(−0.16)	(0.43)	(−1.70)	(−3.15)	(−2.22)
SMB	0.1669*	0.3395***	0.2010*	0.0350	−0.0466	0.0735	−0.0139	−0.1223	−0.0929
	(1.79)	(2.62)	(1.71)	(0.42)	(−0.36)	(0.54)	(−0.40)	(−1.49)	(−0.92)
HML	0.0977	−0.2074*	−0.3477***	−0.0204	−0.2371*	−0.0601	−0.0286	−0.0814	−0.2123**
	(0.78)	(−1.67)	(−3.65)	(−0.25)	(−1.85)	(−0.59)	(−0.69)	(−0.95)	(−2.10)
MOM	−0.0554	0.0552	−0.0777	−0.0931*	−0.0570	−0.1988**	−0.0162	0.0165	−0.1262**
	(−1.04)	(0.71)	(−1.28)	(−1.86)	(−0.71)	(−2.53)	(−0.66)	(0.35)	(−2.32)
Observations	282	237	207	282	237	207	288	261	231
R^2	0.6720	0.6000	0.7711	0.0136	0.0145	0.0533	0.0115	0.0411	0.0569

Jagannathan et al. (2022): Flows to Home-Linked Funds

Table 7
Fund flows to home-linked funds.
We report results of panel regressions of monthly fund flows to active U.S. international equity mutual funds from 1991 to 2014. Results shown are for the following regression: $Flows_{i,t} = \beta\ Home\text{-}linked_{i,t} + \delta' Z_{i,t} + \eta_i + \theta_t + \eta_i \times \theta_t + \varepsilon_{i,c,t}$. The dependent variable, $Flows_{i,t}$, is the flows to fund i during month t. *Home-linked* is a dummy variable which takes the value of one for funds with home-linked managers (*HLMgr*). Among the control variables, $Z_{i,t}$, we include *Fund return*, the cumulative past 12-month fund return and feature the interaction of *Home-linked* × *Fund return*, in Columns (6) – (8) to assess whether home-linked manager funds are associated with different flow-performance sensitivity. The control variables *Fund size, Turnover, Fund age*, and *No. of managers* have been transformed into natural logs. See Table 1 for variable definitions. FE denotes fixed effects at the fund category level (η_i), at the year level (θ_t) and at category-year levels ($\eta_i \times \theta_t$). *t*-statistics are reported in parentheses. Standard errors are clustered at the fund and year level. *, **, and ***, represent significance at the 10%, 5%, and 1% levels, respectively.

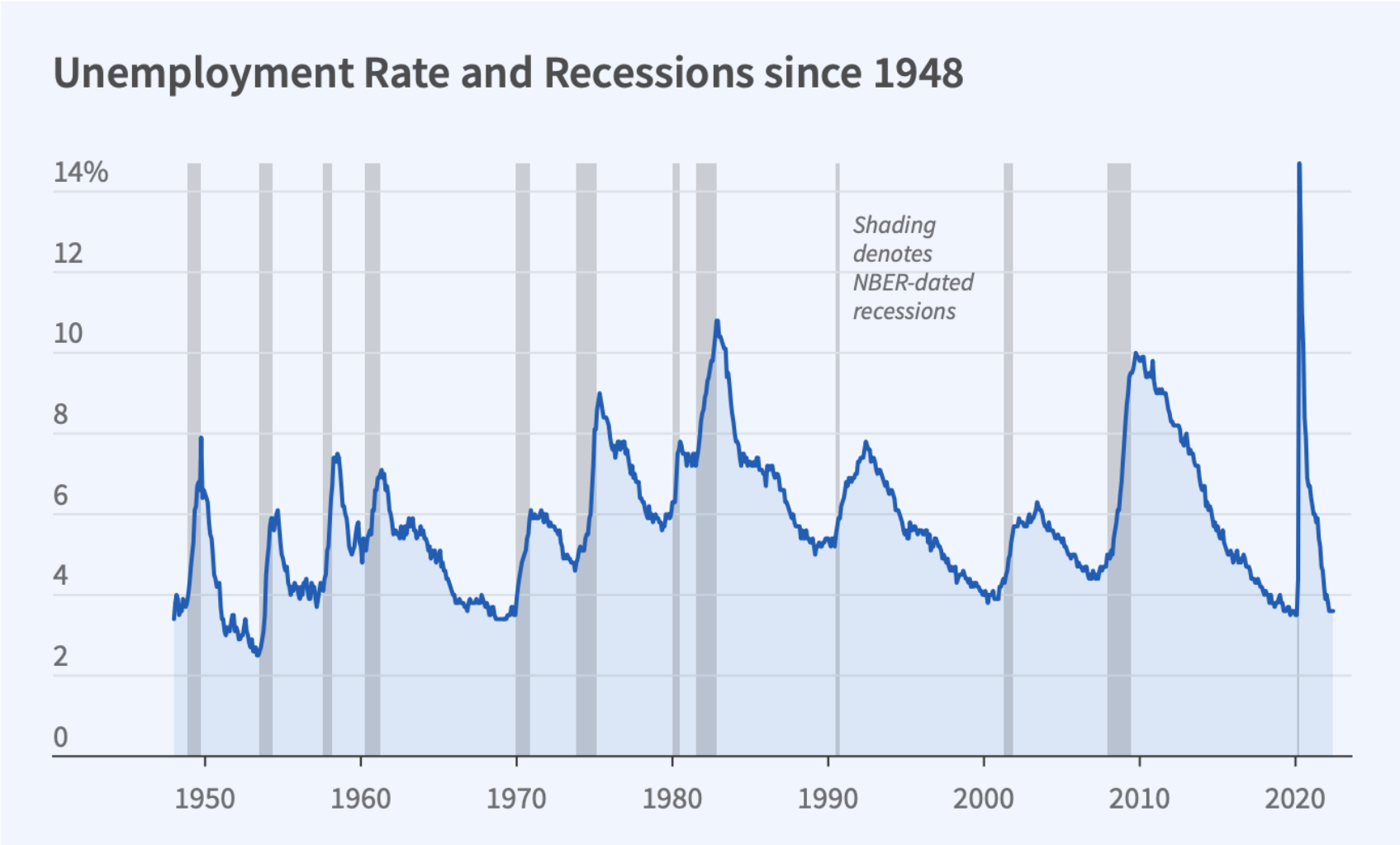
	Global Funds			Regional Funds	Country Funds	Global Funds	Regional Funds	Country Funds
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Home-linked	0.0023**	0.0017**	0.0018**	0.0052**	0.0075**	0.0019*	0.0024	0.0035
	(2.19)	(2.08)	(2.25)	(2.28)	(2.00)	(1.71)	(1.02)	(0.93)
Home-linked × *Fund return*						0.0011	0.0181**	0.0269*
						(0.26)	(2.29)	(1.94)
Fund size	−0.0002	−0.0002	−0.0008***	−0.0007	−0.0062***	−0.0002	−0.0008	−0.0064***
	(−0.51)	(−0.58)	(−2.85)	(−0.93)	(−4.45)	(−0.62)	(−1.05)	(−4.30)
Fund return	0.0345***	0.0329***	0.0251***	0.0200***	0.0313***	0.0415***	0.0245***	0.0304***
	(11.89)	(11.93)	(13.41)	(4.43)	(3.86)	(13.64)	(5.41)	(3.91)
Fund risk	0.0132	0.0677**	−0.0186	−0.0836	−0.1033	−0.0467	−0.1018*	−0.1226
	(0.38)	(1.97)	(−1.11)	(−1.35)	(−1.23)	(−1.42)	(−1.68)	(−1.44)
Expense ratio	0.1215	0.1335	−0.0460	0.0974	0.3688	0.1252	0.0679	0.3108
	(1.09)	(1.57)	(−0.55)	(0.42)	(0.87)	(1.11)	(0.29)	(0.75)
Turnover	−0.0024***	−0.0023***	−0.0018***	−0.0030***	−0.0039**	−0.0023***	−0.0029***	−0.0035**
	(−4.72)	(−5.56)	(−4.62)	(−3.08)	(−2.39)	(−4.29)	(−2.85)	(−2.08)
Fund age	−0.0143***	−0.0144***	−0.0098***	−0.0193***	−0.0066*	−0.0143***	−0.0190***	−0.0057*
	(−17.59)	(−22.72)	(−16.71)	(−10.14)	(−1.95)	(−17.05)	(−9.91)	(−1.78)
No. of managers	−0.0008	−0.0007	−0.0007	0.0013	−0.0009	−0.0007	0.0014	−0.0005
	(−1.00)	(−1.26)	(−1.24)	(0.75)	(−0.33)	(−0.99)	(0.84)	(−0.20)
Prior *experience*	−0.0052***	−0.0045***	−0.0051***	−0.0033	0.0013	−0.0052***	−0.0040	0.0014
	(−2.58)	(−2.86)	(−3.27)	(−1.08)	(0.24)	(−2.61)	(−1.33)	(0.25)
Lagged flow			0.2390***					
			(16.95)					
Observations	51,368	51,368	51,362	13,591	4262	51,368	13,591	4262
Adjusted R^2	0.0520	0.0643	0.1016	0.0569	0.0714	0.0539	0.0604	0.0773
Category FE	YES	NO	NO	YES	YES	YES	YES	YES
Yr FE	YES	NO	NO	YES	YES	YES	YES	YES
Category × Yr FE	NO	YES	NO	NO	NO	NO	NO	NO

Business Cycles and Financial Crises

Business Cycles Overview

- The NBER Business Cycle Dating Committee identifies the dates of peaks and troughs that frame economic recessions and expansions
- It defines recession as the period between a peak of economic activity and its subsequent trough, or lowest point. Between trough and peak, the economy is in an expansion.
- Under the NBER definition, a recession involves a significant decline in economic activity that is spread across the economy and lasts more than a few months
- This interpretation gives rise to three criteria: depth, diffusion and duration
- NBER Business Cycle Dating is retroactive, the committee waits until sufficient data are avaiable in order to avoid needing to make revisions

NBER Recessions Since 1948



Source: https://www.nber.org/research/business-cycle-dating

What Drives Business Cycle Fluctuations?

1. Demand Shocks:
   - Changes in consumer or business confidence can impact their consumption/savings/investment decisions, leading to shifts in aggregate demand
2. Supply Shocks:
   - Geopolitical issues or shocks such as COVID can lead to problems producing enough goods
3. Policy:
   - Fiscal policy can directly increase aggregate demand by increasing government spending, reducing taxes, increasing government transfers to individuals, or a combination of the three. Monetary policy can also be used to impact aggregate demand.

- As you will see in the empirical papers, there are several channels through which these shocks can propagate

Diamond and Dybvig (1983) Model I

- Research question: why are bank deposits subject to runs? What types of policies can be used to make bank runs less likely?
- Background insight: in its simplest form, the purpose of a bank is to turn illiquid assets (e.g. business loans, mortgages) into liquid liabilities (deposits). This liquidity transformation leaves banks vulnerable to runs
- Three key takeaways from this paper:
  1. Banks issuing demand deposits can improve on a competitive market by providing better risk sharing among people who need to consume at different random times
  2. The demand deposit contract providing this improvement has an undesirable equilibrium (a bank run) in which all depositors panic and withdraw immediately, including even those who would prefer to leave their deposits in if they were not concerned about the bank failing
  3. Bank runs cause real economic problems because even "healthy" banks can fail, causing the recall of loans and the termination of productive investment

Diamond and Dybvig (1983) Model II

- There is one consumption good, produced by a riskless technology with the following payoffs:

T=0	T=1	T=1
-1	$\begin{cases} 0 \\ 1 \end{cases}$	$\begin{cases} R > 1 \\ 0 \end{cases}$

  where the choice between $(0, R)$ and $(1, 0)$ is made in period 1
- All consumers are identical in period 0, with each consumer facing a probability of being type 1 (impatient) or type 2 (patient)
  - Type 1 agents only care about consumption in period 1
  - Type 2 agents only care about consumption in period 2
- Agents find out their type in period 1
- The consumption good can be stored at no cost (so if a type 2 agents obtains goods at period 1, they can store them until period 2)
- All consumers get an endowment of 1 in period 0 and no endowment in periods 1 or 2

Diamond and Dybvig (1983) Model III

- What would the consumers do if there was no bank and they could invest in the technology directly?
  - Invest their endowment in the technology. Withdraw at period 1 if they are type 1 and wait until period 2 if they are type 2
  - Type 1 consumers would get one unit of consumption and type 2 consumers would get R
- Consumers discount are type 1 with probability π. What is their expected utility without a bank?

$$\mathbb{E}[u(c)] = \pi u(1) + (1 - \pi)u(R)$$

- Let's say $u(c) = -\frac{1}{c}$, $\pi = 0.25$ and $R = 2$. Then, expected utility of holding the illiquid asset directly is:

$$\mathbb{E}[u(c)] = 0.25 \times \left(-\frac{1}{1}\right) + (1 - 0.25) \times \left(-\frac{1}{2}\right) = -0.625$$

Diamond and Dybvig (1983) Model IV

- What if there was a more liquid asset with the following payoffs?

T=0	T=1	T=1
-1	0	1.813
	1.28	0

- Expected utility would be:

$$\mathbb{E}[u(c)] = 0.25 \times \left(-\frac{1}{1.28}\right) + 0.75 \times \left(-\frac{1}{1.813}\right) = -0.608 > -0.625,$$

so investors would prefer this asset to the illiquid asset

Diamond and Dybvig (1983) Model V

- How does the more liquid asset resemble a bank deposit? The bank could pay 1.28 to those that withdraw in period 1 and 1.813 to those that withdraw in period 2 (think of this as one and two period interest on a savings account)
- How could the bank finance this?
  - Suppose there are 100 depositors, so the bank receives \$100 in period 0 and invests in the illiquid asset
  - In period 1, 25 of those depositors become the impatient type and thus decide to withdraw, so the bank needs to pay out \$1.28$\times$ 25=\$32. It has \$100-\$32=\$68 left in the illiquid asset
  - In period 2, the asset will pay out \$68 $\times$ 2 = \$136, which divided among the 75 type 2 consumers is \$1.813
- This is the sense in which banks provide a "liquidity transformation" service
- This equilibrium, where everyone withdraws according to their type, is the "good equilibrium" and is better than the outcome without banking

Diamond and Dybvig (1983): Model VI

- What could go wrong? If the consumers believe that 79 or more of their fellow consumers will withdraw in period 1, then all of them will try to withdraw
- If 79 consumers withdraw in period 1, then the bank would have to pay $79 \times 1.28 = 101.12$, so the bank would have no money left to invest in order to repay the type 2 consumers
- If that is the case, no one would want to wait until time 2 to withdraw, so all 100 would try to withdraw at time 1
- This is the "bad" or "bank run" equilibrium, which makes consumers worse off than if they had invested directly in the illiquid asset
- The paper proposes two solutions to this problem: deposit insurance and suspension of convertibility

Empirical Papers Related to Business Cycles and Financial Crises

Babina et al. (2023): Overview

- Research question: what effect did the Great Depression have on innovation?
- Main findings:
  1. Areas harder hit by the crisis experienced large and persistent declines in patenting by independent inventors
  2. The decline was largest for young and inexperienced inventors
  3. Innovation by large firms increased

Babina et al. (2023): Empirical Design

- Main specification is a DiD:

$$\log(Innovation_{cst}) = \alpha_c + \gamma_{st} + \beta Crisis_{cs} \times After1929_t + X'_{cst}\zeta + \varepsilon_{cst}$$

  - c indexes counties, s indexes states and t indexes time
  - $Innovation_{cst}$ is the number of patents, total number of future citations or average citations per patent
  - α_c are county fixed effects
  - γ_{st} are state×time fixed effects
  - $Crisis_{cs}$ denotes the degree of bank distress in county c during the crisis
  - X_{cst} contains county-specific controls
- Standard errors are clustered by county

Babina et al. (2023): Results I

Table 3
Local severity of the crisis during the Great Depression and innovation quantity

	(1) Ln(# Ind. Patents+1)	(2) Ln(# Firm Patents+1)	(3) Ln(# Total Patents+1)
Crisis X After1929	−0.127***	0.016	−0.105***
	(0.029)	(0.027)	(0.031)
StateXTime FE	Y	Y	Y
County FE	Y	Y	Y
Start Decade	1910	1910	1910
End Decade	1940	1940	1940
Adj R-Sq	0.895	0.896	0.903
Obs	11,900	11,900	11,900

Babina et al. (2023): Results II

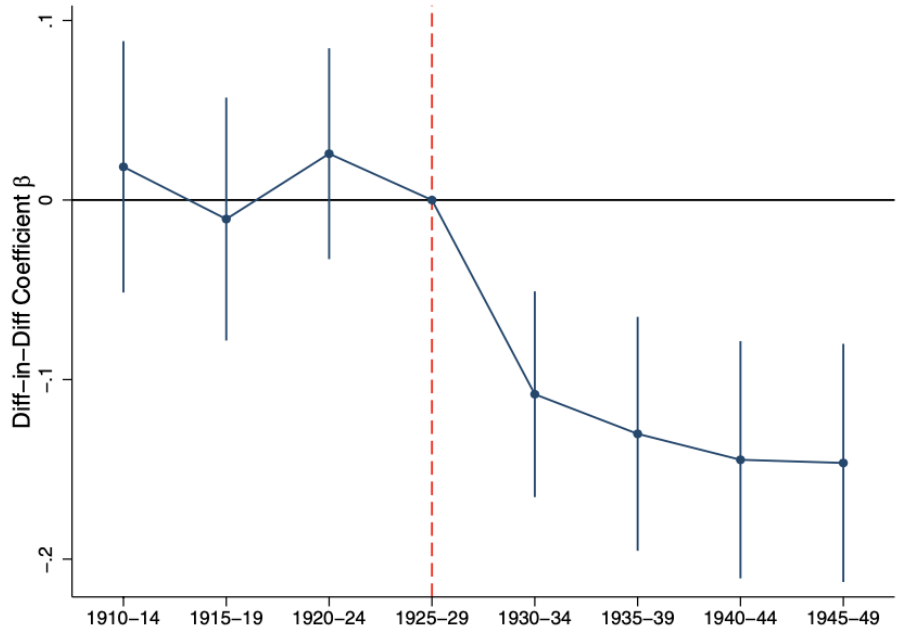


Figure 2
Local severity of the crisis during the Great Depression and independent innovation quantity
The figure shows estimates from a difference-in-differences regression of the number of independent patents on a proxy for the local severity of economic crisis during the Great Depression. The estimation strategy relies on cross-sectional variation in distress across U.S. counties within a state. The sample is the near universe of all independent patents granted by the U.S. Patent and Trademark Office (USPTO). Independents are patents by inventors residing in the United States that were either unassigned or assigned to individuals at the time of the patent grant date. The unit of observation is county-time, where time is 5 years. The dependent variable is the logarithm of one plus the number of independent patents filed over 5-year periods within each county. *Crisis* is an indicator variable equal to one for counties with at least one bank suspension during the Great Depression years of 1930 through 1933, inclusive. The estimates of the effect of local distress on independent innovations are the coefficients for the interaction between Crisis and 5-year indicators that measure the relative change in patenting in areas with high distress relative to the reference period of 1925–1929. We plot betas and 95% confidence intervals from a difference-in-differences regression:

$$ln(Number\,Patents+1)_{cst} = \alpha_c + \gamma_{st} + \sum \beta_t 1_t Crisis_{cs} + \epsilon_{cst}, \quad (2)$$

where c denotes county, s – state, and t – 5-year period. α_c is county fixed effects; γ_{st} is state-by-time fixed effects; and 5-year indicators equal to one for a given time period, and zero otherwise. Standard errors are clustered at the county level.

Babina et al. (2023): Results III

Table 11
Local severity of the crisis during the Great Depression and innovation quantity and quality in the (very) long run

	(1) Ln(# Ind. Pat.+1)	(2) Ln(# Firm Pat.+1)	(3) Ln(# Cit. Ind.+1)	(4) Ln(# Cit. Firm+1)
Crisis X After1929	−0.196***	0.179***	−0.052	0.374***
	(0.030)	(0.039)	(0.045)	(0.064)
StateXTime FE	Y	Y	Y	Y
County FE	Y	Y	Y	Y
Start Decade	1910	1910	1910	1910
End Decade	1990	1990	1990	1990
Adj R-Sq	0.863	0.830	0.761	0.764
Obs	26,775	26,775	26,775	26,775

The table shows estimates from a difference-in-differences regression of the number of patents and patent citations on the local severity of economic crisis during the Great Depression in the (very) long run. The estimation strategy relies on cross-sectional variation in distress across U.S. counties within a state. The sample is the near universe of all patents granted by the U.S. Patent and Trademark Office (USPTO) to either U.S. inventors or U.S. firms. The unit of observation is county-decade, where decades include 1910 through 1990. In column 1, we limit the sample to independent patents and define the dependent variable as the logarithm of one plus the number of independent patents filed over 10-year periods within each county. Independent denotes patents by inventors residing in the United States that were either unassigned or assigned to individuals at the time of the patent grant date. In column 2, we limit the sample to patents assigned to large, incumbent U.S. firms and define the dependent variable as the logarithm of one plus the number of U.S. firm patents filed over 10-year periods within each county. We define large incumbent firms as having at least three patents in a prior decade (three patents is the 75th percentile). In columns 3 and 4, we repeat the same analyses, but we use as outcome variables the total number of all future citations given to patents filed by independents (column 3) and large firms (column 4) over 10-year periods within each county. *Crisis* is an indicator variable equal to one for counties with at least one bank suspension during the Great Depression years of 1930 through 1933, inclusive. The main coefficient of interest is the interaction between the *Crisis* variable and the After1929 indicator, which equals one for the observations starting from the 1930s decade. This variable estimates the average long-run change in the outcome considered between more and less affected areas. All columns include state-by-time and county fixed effects. Standard errors are clustered at the county level and reported in parentheses.
$^{*}p < .1$; $^{**}p < .05$; $^{***}p < .01$.

Babina et al. (2023): Results IV

Table 12
Local severity of the crisis during the Great Depression and independent innovation in the (very) long run: Heterogeneity by external finance dependence and teamwork

	Ln(# Independent Patents+1)			
	(1)	(2)	(3)	(4)
Crisis X After1929	−0.216***	−0.142***	−0.201***	−0.109***
	(0.029)	(0.026)	(0.030)	(0.023)
StateXTime FE	Y	Y	Y	Y
County FE	Y	Y	Y	Y
LHS	High Fin. Dep.	Low Fin. Dep.	Solo Patent	Team Patent
Start Decade	1910	1910	1910	1910
End Decade	1940	1940	1940	1940
Adj R-Sq	0.849	0.831	0.860	0.772
Obs	26,775	26,775	26,775	26,775

The table shows estimates from a difference-in-differences regression of the number of patents on the local severity of economic crisis during the Great Depression in the (very) long run across different patent types. The estimation strategy relies on cross-sectional variation in distress across U.S. counties within a state. The sample is the near universe of all patents granted by the U.S. Patent and Trademark Office (USPTO) to either U.S. inventors or U.S. firms. The unit of observation is county-decade, where decades include 1910 through 1990. In column 1, we limit the sample to independent patents in technologies used by industries that are more dependent on external finance and define the dependent variable as the logarithm of one plus the number of independent patents in this category filed over 10-year periods within each county. We identify a patent as high-dependence if its technology class (CPC three-digit) is linked with any high-dependence industry (column 3, table A3) in Nanda and Nicholas (2014). We use the concordance table by Goldschlag et al. (2019) to link industries and technologies. In column 2, we repeat the same procedure but now look at independent patents in technologies that are used in industries less dependent on external finance, defined as the residual category. In column 3, we limit the sample to independent patents that are produced by inventors working alone (i.e., solo inventor) and define the dependent variable as the logarithm of one plus the number of independent patents in this category filed over 10-year periods within each county. Following the same logic, in column 4, we do the same but focus on patents filed by independent inventors patenting in teams. *Crisis* is an indicator variable equal to one for counties with at least one bank suspension during the Great Depression years of 1930 through 1933, inclusive. The main coefficient of interest is the interaction between the *Crisis* variable and the After1929 indicator, which equals one for the observations starting from the 1930s decade. This variable estimates the average long-run change in the outcome considered between more- and less-affected areas. All columns include state-by-time and county fixed effects. Standard errors are clustered at the county level and reported in parentheses.
$^{*}p < .1$; $^{**}p < .05$; $^{***}p < .01$.

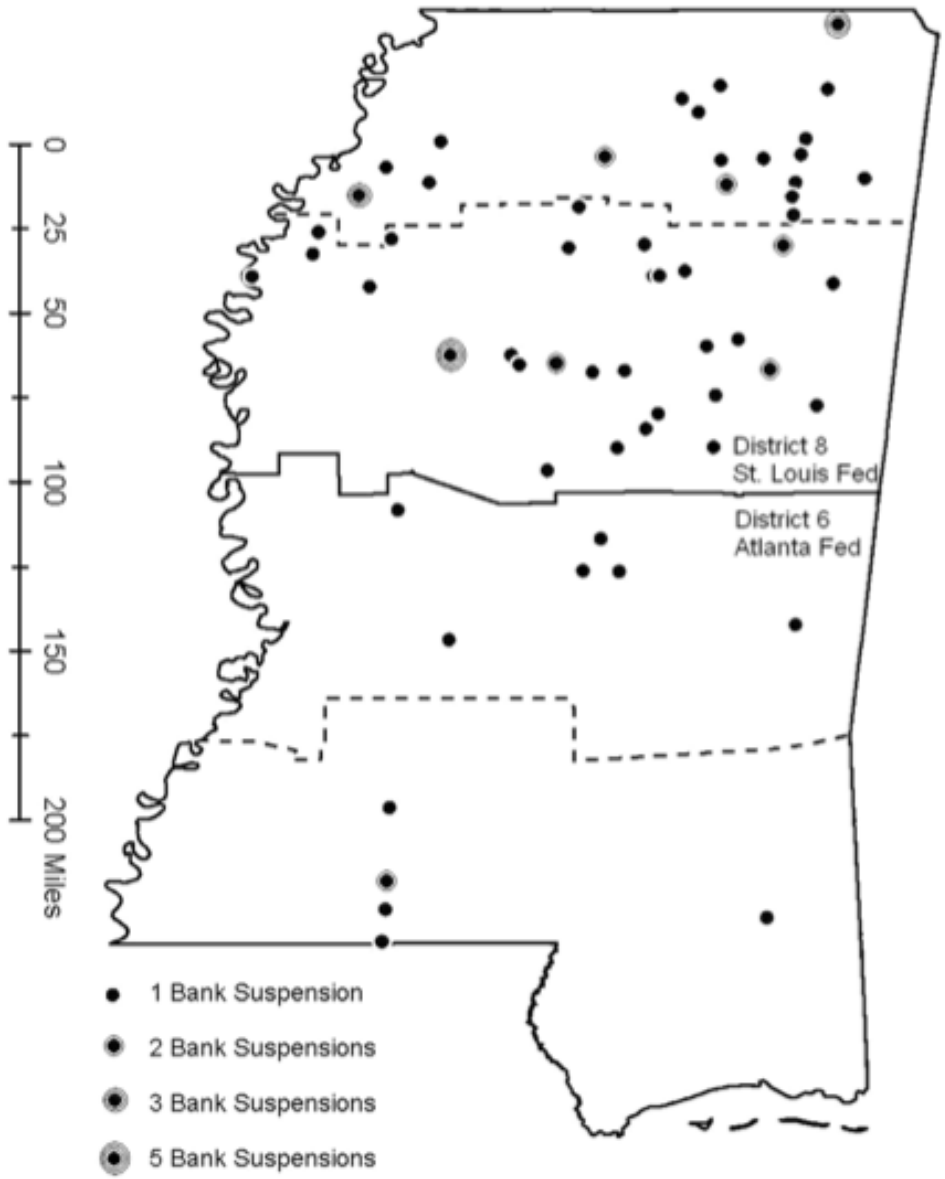
Richardson and Troost (2009): Overview

- Research question: what is the effect of central bank aid to struggling banks on bank failure, lending, local commerce and local economic recovery?
- The problem is that the reasons for the central bank's decision to lend to certain struggling banks could be correlated with the likelihood of that bank failing and with local economic conditions
- The solution is to exploit the fact that, during the Great Depression, Mississippi was divided between the Atlanta and St. Louis Federal Reserve Districts and the two regional Fed banks had very different policies with respect to helping struggling banks

Richardson and Troost (2009): Historical Background

- Three key facts:
  1. At the beginning of the depression, the Atlanta and St. Louis Federal Reserve banks employed different policies with respect to acting as a lender of last resort
  2. Mississippi was homogeneous in economic, demographic and regulatory dimensions, particularly in counties adjacent to the Federal Reserve district boundary
  3. In the fall of 1930, Mississippi experienced a panic in which a sudden shift in depositors' perceptions about the safety of financial institutions triggered a bank run
- The Atlanta Fed employed a policy of acting as a lender of last resort to extend credit to "solvent but illiquid" financial institutions to enable them to survive deposit losses and thus prevent runs
- The St. Louis Fed was a proponent of the "Real Bills view that the supply of credit should contract during recessions" since a lower level of economic activity required less credit to sustain it. As a result, the St. Louis Fed limited lending or required double collateral (until it changed course in 1931)

Richardson and Troost (2009): Preliminary Evidence of a Geographic Discontinuity



Richardson and Troost (2009): Details of 1930 Mississippi Banking Crisis

- On November 7, 1930, Caldwell and Company, which controlled the largest financial conglomerate in the South, collapsed, which led to bank runs in Tennessee, Arkansas, Illinois, and North Carolina
- Over the following six weeks, newspapers reported on the financial scandal leading to this collapse and to the closure of the Bank of the United States in New York City. They also reported on a court decision that invalidated a law that had previously exempted Mississippi banks from taxation
- The cumulative effect of these events was a lack of depositor confidence in Mississippi banks, with deposits falling slowly until December 19, 1930 when the state banking department closed three banks (one because of embezzlement and two because of frozen assets), leading to panic
- The differing response of the Atlanta and St. Louis Federal Reserve Banks to this panic provides a natural experiment

Richardson and Troost (2009): Main Results

TABLE 5
LOG-LOGISTIC SURVIVAL REGRESSIONS FOR INDIVIDUAL BANKS
Dependent Variable: Log Days until Bank Distress

	(1)	(2)	(3)	(4)	(5)	(6)
Fed Atlanta during crisis 1930	11.20*	2.65*	2.45*	2.64*	2.82*	1.96*
	(1.18)	(.78)	(.67)	(.76)	(1.35)	(.53)
Fed Atlanta during crisis 1931	1.25	.42	.47	.31	.13	.28
	(.84)	(.65)	(.59)	(.64)	(1.23)	(.50)
Fed Atlanta during crisis 1933	.61	1.07	.97	.86	.73	.77
	(.92)	(.94)	(.90)	(.98)	(1.35)	(.72)
Federal Reserve Atlanta	−1.01*	−.90*	−.98*	−1.05*	−.93**	−.77*
	(.38)	(.36)	(.47)	(.43)	(.52)	(.33)
Banking crisis—fall 1930	−12.38*	−3.76*	−3.50*	−3.70*	−4.19*	−2.67*
	(1.19)	(.92)	(.77)	(.92)	(1.60)	(.58)
Banking crisis—fall 1931	−2.85*	−2.41*	−2.23*	−2.34*	−2.66*	−1.88*
	(.74)	(.59)	(.54)	(.56)	(.78)	(.45)
Banking crisis—winter 1933	−1.00	−1.51**	−1.40**	−1.50**	−1.46	−.47
	(.70)	(.87)	(.81)	(.87)	(1.33)	(.56)
Assets % cash		6.37*	5.66*	6.31*	7.06*	4.55*
		(1.51)	(1.41)	(1.53)	(2.35)	(1.142
Net worth/total assets		7.53*	6.08*	6.60*	6.57*	6.96*
		(2.21)	(1.94)	(2.19)	(2.54)	(2.29)
Constant	9.09*	5.59*	4.97*	6.99*	11.31*	68.41
	(.35)	(1.97)	(2.09)	(2.14)	(3.65)	(78.73)
$\ln(\gamma)$	−.37*	−.65*	−.70*	−.67*	−.61*	−.82*
	(.09)	(.11)	(.11)	(.12)	(.13)	(.12)
Bank characteristics vector		MS	MS	MS	MS	CM
County characteristics vector			MS	PC	PC	CM
Number of explanatory variables	9	17	21	22	22	28
Sample limited to					Border counties	
Number of subjects	318	318	318	318	181	318
Number of failures	129	129	129	129	72	129
Days at risk	314,954	314,954	314,954	314,954	176,581	314,954
Log likelihood	−186.3	−144.2	−140.3	−141.8	−78.8	−133.8
Wald χ^2	115.6	34.3	44.6	40.6	35.4	98.35
Wald χ^2 degrees of freedom	7	15	19	20	20	26

NOTE.—The dependent variable is log days until distress (liquidation, suspension, or consolidation under duress) after July 1, 1929. Standard errors (in parentheses) estimated with Huber-White sandwich method clustered on individual banks. CM indicates that the vector of control variables conforms to the specifications of Calomiris and Mason (2003). MS indicates that the vector is fitted to Mississippi fundamentals. PC indicates that the vector consists of principal components of county variables. The border county sample consists of all banks located in counties for which at least 50 percent of the area lay within 1 degree latitude of the Federal Reserve district border. The number of explanatory variables includes the constant and the curvature parameter.

* Significant at the 5 percent level.

** Significant at the 10 percent level.

Chodorow-Reich (2014): Overview

- Research question: how do bank lending frictions affect employment outcomes?
- Problem: struggling firms may have trouble getting a loan and also reduce employment, so we need an exogenous shock to bank lending frictions
- Solution: use the dispersion in lender health following the Lehman bankruptcy
- Findings: firms that had precrisis relationships with less healthy lenders had a lower likelihood of obtaining a loan following the Lehman bankruptcy, they paid a higher interest rate if they did borrow and they reduced employment compared to precrisis clients of healthier lenders. These effects are driven by small and medium firms

Chodorow-Reich (2014): Identification Details

- Identification relies on two observations:
  1. Bank-borrower relationship are sticky (i.e. firms that borrowed before the crisis from banks that did less lending during the crisis would have greater difficulty obtaining bank financing than firms that had borrowed from healthier lenders)
  2. The origins of the 2008 crisis lay outside of the corporate loan sector, implying that the cross-sectional variation in banks' willingness to make corporate loans was plausibly orthogonal to the characteristics of each banks' precrisis borrowers
- Example: During the financial crisis, Credit Suisse suffered large losses from exposure to mortgage-backed securities, while US Bankcorp did not. In the nine months following the Lehman bankruptcy, Credit Suisse reduced its lending in the syndicated market by about 79% relative to before the crisis, whereas U.S. Bankcorp reduced lending by only 14%. As a result, firms with precrisis lending syndicates where U.S. Bankcorp had a lead role were nearly four times as likely to receive a loan during the crisis as firms with syndicates where Credit Suisse had a lead role

Chodorow-Reich (2014): Evidence of Relationship Stickiness

- To test whether relationships in the syndicated lending market are sticky:

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

- Main coefficient of interest is γ_1, which is 0.71, indicating that even after controlling for a bank's average market share (α_b), a bank that served as the prior lead lender of a private borrower (the omitted category) has a 71 percentage point greater likelihood of serving as the new lead lender
- Both γ_3 and γ_4 are negative, indicating a lower repeat borrowing propensity among publicly traded borrowers without and with a credit rating, respectively

Chodorow-Reich (2014): Empirical Strategy I

- To measure the quantity of loans made by bank b to all borrowers other than firm i relative to before the crisis, define:

$$\Delta L_{-i,b} = \frac{\sum_{j \neq i} \alpha_{b,j,crisis} L_{b,j,crisis}}{0.5 \sum_{j \neq i} \alpha_{b,j,normal} L_{b,j,normal}},$$

  where $L_{b,j,t}$ is equal to one if bank b makes a loan to borrower j in period t and $\alpha_{b,j,t}$ is a proxy for bank b's share of the loan.

- To measure loan supply to borrower i, define:

$$\Delta \tilde{L}_{i,s} = \sum_{b \in s} \alpha_{b,i,last} \Delta L_{-i,b},$$

  which in words is a weighted average over all members of the last precrisis loan syndicate.

Chodorow-Reich (2014): Empirical Strategy II

- The author constructs two instruments for borrower loan supply:
  1. Exposure to Lehman Brothers, measured as the fraction of a bank's syndication portfolio where Lehman Brothers had a lead role
  2. Exposure to toxic mortgage-backed securities, measured as the correlation of the bank's daily stock return with the return on an index of residential mortgage-backed securities

	(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

Chodorow-Reich (2014): Empirical Strategy III

- The main analysis in the paper aims to answer three questions:
  1. Does lender health affect the probability of borrowing?
  2. Conditional on borrowing, does lender health effect the interest rate?
  3. Do the effects on lending spill over into employment?

Chodorow-Reich (2014): Results I

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

Chodorow-Reich (2014): Results II

THE EFFECT OF BANK HEALTH ON INTEREST RATE SPREADS

	(1)	(2)	(3)	(4)	(5)	(6)
	Change in interest rate spread					
	OLS		$\Delta\tilde{L}_{i,s}$ instrumented using			
			Lehman exposure	ABX exposure	Bank statement items	All
Explanatory variables						
%Δ loans to other firms ($\Delta\tilde{L}_{i,s}$)	−14.6**	−12.2**	−23.1*	−20.0	−17.2*	−17.6**
	(5.26)	(4.15)	(11.2)	(13.3)	(7.63)	(6.68)
1-digit SIC, 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			60.5	7.8	14.3	14.5
J-statistic p-value	.	.	.	.	.	0.967
$E[\Delta Spread]$	130.6	130.6	130.6	130.7	130.6	130.7
$E[\widehat{Spread}:\Delta\tilde{L}_{p90} - \Delta\tilde{L}_{p10}]$	−39.7	−33.0	−62.8	−54.3	−46.6	−47.7
Lead lender 1 clusters	34	34	34	32	34	32
Lead lender 2 clusters	30	30	30	28	30	28
Observations	350	350	350	346	350	346

Chodorow-Reich (2014): Results III

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
$E[\tilde{g}_j^y : \Delta\tilde{L}_{p90} - \Delta\tilde{L}_{p10}]$	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

Mian and Sufi (2014): Overview

- Research question: what can explain the large drop in employment in 2007-2009?
- Findings:
  - Deterioration in household balance sheets, which the authors call the "housing net worth channel," played a significant role in the sharp decline in US employment between 2007 and 2009
  - Counties with a larger decline in housing net worth experience a larger decline in non-tradable employment
  - This result is not driven by industry-specific supply-side shocks, exposure to the construction sector, policy-induced business uncertainty, or contemporaneous credit supply tightening
- Definition of the housing net worth channel: decline in employment because of a sharp reduction in the housing net worth of households. A decline in housing net worth could reduce employment by suppressing consumer demand either through a direct wealth effect or through tighter borrowing constraints driven by the fall in collateral value

Mian and Sufi (2014): Empirical Strategy I

- In order to test whether housing net worth shocks translate into non-tradable employment losses, run the following regression:

$$\Delta \log E_i^{NT} = \alpha + \eta \times \Delta HNW_i + \varepsilon_i,$$

where $\Delta \log E_i^{NT}$ is the log change in non-tradable employment excluding construction (e.g. restaurants, grocery stores, entertainment) in county i between 2007 and 2009, ΔHNW_i is the housing net worth shock, defined as $\frac{\Delta \log p_{06-09}^{H,i} \times H_{2006}^i}{NW_{2006}^i}$.

- Note that the change in housing net worth depends on both the change in house price and household leverage

Mian and Sufi (2014): Empirical Strategy II

- Concern: change in housing net worth may be spuriously correlated with supply side industry-specific shocks that impact both employment and housing net worth. Specifically, certain industries may be harder hit during the recession, and counties with greater exposure to these industries may naturally experience both a larger decline in housing net worth and larger fall in employment.
- They address this by adding controls for the share of a county's employment in 2006 that is in each of the 23 two-digit industries
- They also instrument for change in housing net worth using housing supply elasticity and controlling for job losses in construction

Mian and Sufi (2014): Results

NON-TRADABLE EMPLOYMENT GROWTH AND THE HOUSING NET WORTH SHOCK[a]

	Employment Growth, Non-Tradable Industries, 2007–2009									
Non-Tradable Definition Used:	Rest. & Retail	Geog. Concen.	Rest. & Retail	Geog. Concen.	Rest. & Retail	Geog. Concen.	Rest. & Retail	Rest. & Retail	Geog. Concen.	Rest. & Retail
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Δ Housing Net Worth, 2006–2009	0.190**	0.199**	0.174**	0.166**	0.374**	0.208*	0.489**	0.440**	0.212*	0.133**
	(0.042)	(0.049)	(0.043)	(0.046)	(0.132)	(0.086)	(0.127)	(0.140)	(0.091)	(0.036)
	[0.022]	[0.017]	[0.021]	[0.016]	[0.081]	[0.067]	[0.118]	[0.072]	[0.057]	[0.022]
$\Delta HNW *$ (Construction Share 07)								−1.99*	−0.325	
								(0.856)	(0.561)	
Construction Share 07								−0.082	−0.183	
								(0.158)	(0.126)	
Δ Construction Employment, 2007–2009										0.079**
										(0.027)
Constant	−0.022**	−0.021**	0.176	0.070	0.445	1.233**	−0.102	0.254	0.072	0.162
	(0.007)	(0.007)	(0.443)	(0.286)	(0.536)	(0.438)	(0.57)	(0.428)	(0.290)	(0.430)
Specification	OLS	OLS	OLS	OLS	IV	IV	IV	OLS	OLS	OLS
Industry controls?			YES	YES	YES	YES	YES	YES	YES	YES
Other controls?							YES			
N	944	944	944	944	540	540	540	944	944	944
R^2	0.096	0.156	0.175	0.236	0.158	0.275	0.144	0.188	0.239	0.194

Campello et al. (2010): Overview

- Research question: how do financial constraints affect firm behavior during the financial crisis?
- Use a survey of 1,050 CFOs in the US, Europe and Asia to elicit a measure of financial constraints during the global financial crisis of 2008
- Findings:
  - Constrained firms planned deeper cuts in tech spending, employment, and capital spending. They also burned through more cash, drew more heavily on lines of credit for fear banks would restrict access in the future, and sold more assets to fund their operations
  - The inability to borrow externally caused many firms to bypass attractive investment opportunities, with 86% of constrained U.S. CFOs saying their investment in attractive projects was restricted during the credit crisis of 2008

Campello et al. (2010): Measuring Credit Constraints from a Survey

- The survey asks CFOs to answer whether their firm is "not affected," "somewhat affected," or "very affected" by difficulties in accessing credit markets
  - 244 respondents said they were unaffected, 210 said they were somewhat effected and 115 said they were very affected
- The survey then asks CFOs who answered very or somewhat affected to elaborate. In particular, have they experienced quantity constraints (limited credit availability), higher costs of external funds or difficulties in originating or renewing a line of credit with their banks
  - 81% of very affected firms experienced quantity constraints, 59% experienced price constraints and 55% experienced LC access issues
  - 50% of somewhat affected firms experienced quantity constraints, 40% experienced price constraints and 20% experienced LC access issues

Campello et al. (2010): Empirical Strategy

- For every firm identified as financially constrained (treated) the authors find an unconstrained match (control) that is in the same size category, same ownership category, same credit rating category and same industry
- The empirical strategy is to compare differences in corporate policies for constrained firms relative to their unconstrained match

Campello et al. (2010): Results

Policy	Difference between constrained and unconstrained firms			
	Pre-crisis period		Crisis period	
	Abadie-Imbens	Dehejia-Wahba	Abadie-Imbens	Dehejia-Wahba
% Change in technology expenditures	−5.467*** (−2.61)	−5.369*** (−2.72)	−11.160*** (−3.09)	−11.278*** (−3.00)
% Change in capital expenditures	−7.706*** (−2.57)	−7.813*** (−2.63)	−8.494*** (−3.79)	−8.054*** (−2.73)
% Change in marketing expenditures	−5.878*** (−3.19)	−5.843*** (−3.19)	−11.709*** (−4.05)	−11.866*** (−3.75)
% Change in employees	−5.603*** (−4.04)	−5.541*** (−3.43)	−8.431*** (−4.18)	−8.495*** (−3.89)
% Change in cash holdings	−3.467 (−1.39)	−3.589 (−1.58)	−8.536* (−1.87)	−8.496** (−2.03)
% Change in dividend payout	−7.559** (−1.98)	−7.172* (−1.70)	−28.412** (−2.09)	−27.941** (−1.97)

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