

Financial Regulation, Financial Globalization, and the Synchronization of Economic Activity

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Motivation

- A key question in international economics and finance: **What is the effect of financial integration on business cycle synchronization?**
- Many argue that financial globalization, **banks' international linkages especially**, acted as catalysts for the transmission of the 2007–2008 crisis from a corner of the U.S. capital markets to the rest of the world.
- **What did we know before 2007–2008 crisis about propogation?** We lack a good understanding of the effect of financial integration on the transmission of productivity and “financial” shocks
 - Elaborate theoretical models
 - Empirical studies tend to contradict canonical models

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Broad Research Project

- 1 **Question: How does financial globalization affect output comovement during tranquil times?**

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- 2 **Question: What has been the effect of financial linkages on the propagation of the 2007–2008 crisis?**

Global Banks and Crisis Transmission (with Elias Papaioannou and Fabrizio Perri)

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This Paper: Identification

- Analyze empirically the effect of financial (banking) integration on international output co-movement.
- Address some key open identification issues of previous empirical research
 - Link to theory - Underlying shocks
 - Omitted variables
 - Measurement error
 - Reverse causation
- Identify the one-way effect of financial integration on business cycle synchronization in tranquil times.
 - Sample: 18 – 20 advanced economies, period 1978 – 2006 (pre-crisis)

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Theory A: Negative Relationship

- Standard IRBC Theory/Banking Models (e.g. Backus, Kehoe, Kydland, 1992): A higher degree of financial integration leads to less synchronized (more divergent) output cycles (similar to “collateral” channel in banking models; e.g. Morgan, Rime, and Strahan, 2004)
- Comparative Advantage/Specialization (Obstfeld, 1995): Cross-border financial integration allows specialization and this in turn leads to divergent output cycles
- International Diversification (e.g. Heathcote and Perri, 2005): Diversification gains are larger when output growth patterns are not much correlated

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Theory B: Positive Relationship

- Financial Frictions/Contagion (Calvo, 1998; Calvo and Mendoza, 2000; Devereux and Yetman, 2010): Sudden stops/information frictions; asset prices transmit internationally via balance sheets of leveraged intermediaries, causing contagion
- Bank Capital Shocks/Contagion (e.g. Calvo (1998); Allen and Gale, 2000; Morgan, Rime, and Strahan, 2004; Mendoza and Quadrini, 2010; Korinek, Roitman, and Vegh, 2010): Negative shock to banks capital might lead to a withdrawal from both countries via overlapping balance sheets/global asset prices

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Theory C: Synthesis

Opposing effects of productivity and financial shocks; ambiguous effect of integration on comovement

- Banking literature (e.g. Morgan, Rime, and Strahan, 2004)
- International macro (e.g. Quadrini and Perri, 2010; Enders, Kollman, and Muller, 2010; Kalemli-Ozcan, Papaioannou, and Perri, 2010)

Empirical Literature

- Most country studies document a positive cross-country correlation between financial integration and output co-movement (with the world) (e.g. Kose et al. 2008)
- Most country-pair cross-sectional studies also document a positive cross-country correlation between bilateral financial integration and output co-movement (e.g. Imbs, 2004, 2006; Otto, Voss, and Willard, 2001).
- Indirect evidence from states/regions: a higher level of integration leads to specialization which leads to decrease synchronization (with the group) (e.g. Kalemli-Ozcan, Sorensen, and Yosha (2001, 2003).

Challenges to Identification

- Separating productivity from financial shocks
- Isolating idiosyncratic from common (global/regional) shocks
- Omitted Variable Bias:
 - Country-pair unobserved/hard-to-account-for factors (Baxter and Kouparitsas, 2005; Guiso, Sapienza, and Zingales, 2009)
 - Global factors (related to other features of globalization)
- Reverse causality
- Measurement Issues
 - Classical measurement error may not be a major concern
 - Indirect exposure, financial centers (Kalemli-Ozcan, Papaioannou, and Perri, 2010)
 - Types of flows/holdings

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Identification using time variation

- Compare how a given country-pair's cycle synchronization changes over time relative to changes in other pairs, when bilateral financial linkages changes, conditional on common shocks.
- Within country-pair comparison fully absorbs country-pair specific differences in synchronization and integration; the estimated difference is due to changes in financial integration over time.
- Our paper is first in identifying from changes over time both in OLS and IV contexts.

Identification using time variation

- Confidential dataset from the BIS on banks' international bilateral exposure over the past 30 years in a panel of 18 – 20 developed countries
 - Account for time-invariant bilateral factors (e.g. culture, distance) via country-pair fixed effects
 - Account for global shocks and trends via time fixed effects (and also country-specific and country-pair specific trends)
- Focus on high-income countries during last 3 decades (before recent crisis):
 - Minimize parameter heterogeneity and outlier problems
 - Assumption: fluctuations in this period for our countries were not mainly caused by major common financial shocks (exception: Scandinavian crisis in early 90s'; Japan; Spain in early 80s).

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Empirical Specification

$$SYNCH_{ijt} = \alpha_t + \alpha_{ij} + \beta BANKINT_{ijt-1} + \mathbf{X}'_{ijt-1} \delta + \varepsilon_{ijt}$$

- α_t : Year fixed-effects (common global shocks)
- α_{ij} : Country-pair fixed-effects (bilateral unobserved or hard-to-account-for factors)
- $\mathbf{X}'_{ijt-1} \delta$: Other controls such as trade, income, specialization

Caveats

- Reverse causation
- Measurement error is still an issue (indirect exposure; other types of foreign investment)
- Country-pair time-varying omitted variables (unlikely; cannot be ruled out)

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Three alternative measures of synchronization

- 1 *SYNCH1*: Negative of absolute value of real GDP per capita growth differences between countries i and j in year t (Giannone, Lenza, and Reichlin, 2009).

$$SYNCH1_{ijt} \equiv - |(\ln Y_{it} - \ln Y_{it-1}) - (\ln Y_{jt} - \ln Y_{jt-1})|$$

- 2 *SYNCH2*: Same as *SYNCH1* but look at the deviations from the country and time average growth (Morgan, Rime, Strahan, 2004)

$$SYNCH2_{ijt} \equiv -|\nu_{it} - \nu_{jt}| \quad (1)$$

$$\ln Y_{it} - \ln Y_{it-1} = \gamma_i + \phi_t + \nu_{it} \quad \forall i, j \quad (2)$$

- 3 *SYNCH3*: 5-year correlation of the cyclical component of output (Baxter-King filter)

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BIS Data

- BIS International Locational Banking Statistics Database: Supervisory confidential data; reflect 99% of the overall international exposure of a country's banking institutions.
- Asset and liability holdings of banks 40 countries ("the *reporting area*") in more than 200 countries (the "*vis-a-vis area*") at a quarterly frequency since the end of 1977.
- Focus on annual bilateral data from and to 18 rich economies over 1978 – 2006:
 - ★ Australia, Austria, Belgium, Canada, Switzerland, Germany, Denmark, Spain, Finland, France, United Kingdom, Ireland, Italy, Japan, Netherlands, Portugal, Sweden, and the United States.

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How important?

BIS data is mainly bank to bank debt; but recently it also captures bank's investment in equity-like instruments and (government and corporate) bonds.

According to the aggregate statistics of Lane and Milesi-Ferretti (2009), during 1978 – 2006:

- Debt holdings around 67% of the total stock of international positions for our group of countries.
- Banking activities (loans, debt) around 60% of total external positions.

De-Facto Bilateral Bank Integration Measures

- $BANKINT1_{ijt}$: average value of the (logs) of real bilateral STOCKS - HOLDINGS of bank asset and liabilities normalized with the sum of the population of the two countries.
- $BANKINT2_{ijt}$: average value of the (logs) of real bilateral STOCKS - HOLDINGS of bank asset and liabilities normalized with the sum of the GDP of the two countries.
- Previous version: GROSS FLOWS - TRANSACTIONS of bank assets and liabilities normalized with the sum of the population (and GDP) of the two countries.

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Bank Integration and Synchronization: Between Estimates

Dependent variable: Synchronization

| Synchronization Measure Bank Integration Measure | SYNCH1 BANKINT1 | SYNCH1 BANKINT2 |
|---|--------------------|---------------------|
| Banking Integration | .1272*** (.029) | .1327*** (.0289) |
| Country-Pair Fixed Effects | no | no |
| Time (Year) Fixed Effects. | no | no |
| R^2 | 0.114 | .122 |
| Observations | 4229 | 4229 |
| Country-Pairs | 153 | 153 |

Bank Integration and Synchronization: Within Estimates

Dependent variable: Synchronization

| Synchronization Measure Bank Integration Measure | SYNCH1 BANKINT1 | SYNCH1 BANKINT1 | SYNCH1 BANKINT2 | SYNCH1 BANKINT2 |
|---|--------------------|----------------------|---------------------|----------------------|
| Banking Integration | .1272*** (.029) | -.3852*** (.0622) | .1327*** (.0289) | -.3947*** (.0639) |
| Country-Pair Fixed Effects | no | yes | no | yes |
| Time (Year) Fixed Effects | no | yes | no | yes |
| R^2 | 0.114 | .130 | .122 | .130 |
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OLS: Sensitivity Analysis

- Control for bilateral trade and similarities in production patterns (Table 2)
- Long-run differences with the correlation of the cyclical component of GDP as the dependent variable (Appendix Table 2)
- Dynamic panel methods accounting for inertia in output synchronization (Appendix Table)
- Conditional on GDP differences; differences in trade (Table 3)
- WLS, so as to account for outliers (Appendix Figure 1)
- Adding country-specific time trends or even country-pair specific time trends (Table 3)

OLS: Results Summary

- 1 Across country-pairs: A positive correlation between banking integration and GDP synchronization
 - In line with previous empirical studies
- 2 Within country-pairs: A higher degree of bilateral banking integration leads to less synchronized output fluctuations.
 - Contrasts previous studies.
 - Supportive to “standard” IRBC and banking theories that in the absence of major financial shocks, financial/banking integration will magnify TFP (collateral) shocks.

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Shortcomings of OLS Estimation

- Although we have dealt with omitted variables (arising from hard-to-account-for time-invariant country-pair factors and common to all countries trends), the panel OLS coefficients may be driven by reverse causation.
- Moreover there is a possibility that we have omitted another country-pair time-varying factor (although we do control for trade and production differences)
- Measurement error
 - Non bank flows (FDI, FPI, other investment flows)
 - Indirect exposure

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Solution

Bilateral time-varying IV: Index of legislative-regulatory harmonization policies in financial markets used as an instrument for bilateral banking linkages (using data from Kalemli-Ozcan, Papaioannou, and Peydro, 2010)

Legislative-Regulatory Harmonization Policies in Financial Services and Banking \Rightarrow Financial/Banking Integration \Rightarrow Business Cycle Synchronization

Panel IV

$$SYNCH_{i,j,t} = \alpha_t + \alpha_{ij} + \beta BANKINT_{ijt-1} + \mathbf{X}'_{i,j,t-1} \Psi + \varepsilon_{i,j,t} \quad (3)$$

$$BANKINT_{i,j,t} = \delta_t + \delta_{ij} + \gamma HARMON_{i,j,t} + \mathbf{X}'_{i,j,t} \Phi + v_{i,j,t}$$

- $HARMON_{i,j,t}$: Index reflecting the degree of bilateral legislative-regulatory harmonization policies (in the context of EU's Financial Services Action Plan (FSAP))

Financial Services Action Plan

- EU Commission launched in the end of 1998 the Financial Services Action Plan (FSAP).
- FSAP was package of legislative measures to create a single liquid financial market.
- FSAP were mainly contained in a set of EU-wide laws (27 EU Directives and 2 EU Regulations).
 - Directives do not mechanically become enforced across national borders (in contrast to Regulations).
 - EU countries delay the transposition of the Directives into national law.
 - Use information from the Commission on the implementation of each of the 27 Directives of the FSAP.

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Financial Services Action Plan (cont.)

- **Categories of legislative acts:**

- Banking
- Insurance
- Securities (Corporate law/governance)

- **Examples:**

- Directive on the taking up, pursuit and prudential supervision of the business of electronic money institutions.
- Money laundering directive.
- Directive on insider dealing and market manipulation.
- Directive on payment systems

Financial Harmonization as an Instrument

(1) Define 27 indicator variables (one for each Directive k) that equal one if at any given year **both** countries in each country-pair cell have transposed the Directive into national law and zero otherwise ($LEX_{i,j,t}^k$).

(2) Take the log of the sum of these 27 indicator variables plus 1 for each country-pair.

$$HARMON_{i,j,t} \equiv \ln \left(\sum_{k=1}^{K=27} LEX_{i,j,t}^k + 1 \right) \quad (4)$$

IV Steps

- **Establish a “reduced-form” relationship**
 - Business cycle synchronization ($SYNCH_{i,j,t}$) and legislative-regulatory harmonization policies in financial services ($HARMON_{i,j,t}$)
- **Establish a strong first-stage relationship**
 - Legislative-regulatory harmonization policies in financial services ($HARMON_{i,j,t}$) do spur cross-border banking activities ($BANKINT_{ij}$)
- **Combine the “reduced-form” estimates and the first-stage relationship**

Banking Integration and Synchronization, cont.

Dependent variable: Synchronization (1978-2006)

| | | | | |
|--|-----------------------|-----------------------|-----------------------|------------------------|
| Financial Sector Harmonization $HARMON_{i,j,t-1}$ | -0.2420*** (.0430) | -0.2262*** (.0432) | -0.2662*** (0.849) | -0.2452*** (0.0912) |
| Country-Pair Fixed Effects | yes | yes | yes | yes |
| Time (Year) Fixed Effects | yes | yes | yes | yes |
| Exch. Rate. Regime Control | no | yes | yes | yes |
| Other Controls (GDP, POP) | no | no | yes | yes |
| Trends | no | no | country | country-pair |
| R^2 | 0.096 | 0.097 | 0.193 | 0.218 |
| Observations | 4229 | 4229 | 4229 | 4229 |
| Country-Pairs | 153 | 153 | 153 | 153 |

Banking Integration and Synchronization

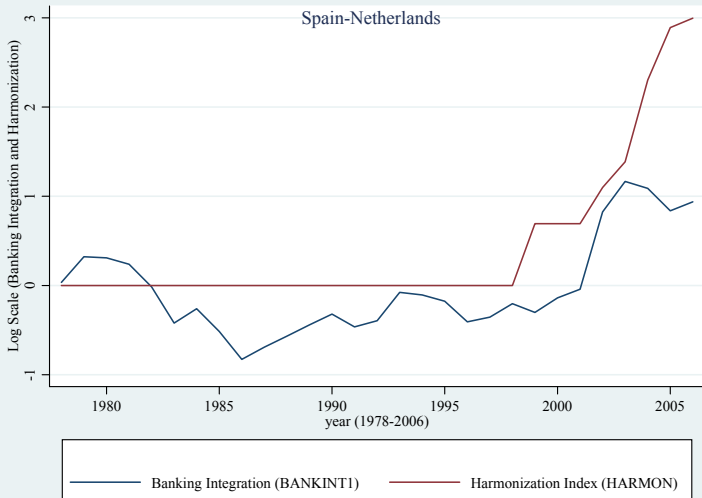
Dependent variable: Synchronization (1995-2006)

| | | | | |
|---|---------------------|----------------------|-----------------------|------------------------|
| Financial Sector Harmonization <i>HARMON</i> _{<i>i,j,t-1</i>} | -0.1518* (.0796) | -0.1776** (.0762) | -0.1254** (0.0630) | -0.2776*** (0.0911) |
| Country-Pair Fixed Effects | yes | yes | yes | yes |
| Time (Year) Fixed Effects | yes | yes | yes | yes |
| Exch. Rate. Regime Control | no | yes | yes | yes |
| Other Controls (GDP, POP) | no | no | yes | yes |
| Trends | no | no | country | country-pair |
| <i>R</i> ² | 0.150 | 0.153 | 0.352 | 0.412 |
| Observations | 1831 | 1831 | 1831 | 1831 |
| Country-Pairs | 153 | 153 | 153 | 153 |

First Stage Estimates

Dependent variable: Banking Integration (*BANKINT1*)

| | | | | |
|---|----------------------|-----------------------|-----------------------|-----------------------|
| Financial Sector Harmonization <i>HARMON_{i,j,t}</i> | 0.4046*** (.0834) | 0.3312*** (.0754) | 0.2300*** (0.0533) | 0.2136*** (0.0519) |
| Exchange Rate Regime | | -0.2471*** (.0787) | | -0.1028*** (.0623) |
| Country-Pair Fixed Effects | yes | yes | yes | yes |
| Time (Year) Fixed Effects | yes | yes | yes | yes |
| Other Controls (GDP, POP) | no | no | yes | yes |
| <i>F</i> – score | 23.52 | 19.31 | 18.59 | 16.97 |
| Observations | 4229 | 4229 | 4229 | 4229 |
| Country-Pairs | 153 | 153 | 153 | 153 |



Second Stage: Integration and Synchronization

Dependent variable: Synchronization (*SYNCH1*)

| | | | | |
|--|-----------------------|-----------------------|-----------------------|----------------------|
| Banking Integration <i>BANKINT1_{i,j,t-1}</i> | -0.5982*** (.1458) | -0.6829*** (.1908) | -0.6711** (0.3063) | -0.7734** (0.333) |
| Exchange Rate Regime | | -0.1155 (.0953) | | -0.1474* (.0865) |
| Country-Pair Fixed Effects | yes | yes | yes | yes |
| Time (Year) Fixed Effects | yes | yes | yes | yes |
| Other Controls (GDP, POP) | no | no | yes | yes |
| <i>F</i> – score | 23.52 | 19.31 | 18.59 | 16.97 |
| Observations | 4229 | 4229 | 4229 | 4229 |
| Country-Pairs | 153 | 153 | 153 | 153 |

Second Stage: Financial Integration and Synchronization Excluding Crises Years

Dependent variable: Synchronization (*SYNCH1*)

| | Excl. Major Crises | | Excl. Major & Minor | |
|--|-----------------------|----------------------|-----------------------|----------------------|
| Banking Integration <i>BANKINT1_{i,j,t-1}</i> | -0.5678*** (.1505) | -0.7332** (.3382) | -0.6464** (0.1751) | -0.8888* (0.4066) |
| Country-Pair Fixed Effects | yes | yes | yes | yes |
| Time (Year) Fixed Effects | yes | yes | yes | yes |
| Other Controls (GDP, POP, ER) | no | yes | no | yes |
| <i>F</i> – score | 22.57 | 16.80 | 19.73 | 12.53 |
| Observations | 3909 | 3909 | 3506 | 3506 |
| Country-Pairs | 153 | 153 | 153 | 153 |

Channel...

- Negative association between financial integration (outcome-based measure and regulatory index) and output synchronization, conditional on
 - unobserved country-pair heterogeneity, common shocks and country-pair trends
 - differences in GDP (convergence mechanism)
 - differences in GDP growth (return chasing)
 - differences in exports/imports (current account)
- International real business cycle models and multi-economy banking theories predict:
 - negative association between banking/financial integration and output synchronization
 - capital flows from country experiencing a (relative) negative shock to the country experiencing a (relative) positive shock

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Output Growth and Foreign Asset Positions

Dependent Variable: Change in Foreign Asset Position

| | Of country i to country j | | Of country j to country i | |
|--|-------------------------------|----------------------|-------------------------------|---------------------|
| GDP growth difference betw. country i and country j | -0.0350** (0.0063) | -0.0348* (0.0065) | 0.0134** (.0054) | 0.0126** (0.005) |
| Country-Pair Fixed Effects | yes | yes | yes | yes |
| Time (Year) Fixed Effects | yes | yes | yes | yes |
| Country-Pair Time Trends | no | yes | no | yes |
| Observations | 4229 | 4229 | 4229 | 4229 |
| Country-Pairs | 153 | 153 | 153 | 153 |

To Conclude...

- Theory predicts that:
 - in the absence of major financial shocks, financial integration leads to a lower degree of business cycle synchronization
 - when financial shocks dominate then financial integration may lead to more synchronized output cycles
- Cross-country empirical studies:
 - numerous empirical unresolved issues
- **THIS PAPER: think carefully about identification**
 - theoretical challenges (distinguishing productivity from financial shocks; separating idiosyncratic from common shocks)
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Our Paper: IV

- In the cross-section, a higher degree of financial integration is associated with more synchronized output cycles
- Within country-pair estimates show that a higher degree of financial integration is associated with less synchronized cycles
- Employ a novel IV approach using a bilateral (country-pair) time-varying policy instrument.
 - Legislative/Regulatory changes in financial intermediation.
 - Peculiar structure of EU-wide legislation process.

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Policy Implications

- Our results suggest that policy suggestions based on simple time-series or cross-sectional correlations can be quite misleading.
- In line with theory (but in contrast to previous empirical studies), when productivity shocks are dominant, financial integration leads to less synchronized cycles.
- When credit shocks are dominant, at least in theory this result can be reversed.
- Empirical research should analyze the effect of financial globalization on the propagation of the recent financial crisis (a credit shock) as data become available.

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New Research

Question: What has been the effect of financial linkages on the propagation of the 2007-2008 crisis?

Global Banks and Crisis Transmission (with Elias and Fabrizio)

- Empirical Contribution:
 - Has the partial effect of financial integration on output synchronization changed during the 2007 – 2010?
 - Is an increased degree of financial linkages to the US financial system associated with stronger co-movement? (no robust evidence so far)

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Challenge: Output comovement during a crisis may be due to a common shock rather than a country-specific shock that spills-over contagiously (Observational equivalence)

Theoretical Contribution

- Develop a DSGE model with international banks and two types of shocks so as to reconcile the empirical regularities.
- Discipline the model with empirical facts and use the model to identify source of output fluctuations in our sample of industrial countries.

Results

- Before 2007 crisis, there was a strong negative association between financial linkages and output synchronization
- Partial effect of financial integration on output synchronicity turns positive (total effect becomes less negative)
- Same result when we focus on Scandinavian, Spain and Japan banking crisis.
- Positive association between synchronization and exposure to US financial system via indirect links (Cayman Islands)
- Simulated data from the model gives similar results to regressions.

Banking Integration and Synchronization

| | Correlation of GDP growth | Synchronization 1 |
|---------------------------------|---------------------------|------------------------|
| Crisis Indicator (2007:q3-2010) | 0.5344*** (0.0852) | – |
| Banking Integration | -0.0914** (0.0384) | -0.3022*** (0.0645) |
| Banking Integration X Crisis | 0.0263** (0.0121) | 0.1931*** (0.0496) |
| Country-Pair Fixed Effects | yes | yes |
| Period Fixed Effects | no | yes |
| Country-specific time trends | no | yes |
| R^2 | .801 | .166 |
| Observations | 340 | 14328 |

US Exposure and Output Synchronization

| | Direct US Links | Direct & Indirect Links |
|--|------------------------|-------------------------|
| Banking Integration | -0.2460*** (0.0655) | -0.2066*** (0.0697) |
| Banking Integration X Crisis Indicator | 0.1284** (0.0555) | 0.1176** (0.0553) |
| US Banking Linkages | 0.0204 (0.1563) | -0.4836*** (0.1705) |
| US Banking Linkages X Crisis Indicator | 0.1263 (0.1344) | 0.4075*** (0.1580) |
| Country-Pair Fixed Effects | yes | yes |
| Quarter Fixed Effects | yes | yes |
| Country-specific time trends | yes | yes |
| R^2 (within) | .194 | .170 |
| Observations | 12452 | 10847 |

Model In a Nutshell

- 2 country-2 goods-2 sectors
- Banks intermediate funds between firms and consumers
- Sector 1 is financially segmented
- Sector 2 is financially globally integrated
- Size of sector is measure of integration
- Standard productivity shocks (BKK) create divergence
- Add financial shock to banks risky asset return
- Lost revenue, higher lending rate, same rate globally, working capital goes down