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

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

2. *SYNCH*2: Same as *SYNCH*1 but look at the deviations from the country and time average growth (Morgan, Rime, Strahan, 2004)

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

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

3. *SYNCH*3: 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	SYNCH1	SYNCH1
Bank Integration Measure	BANKINT1	BANKINT2
Banking Integration	.1272***	.1327***
	(.029)	(.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
Observations	4229	4229	4229	4229
Country-Pairs	153	153	153	153

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 ($LEX^k_{i,,j,t}$).

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

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

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	-0.2420***	–0.2262***	-0.2662***	–0.2452***
$HARMON_{i,j,t-1}$	(.0430)	(.0432)	(0.849)	(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

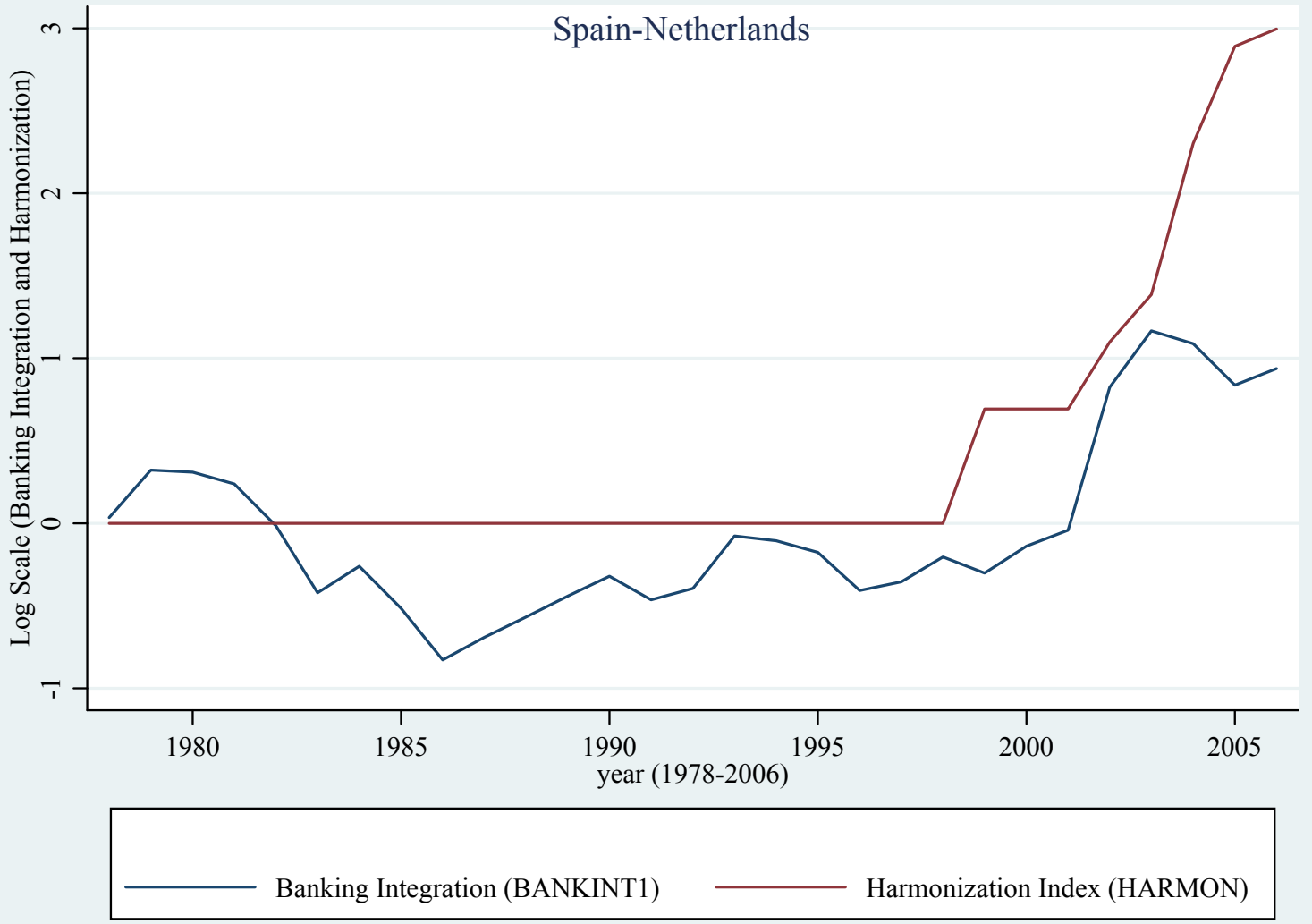
Banking Integration and Synchronization

Dependent variable: Synchronization (1995-2006)				
Financial Sector Harmonization	-0.1518*	–0.1776**	-0.1254**	–0.2776***
$HARMON_{i,j,t-1}$	(.0796)	(.0762)	(0.0630)	(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
R^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	0.4046***	0.3312***	0.2300***	0.2136***
$HARMON_{i,j,t}$	(.0834)	(.0754)	(0.0533)	(0.0519)
Exchange Rate Regime		-0.2471***		-0.1028***
		(.0787)		(.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
$F-score$	23.52	19.31	18.59	16.97
Observations	4229	4229	4229	4229
Country-Pairs	153	153	153	153


Spain-Netherlands
Log Scale (Banking Integration and Harmonization)
-1
0
1
2
3
1980
1985
1990
1995
2000
2005
year (1978-2006)
Banking Integration (BANKINT1)
Harmonization Index (HARMON)

Second Stage: Integration and Synchronization

Dependent variable: Synchronization ($SYNCH1$)

Banking Integration $BANKINT1_{i,j,t-1}$	-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
$F-score$	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	-0.5678***	-0.7332**	-0.6464**	-0.8888*
$BANKINT1_{i,j,t-1}$	(.1505)	(.3382)	(0.1751)	(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
$F - score$	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:
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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**
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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 synchronity 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**	-0.3022***
	(0.0384)	(0.0645)
Banking Integration X Crisis	0.0263**	0.1931***
	(0.0121)	(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***	-0.2066***
	(0.0655)	(0.0697)
Banking Integration X Crisis Indicator	0.1284**	0.1176**
	(0.0555)	(0.0553)
US Banking Linkages	0.0204	-0.4836***
	(0.1563)	(0.1705)
US Banking Linkages X Crisis Indicator	0.1263	0.4075***
	(0.1344)	(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