Spillovers to Emerging Markets During Global Financial Crisis

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Motivation

- **Key question 1:** Broad Research Agenda
  Do shocks spillover via financial linkages across borders?

- **Key question 2:** This paper
  Did the global financial crisis spillover from advanced countries to emerging markets via financial linkages?
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Concepts

- Definition of “Spillovers”: Transmission of an idiosyncratic shock
  - Two countries moving together is not necessarily a spillover

- Most of the long-run comovement is due to common shocks and time invariant country-pair factors like distance and language.

- We are interested in what happens in the short-run when there is a credit crunch in one country or in several countries
Country-Pair Output Correlations: WEO, October 2013

1. Growth Rate Correlations

- **All country pairs**
- **AE country pairs**
- **EMDE country pairs**
- **AE-EMDE country pairs**

2. Detrended Output Correlations

- **All country pairs**
- **AE country pairs**
- **EMDE country pairs**
- **AE-EMDE country pairs**

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Spillovers
What do we do?

We investigate the effect of banking linkages on spillovers during normal times and during GFC for:

- All country-pairs (20 advanced, 43 emerging)
- Advanced to emerging and emerging to emerging pairs
- Emerging to emerging pairs
Since this crisis was not an emerging market crisis, it is important to understand how it spilled-over to them.

It is critical to know whether crisis transmitted whether via conventional linkages like banking and trade or through the means of a global panic.

To understand and/or rule out any mechanism is important than ever in the light of the potential spillovers from upcoming changes in the U.S. monetary policy.
Results

- **Key question 1**: Broad Research Agenda *Do shocks spillover via financial linkages across borders?*
  - **Theory**: Ambiguous (depends on shocks and frictions)
  - **Evidence**: YES, but sign differs for different shocks
    - ★ Real shocks (normal times): Financial linkages cause divergent cycles
    - ★ Financial shocks (crisis times): Financial linkages cause synchronized cycles

- **Key question 2**: This paper *Did the global financial crisis transmitted from advanced countries to emerging markets via financial linkages?*
  - NO. More of a panic/contagion story where financial linkages played a role of amplification
    - ★ EM results are consistent with Alvarez and De Gregorio (2013) and Raddatz and Schmukler (2012)
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Theory: Ambiguous

- **Standard IRBC Theory** (e.g. Backus, Kehoe, Kydland, 1992): A higher degree of financial integration leads to less synchronized output cycles.

- **Financial Frictions/Contagion** (Calvo, 1998; Calvo and Mendoza, 2000; Devereux and Yetman, 2010; Mendoza and Quadrini, 2010): Sudden stops/information frictions; asset prices transmit internationally via balance sheets of leveraged intermediaries, causing contagion.

- **Banking Models** (e.g. Holmstorm and Tirole, 1998; Morgan, Rime, and Strahan, 2004; Allen and Gale, 2000): Similar return-chasing story to IRBC, so called collateral channel, if the shock is to the collateral of the firm. Contagion story if there is a negative shock to bank capital, withdrawal from both countries via overlapping balance sheets/global asset prices.

- **Comparative Advantage/Specialization** (Obstfeld, 1995): Cross-border financial integration allows specialization and this in turn might lead to divergent output cycles.

- **International Diversification** (e.g. Heathcote and Perri, 2005): Diversification gains are larger when output growth patterns are not much correlated.

- **Synthesis** (e.g. Quadrini and Perri, 2010; Enders, Kollman, and Muller, 2010; Kalemli-Ozcan, Papaioannou, and Perri, 2013)
Key Empirical Challenges

- Separating productivity from financial shocks
- Isolating idiosyncratic from common (global) shocks
- Isolating idiosyncratic shock from a heterogeneous response to a common shock
- Simultaneity: Country-pair unobserved/hard-to-account-for factors
- Indirect exposure, financial centers
- Types of flows/holdings
Identification via changes instead of levels

- 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.
- BIS data on banks’ international bilateral exposure over the past 30 years for 20 advanced countries and past 10-15 years for 43 emerging markets.
Empirical Specification

\[ \text{Synch}_{i,j,t} = \alpha_{i,j} + \lambda_t + \beta \text{Linkages}_{i,j,t-1} + \gamma \text{Post}_t \times \text{Linkages}_{i,j,t-1} + X'_{ijt} \Phi + \epsilon_{i,j,t} \]

- \( \lambda_t \): Time fixed-effects (common global shocks)
- \( \alpha_{ij} \): Country-pair fixed-effects (bilateral unobserved or hard-to-account-for factors)
- \( \text{Post} \): Crisis Dummy (1 after 2007:q3 or 2008:q2)
- \( X'_{ijt-1} \delta \): Other controls such as trade, income, specialization
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By using this methodology of country-pair fixed effect estimation, recent literature finds:

- For advanced to advanced country-pairs: (See Kalemli-Ozcan, Papaioannou, and Peydro (2013) and Kalemli-Ozcan, Papaioannou, and Perri (2013))
  - In the absence of major financial shocks (normal times), financial integration leads to a lower degree of business cycle synchronization
  - When financial shocks dominate then financial integration leads to more synchronized output cycles (global financial crisis and previous crises)
- For all country-pairs: (See WEO (2013), Hale and Imbs (2013).)
  - Similar results
This paper

Focus on advanced to emerging and emerging to emerging linkages separately and compare to the benchmark result of advanced to advanced pairs.
Two alternative measures of synchronization

1. **CORR**: 5-year correlation of the cyclical component of output

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

\[ SYNCH_{ijt} \equiv -| \ln Y_{it} - \ln Y_{it-1} - (\ln Y_{jt} - \ln Y_{jt-1}) | \]
BIS Data

- BIS International Locational Banking Statistics Database: Supervisory 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 for advanced and since late 1990s for emerging.
Bilateral Bank Integration Measures

\[
\text{Linkages} / \text{GDP} = \frac{\text{Assets}_{i,j,t} + \text{Liabilities}_{i,j,t} + \text{Assets}_{j,i,t} + \text{Liabilities}_{j,i,t}}{(\text{GDP}_{i,t} + \text{GDP}_{j,t})}
\]

\[
\text{Linkages} / \text{Total} = \frac{\text{Assets}_{i,j,t} + \text{Liabilities}_{i,j,t} + \text{Assets}_{j,i,t} + \text{Liabilities}_{j,i,t}}{\text{Total Assets}_{i,t} + \text{Total Liabilities}_{i,t} + \text{Total Assets}_{j,t} + \text{Total Liabilities}_{j,t}}
\]
Figure 3: Pairwise GDP Growth Correlations over Time – Advanced Economies
Figure 4: Pairwise GDP Growth Correlations over Time – Emerging Markets
Figure 6: Financial Linkages over Time – Emerging Markets

- Linkages/Population (left)
- Linkages/GDP (right)
- Linkages/Total Link. (right)
Regression Results

- Simple difference-in-difference specification in the period just before and during the recent financial crisis.

- Split the sample into two 5-year periods and for each time-span we estimate the correlation of real per capita GDP growth between each country-pair: Pre-crisis period is 2002q4-2007q3 and post-crisis is 2007q4-2012q3.

- Multi-period estimation
### Two period

### Table 2: Bilateral financial linkages and output correlations

**Dependent variable:** pairwise GDP growth correlations

<table>
<thead>
<tr>
<th>Sample</th>
<th>All country-pairs</th>
<th>EM-EM and EM-AE country-pairs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[1]</td>
<td>[2]</td>
</tr>
<tr>
<td>Crisis indicator</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>0.3801***</td>
<td>0.4484***</td>
</tr>
<tr>
<td></td>
<td>(0.0555)</td>
<td>(0.0672)</td>
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<tr>
<td></td>
<td>6.85</td>
<td>6.67</td>
</tr>
<tr>
<td>Linkages/TotalLinkages</td>
<td>-0.0529*</td>
<td>-0.0585**</td>
</tr>
<tr>
<td></td>
<td>(0.0281)</td>
<td>(0.0281)</td>
</tr>
<tr>
<td></td>
<td>-1.88</td>
<td>-2.08</td>
</tr>
<tr>
<td>Linkages/TotalLinkages x Crisis</td>
<td>0.0213*</td>
<td>0.0229*</td>
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<tr>
<td></td>
<td>(0.0120)</td>
<td>(0.0129)</td>
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<tr>
<td></td>
<td>1.78</td>
<td>1.78</td>
</tr>
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<td>Country-pair fixed</td>
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<td>Yes</td>
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<tr>
<td>R-squared (within)</td>
<td>0.690</td>
<td>0.694</td>
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<td>Observations</td>
<td>535</td>
<td>535</td>
</tr>
<tr>
<td>Country Pairs</td>
<td>310</td>
<td>310</td>
</tr>
</tbody>
</table>
Table 3: Bilateral financial linkages and GDP synchronization
Dependent variable: GDP growth synchronization

<table>
<thead>
<tr>
<th></th>
<th>All country-pairs</th>
<th>EM-EM and EM-AE country-pairs</th>
<th>EM-EM country-pairs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crisis indicator</td>
<td>-0.6615</td>
<td>0.4994</td>
<td>-1.32</td>
</tr>
<tr>
<td></td>
<td>(0.0712)</td>
<td>(0.0714)</td>
<td>(0.0757)</td>
</tr>
<tr>
<td>Linkages/TotalLink.</td>
<td>-0.2834***</td>
<td>-0.2142***</td>
<td>-0.2117***</td>
</tr>
<tr>
<td></td>
<td>(0.3394)</td>
<td>(0.2920)</td>
<td>(0.2837)</td>
</tr>
<tr>
<td></td>
<td>-3.98</td>
<td>-3.00</td>
<td>-2.79</td>
</tr>
<tr>
<td>Linkages/TotalLink.</td>
<td>0.3534***</td>
<td>0.3255***</td>
<td>0.3252***</td>
</tr>
<tr>
<td>x Crisis</td>
<td>(0.1006)</td>
<td>(0.0989)</td>
<td>(0.0987)</td>
</tr>
<tr>
<td></td>
<td>3.51</td>
<td>3.29</td>
<td>3.29</td>
</tr>
<tr>
<td>Trade</td>
<td>0.0037</td>
<td>0.0047</td>
<td>0.0057</td>
</tr>
<tr>
<td></td>
<td>(0.0057)</td>
<td>(0.0059)</td>
<td>(0.0059)</td>
</tr>
<tr>
<td>Trade x Crisis</td>
<td>-0.0116***</td>
<td>(0.0037)</td>
<td>-3.16</td>
</tr>
<tr>
<td>Country-pair fixed</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Time fixed</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Country trends</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Observations</td>
<td>24,267</td>
<td>24,267</td>
<td>22,577</td>
</tr>
<tr>
<td>R-squared (within)</td>
<td>0.185</td>
<td>0.249</td>
<td>0.258</td>
</tr>
</tbody>
</table>

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Spillovers
### Table 4: Bilateral financial linkages, U.S. financial linkages, and GDP synchronization

**Dependent variable: GDP growth synchronization**

<table>
<thead>
<tr>
<th></th>
<th>All country-pairs</th>
<th>EM-EM and EM-AE country-pairs</th>
<th>EM-EM country-pairs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Linkages/total linkages</strong></td>
<td>-0.3247***</td>
<td>-0.2424***</td>
<td>-0.0526</td>
</tr>
<tr>
<td></td>
<td>(0.0735)</td>
<td>(0.0730)</td>
<td>(0.0730)</td>
</tr>
<tr>
<td></td>
<td>-4.2</td>
<td>-3.32</td>
<td>-0.45</td>
</tr>
<tr>
<td><strong>Linkages/total linkages x Crisis</strong></td>
<td>0.3573***</td>
<td>0.3299***</td>
<td>0.3808</td>
</tr>
<tr>
<td></td>
<td>(0.1049)</td>
<td>(0.1031)</td>
<td>(0.1031)</td>
</tr>
<tr>
<td></td>
<td>3.41</td>
<td>3.20</td>
<td>1.43</td>
</tr>
<tr>
<td><strong>U.S. Linkages/total linkages</strong></td>
<td>3.4833***</td>
<td>2.8876***</td>
<td>0.9968</td>
</tr>
<tr>
<td></td>
<td>(0.9059)</td>
<td>(1.0165)</td>
<td>(1.0165)</td>
</tr>
<tr>
<td></td>
<td>3.85</td>
<td>2.84</td>
<td>0.47</td>
</tr>
<tr>
<td><strong>U.S. Linkages/total linkages x Crisis</strong></td>
<td>-3.2204*</td>
<td>-2.7521</td>
<td>-3.3661</td>
</tr>
<tr>
<td></td>
<td>(1.6976)</td>
<td>(1.6745)</td>
<td>(1.6745)</td>
</tr>
<tr>
<td></td>
<td>-1.90</td>
<td>-1.64</td>
<td>-1.38</td>
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<tr>
<td><strong>Crisis indicator</strong></td>
<td>-0.1101</td>
<td></td>
<td>0.1757</td>
</tr>
<tr>
<td></td>
<td>(0.5904)</td>
<td></td>
<td>(0.5904)</td>
</tr>
<tr>
<td></td>
<td>-0.19</td>
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<td>0.09</td>
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<tr>
<td><strong>Country-pair fixed</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Time fixed</strong></td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td><strong>Country trends</strong></td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Observations</strong></td>
<td>20,713</td>
<td>20,713</td>
<td>4,869</td>
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<tr>
<td><strong>R-squared (within)</strong></td>
<td>0.198</td>
<td>0.264</td>
<td>0.211</td>
</tr>
</tbody>
</table>
Results are conditional on:

- Unobserved country-pair heterogeneity, common shocks and country-pair trends
- Trade
- Differences in GDP (convergence mechanism)
- Differences in GDP growth (return chasing)
- Differences in exports/imports (current account)

**Estimates:** linkages explain a third of the actual variation in comovement for all but for emerging the effect is much bigger.
Banking linkages and output synchronization has been negatively related for advanced country-pairs during normal times. This relation turns positive during GFC. For advanced-emerging pairs there is no association between banking linkages and spillovers. For emerging pairs, the normal times negative effect disappears, consistent with the existence of frictions in the international financial markets that hinder capital flows. For emerging pairs, the crisis times effect is positive. There was contagion among the emerging markets that are financially linked although the crisis did not seem to transmit to them from advanced economies via financial linkages. One explanation: increased uncertainty leading to investor panic and a synchronized slowdown in emerging markets, where such a common shock is amplified more for the countries who are financially linked more.