Cross-Border Bank Flows & Systemic Risk

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What is this paper about?

- We examine the impact of cross-border bank flows on recipient countries' banking systems.

- Benefits associated with cross-border bank flows:
  - They facilitate risk-sharing through diversification
  - Reduce banks' exposure to domestic shocks
  - (Allen et al., 2011; Schoenmaker and Wagner, 2011)

- Potential drawbacks:
  - May transmit foreign shocks (e.g. Schnabl, 2012)
  - May be used by banks to circumvent regulation and increase risk-taking (regulatory arbitrage - Houston, et al., 2012)

- Who cares? Financial crisis sparked strong push for stricter capital requirements and more active coordination in regulations due to worries about regulatory arbitrage

But is it necessarily “destructive”?

“Race to the Bottom” View

- Houston, Lin, Ma (2012, JF) use BIS bank flows and find “strong evidence that banks have transferred funds to markets with fewer regulations.”
- Ongena, Popov, Udell (2013, JFE) show laxer business lending activity in 16 Eastern Europe if tougher rules at home

“Benign” View

- Cross-border regulatory competition helps banks evade excessively costly regulations improving capital allocation, economic growth (Acharya 2003; Dell’Arriccia, Marquez 2006; Morrison, White, 2009)
- Karolyi, Taboada (2015) show evidence of regulatory arbitrage in cross-border bank acquisitions, larger positive joint abnormal returns for acquirers from more restrictive regulatory systems

What do we do?

- Using data on bank flows from 26 OECD source countries to 119 target countries, we associate *unexpected* bank inflows to target country with <u>lower</u> systemic risk

- "Novel" bank-level identification strategy to identify channel through which benefits arise:
  - Larger banks with –
  - Poorer asset quality
  - More reliance on nontraditional income sources
  - More volatile sources of funds

- We find more reliable evidence consistent with a benign (potentially beneficial!) view of regulatory arbitrage in cross-border flows for the stability of a banking system

Our contribution and our "hook"

- We are first to examine potential economic consequences of cross-border bank flows linked to "regulatory arbitrage"

- Our advantages are three-fold:
  - Huge growth in cross-border bank flows during 2000s
  - Barth, Caprio, Levine (2004 - 2011) built databases for the World Bank on cross-country bank regulations over time
  - Newly-available measures of systemic risk (Acharya et al., 2015; Adrian & Brunnermeier, 2012; Engle and Brownlees, 2015) and studies of their determinants (Acharya, Schnabl, & Suarez, 2013; Brunnermeier et al., 2015; Engle et al., 2014)

- Our hook? An identification strategy *at the bank-level* to study the channels through which bank flows influence systemic risk in target countries

Data & Summary Stats

- Country-level data:
  - Bank flows – Bank for International Settlements *Consolidated Banking Statistics*
  - Regulatory quality – Barth, Caprio, Levine (2013) – four surveys across 16 year horizon
  - Systemic risk – NYU's Volatility Institute (V-Lab), Thomson Reuters' Datastream
  - Banking sector stability – Global Development Database
  - Additional macro controls – World Bank's WDI
- Bank-level data:
  - Thomson Reuters' Worldscope and Datastream

Measures of Bank Regulation and Systemic Risk

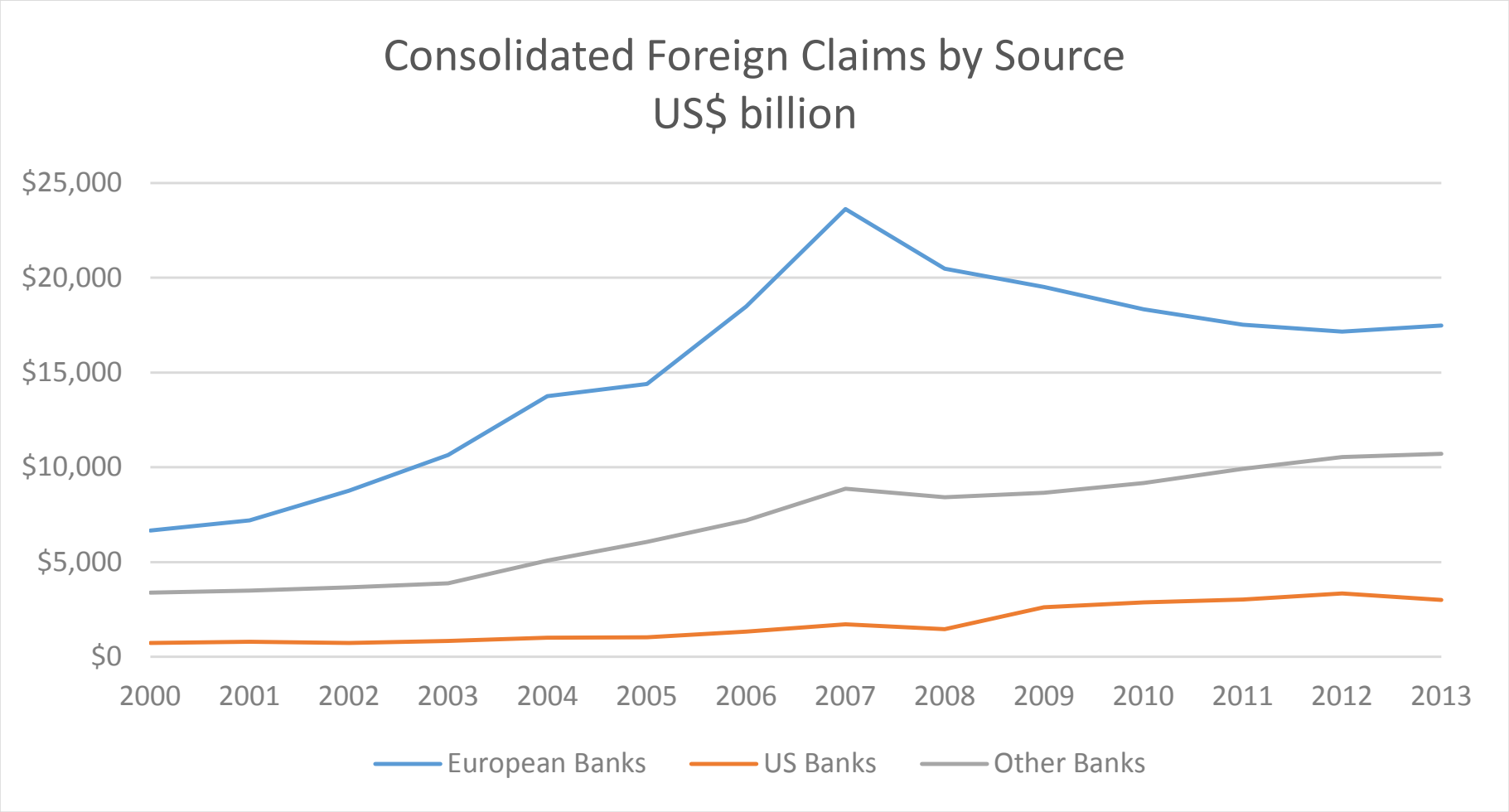
Regulatory quality:

1. Restrictions on bank activities
2. Stringency of capital regulation
3. Official supervisory power
4. Private monitoring
5. Regulation overall-PCA

Systemic Risk:

1. **SRISK (scaled by GDP)**: (Engle et al. 2014*)*
   - how much capital would be needed in a crisis to maintain an 8% capital-to-assets ratio
2. **Marginal Expected Shortfall, MES** (Acharya et al., 2010)
   - the *negative* of the average bank return when the market return is in the left 5% tail of the distribution

Rise of cross-border bank flows



Source: Bank for International Settlements Quarterly Review.

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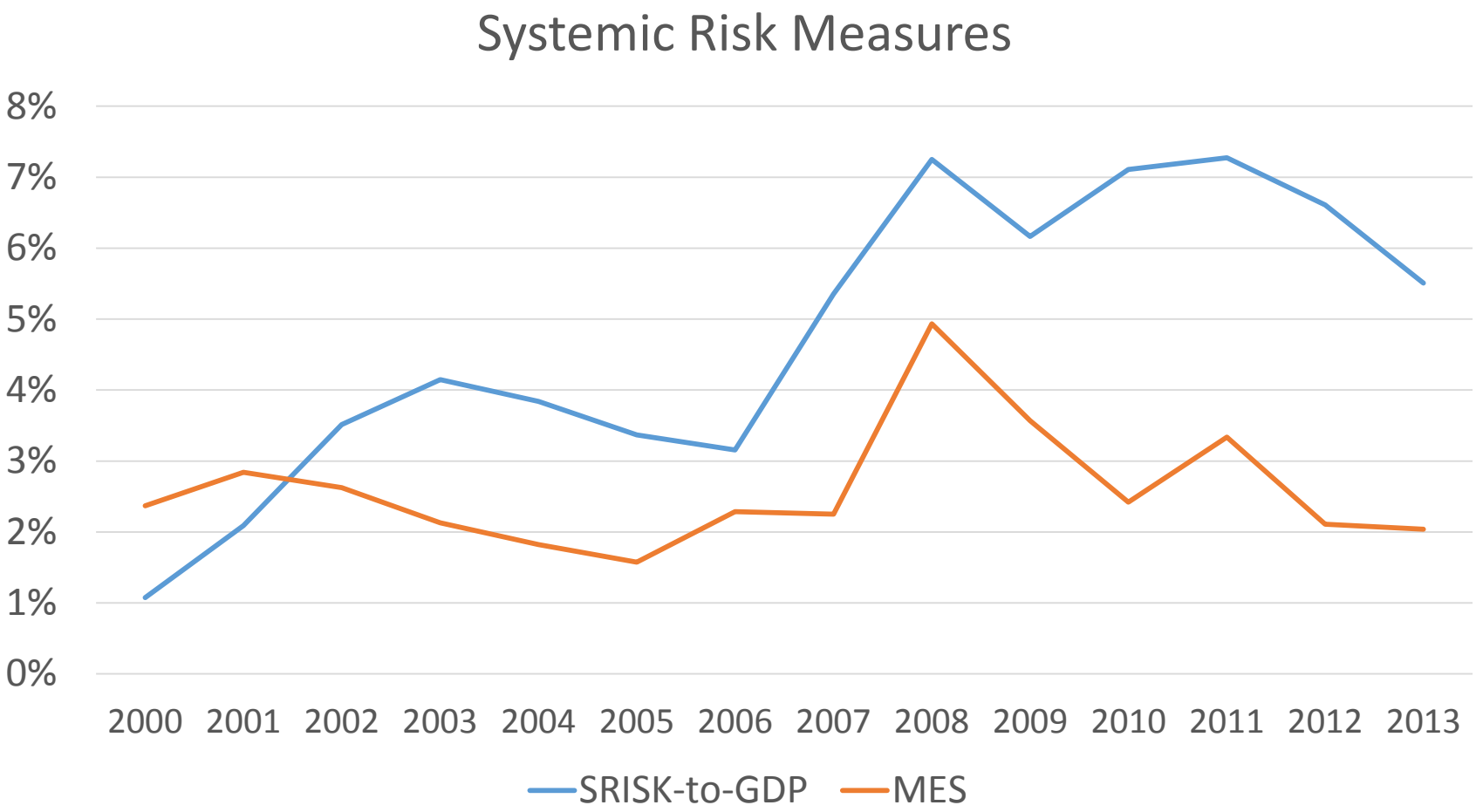
Measures of systemic risk



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Systemic risk & Flows

- **Are bank flows associated with systemic risk in recipient country?**

$$Systemic\ Risk_{r,t} = \alpha + \beta Flows_{r,t-1} + \gamma X_{r,t-1} + \delta_t + \theta_r + \varepsilon_{r,t}$$

- *Systemic risk* refers to our measures of systemic risk: *SRISK-to-GDP* and value-weighted *MES*.
- $Flows_{r,t-1}$ refers to *actual bank flows* to recipient country *r* in year *t-1*. We compute *Flows* as the difference in log of total foreign claims to recipient country from *t*-1 to *t*.
- $X_{r,t-1}$ is a vector of recipient country controls: *Log GDP per capita, GDP growth, Volatility, Market return, Non-interest income,* and *Bank credit*. δ_t , θ_r = year and recipient country fixed effects

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Systemic risk & Flows

A one-σ increase in *Flows* is associated with a 1.14% reduction in *SRISK* (or 13.96% of its std. dev.)

Dependent variable:	*SRISK-to-GDP* (%)				Marginal Expected Shortfall (*MES*, %)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Flows t-1 actual			-0.510***	-0.482***			-0.111***	-0.102***
			(-2.87)	(-3.05)				
Log GDP per capita t-1	-0.405	-1.040***	-0.359	-0.998***	-0.269***	-0.295		
	(-0.58)	(-2.97)	(-0.52)	(-2.92)	(-3.03)	(-3.32		
GDP growth t-1	-0.071	-0.104	-0.012	-0.062	-0.006	0		
	(-0.53)	(-1.05)	(-0.10)	(-0.66)	(-0.23)	(0.01		
Volatility t-1	4.204	2.674	3.439	1.927	1.207	1.129		
	(1.18)	(1.04)	(1.23)	(1.09)	(1.36)	(1.35		
Market return t-1	-0.474	0.142	-1.173	-0.589	0.295	0.26		
	(-0.49)	(0.22)	(-1.26)	(-0.96)	(1.37)	(1.25		
Non-interest income t-1	-0.060*	-0.031	-0.069*	-0.038*	-0.002	-0.00		
	(-1.72)	(-1.39)	(-1.94)	(-1.75)	(-0.44)	(-0.33		
Bank credit t-1	0.090*	0.043*	0.087*	0.039*	0.009*	0.007		
	(1.79)	(1.87)	(1.75)	(1.88)	(1.86)	(1.34		
S-T rate t-1		0.083*		0.065*		0.025		
		(1.92)		(1.78)		(1.16		
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes		
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes		
Observations	477	441	477	441	613	574		
Adjusted R^2	0.765	0.814	0.774	0.822	0.605	0.596		
# countries	55	47	55	47	59	55	59	55

Reliable evidence of an association, but bank flows are not exogenous

So, we seek instrument associated with flows, but <u>not</u> with SRISK-to-GDP

(a) Restrictions index of Dreher, Gaston, Martens (KOF Globalization index)

(b) M&A Failed deals ratio among non-banks

Gravity Model

- We first estimate bank flows by country-pair-year using various specifications of a gravity model, following Houston et al. (2012):

$$Bank\ Flow_{s,r,t} = \alpha + \beta_1 \Delta X_{s,r,t} + \beta_2 Distance_{s,r} + \gamma_t + \delta_s + \theta_r + \varepsilon_{s,r,t}$$

- We extract the residuals ($\varepsilon_{s,r,t}$) and aggregate them at the recipient-country year level:

$$Residual\ Flows_{rt} = \sum_{s=1}^{26} \varepsilon_{s,r,t} \times \frac{GDP_{s,t}}{TOTGDP_t}$$

ΔX is a vector of controls measured as differences between source county *s* and recipient country *r*: 1) *Creditor rights* from Djankov et al. (2007); 2) Depth of credit information (*Credit depth*); 3) Property rights index (*Property rights*) from the Fraser Institute as a proxy for the quality of legal institutions; 4) the *log of GDP per capita*; 5) real *GDP growth*; 6) the natural log of population (*Population*); *Distance* – log distance (km) between countries' capitals; Indicator variable for countries that share the same language , contiguous borders, common heritage

Gravity Model

Economic, Market Conditions

Traditional "Gravity"

"Regulatory Arbitrage"

Panel A – Bilateral Flows Regressions									
Dependent variable: Bank Flows$_{s,r,t}$									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Δ Creditor rights	-0.066	0.003	0.026***	-0.068	-0.152	-0.057	-0.043	-0.081	-0.023
	(-1.15)	(0.31)	(7.02)	(-1.18)	(-1.33)	(-0.48)	(-0.40)	(-0.79)	(-0.22)
Δ Credit depth	-0.019***	0.002	-0.010***	-0.019***	-0.019**	-0.015	-0.021***	-0.023***	-0.020**
	(-2.84)	(0.43)	(-6.45)	(-2.84)	(-2.48)	(-1.48)	(-2.63)	(-2.90)	(-2.18)
Δ Property rights	0.002	-0.022***	-0.005	0.002	0.002	0.017	0.014	0.016	0.015
	(0.32)	(-3.17)	(-1.02)	(0.29)	(0.13)	(1.62)	(1.28)	(1.55)	(1.34)
Δ Log GDP per capita	-0.146***	-0.058***	-0.012	-0.146***	-0.164***	-0.196***	-0.197***	-0.200***	-0.201***
	(-5.11)	(-5.92)	(-1.19)	(-5.11)	(-4.01)	(-5.30)	(-5.27)	(-5.80)	(-5.31)
Δ GDP growth	-0.008***	-0.006***	-0.009***	-0.008***	-0.011***	-0.004**	-0.009***	-0.009***	-0.009***
	(-4.85)	(-4.06)	(-5.16)	(-4.88)	(-4.21)	(-2.11)	(-3.65)	(-3.51)	(-3.60)
Δ Population (log)	-0.443***	-0.032***	0.020***	-0.441***	-0.589***	-0.425***	-0.388***	-0.430***	-0.394***
	(-3.65)	(-3.57)	(6.50)	(-3.63)	(-4.00)	(-2.86)	(-3.06)	(-3.39)	(-3.07)
Same language	0.077***	0.080***	0.054***	0.067***	0.064***	0.097***	0.084***	0.085***	0.087***
	(4.38)	(3.47)	(3.58)	(4.22)	(3.35)	(4.39)	(4.36)	(4.50)	(4.54)
Distance	-0.042***	-0.070***	-0.038***	-0.029***	-0.018**	-0.023**	-0.044***	-0.041***	-0.044***
	(-5.86)	(-5.91)	(-6.11)	(-4.10)	(-2.29)	(-2.61)	(-5.78)	(-5.57)	(-5.82)
Contiguous				0.191***	0.212***				
				(7.55)	(8.03)				
Colony				-0.005	0.007				
				(-0.17)	(0.16)				
Δ Financial liberalization					-0.014**				
					(-2.46)				
Δ Restrictions on bank activities						0.029***	0.028***	0.028***	0.031***
						(4.40)	(4.01)	(4.16)	(4.16)
Δ Stringency of capital regulation						0.014**	0.006		
						(2.52)	(0.95)		
Δ Strength of external audit						0.044***			0.036**
						(3.17)			(2.00)
Δ Independence of supervisors						-0.020			
						(-1.17)			
Source country fixed	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Recipient country fixed effects	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	44,559	44,559	44,559	44,559	30,528	31,733	36,457	37,937	36,545
Adjusted R^2	0.063	0.052	0.056	0.063	0.083	0.055	0.071	0.070	0.072

Instruments: based on source country. Aggregated at recipient country-level.

Two-Stage Identification

	Res. Flows	*SRISK-to-GDP (%)*	Act. Flows	*SRISK-to-GDP (%)*	Res. Flows	*MES (%)*	Act. Flows	*MES (%)*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Overall outflow restrictions index-s	-3.341**		-7.838***					
	(-2.37)		(-3.15)					
Failed CB deals- s	-0.119***		-0.221***					
	(-4.23)		(-4.37)					
Residual or Actual Flows-IV		-1.028**						
		(-2.57)						
Log GDP per capita t-1	-0.044	-0.462**	0.094					
	(-0.69)	(-2.01)	(1.02)	(-1.60)	(-0.74)	(-4.71)	(1.37)	(-4.47)
GDP growth t-1	0.033	0.000	0.075**	0.010	0.029*	0.003	0.073***	0.004
	(1.55)	(0.01)	(2.10)	(0.11)	(1.82)	(0.15)	(2.70)	(0.24)
Volatility t-1	-0.344	3.600**	-0.716	3.540**	-0.486	1.073***	-0.984	1.066***
	(-0.55)	(2.12)	(-0.71)	(2.10)	(-0.88)	(2.71)	(-1.10)	(2.71)
Market return t-1	-0.871***	-1.481*	-1.095***	-1.201	-0.391*	0.240	-0.415	0.267*
	(-3.56)	(-1.81)	(-2.82)	(-1.57)	(-1.85)	(1.61)	(-1.28)	(1.83)
Non-interest income-to-income t-1	-0.011**	-0.071***	-0.016**	-0.069***	-0.006	-0.003	-0.008	-0.003
	(-2.35)	(-3.82)	(-2.25)	(-3.79)	(-1.29)	(-0.70)	(-1.17)	(-0.66)
Bank credit t-1	-0.008**	0.080***	-0.001	0.086***	-0.007*	0.007**	-0.001	0.008***
	(-2.40)	(6.74)	(-0.12)	(7.79)	(-2.00)	(2.56)	(-0.11)	(3.03)
Constant	5.518***	2.558	9.433***	2.253	4.305***	3.562***	7.538***	3.522***
	(5.77)	(0.78)	(8.17)	(0.72)	(4.67)	(5.01)	(6.27)	(5.06)
Observations	464	464	464	464	596	596	596	596
R-squared	0.563	0.803	0.752	0.805	0.452	0.661	0.663	0.665
Adj R2	0.479	0.766	0.705	0.769	0.370	0.611	0.612	0.616
Partial R2		0.208		0.304				0.330
1st stage F-stat		0.000		0.000				0.000
Hansen Jstatistic		2.577		2.213				1.622
Chi-sq(3) P-val		0.108		0.137				0.203

A one-σ increase in *Residual Flows* is associated with a 1.25% reduction in *SRISK* (or 15.4% of its std. dev.)

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Direction of flows by *de jure*

Panel B - Sort by Source and Recipient Quality - *De Jure* Measures

		Dependent Variable: *SRISK-to-GDP (%)*							
		Recipient - High Regulation - Overall (PCA)			Recipient - Low Regulation - Overall (PCA)			(9)	(10)
Regulatory								Rest. on bank act.	
Regulatory Quality - H	Residual Flows t-1	-2.757***			-0.403			..782***	
		(-3.42)			(-1.00)			(-2.70)	
Regulatory Quality - L	Flows - High Regulation - Overall (PCA)		-3.931***			-0.720			-1.664***
			(-3.72)			(-1.00)			(-2.68)
	Flows - Low Regulation - Overall (PCA)			-2.507***			-0.763		
				(-3.30)			(-1.16)		
Country-Level Control								Yes	Yes
Year Fixed Effects	Country-Level Controls							Yes	Yes
Country Fixed Effects	Year Fixed Effects							Yes	Yes
	Country Fixed Effects								
Observations								464	464
R-squared	Observations	167	167	167	281	281	281	0.793	0.784
Adj R2	R-squared	0.816	0.829	0.819	0.857	0.851	0.853	0.755	0.743
Partial R2	Adj R2	0.729	0.748	0.735	0.818	0.811	0.813	0.086	0.077
1st stage F-stat	Partial R2	0.274	0.156	0.200	0.211	0.073	0.076	0.000	0.000
Hansen J-statistic	1st stage F-stat	0.000	0.000	0.000	0.000	0.000	0.000	1.476	1.228
Chi-sq(3) P-val	Hansen Jstatistic	1.331	0.113	2.357	1.638	1.556	1.225	0.224	0.268
	Chi-sq(3) P-val	0.249	0.737	0.125	0.201	0.212	0.268		

Strong recipients seem to benefit more relative to weak recipients

Residual flows are aggregated at the recipient country-year level by source country regulatory quality.
Source countries with *above median* and *above recipient country Regulation overall- PCA* as of prior year-end are classified as *High Regulation-Overall*.

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Understanding the

Reduction in MES is stronger for large banks, with poor asset quality (High NPL), more trading income, and reliance on volatile sources of funds

Dependent variable:						
Residual flows x Large	-0.065***					
	(-5.49)					
Residual flows x High NPL		-0.016**				
		(-2.65)				
Residual flows x High Trading income			-0.038***			
			(-3.06)			
Residual flows x High Cost-to-assets				-0.009		
				(-1.42)		
Residual flows x High ST funding					-0.017**	
					(-2.14)	
Residual flows x High Leverage						-0.006
						(-0.94)
Residual flows (t-1)	-0.016	-0.063**	-0.063***	-0.046**	-0.044*	-0.047**
	(-0.69)	(-2.23)	(-3.52)	(-2.03)	(-1.89)	(-2.06)
Bank and country level controls	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10,774	9,489	7,643	10,747	10,636	10,769
Adjusted R^2	0.561	0.575	0.576	0.559	0.556	0.558
$\chi^2(3)$ *p*-value				0.627		0.568

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Long-Term Impact on Bank Performance

- Further tests show that bank flows are associated with

1. Improvements in efficiency (cost-to-assets)
2. Reduction in non-traditional banking activities
3. Improvement in asset quality (lower non-performing loans)
4. Reduction in leverage

What do we learn?

- First comprehensive study linking cross-border bank flows and systemic risk and show they are **NOT** destabilizing, but associated with improved financial stability
  - Regardless of the regulatory quality of the source country
  - Impact is more pronounced in better quality recipient countries
  - Especially for contributions to systemic risk by large banks, with poor asset quality, more reliance on nontraditional banking activities, and more volatile funding sources

- Following bank flow shocks, banks in target country shift away from non-traditional income, reduce non-performing loans, and improve cost efficiency

- Findings challenge the "destructive" view of regulatory arbitrage and contributes to the literature on bank globalization