

Foreign Investment, Regulatory Arbitrage, and the Risk of U.S. Banking Organizations

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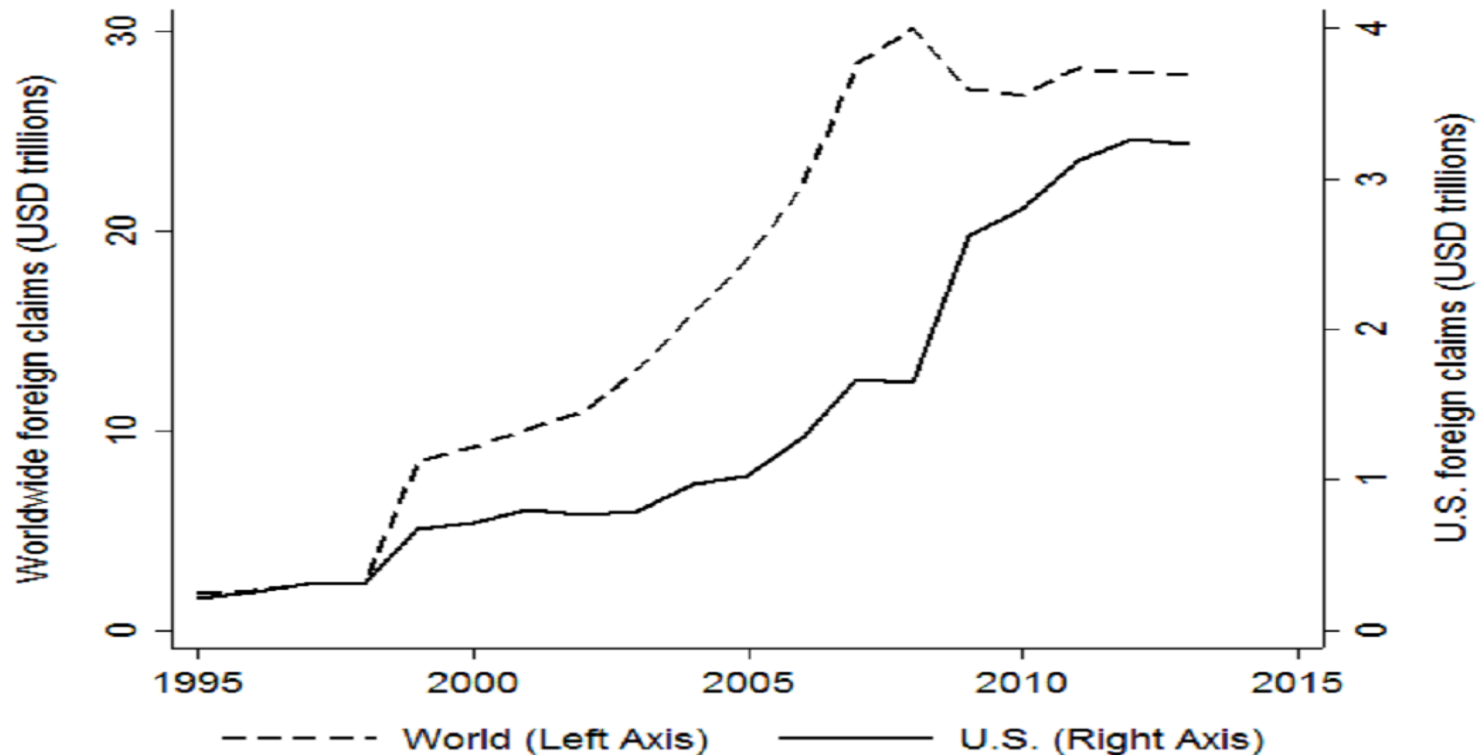
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May 2017

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Global Financial Integration

International banking activity has grown markedly over the past 20 years. BIS data indicate that foreign claims (local and cross-country) increased between 1995 and 2013 from \$1.9 to \$28.1 trillion. During the same period, U.S. foreign claims rose from \$0.2 trillion to \$3.0 trillion.



Global Financial Integration

These international banking trends can be broadly attributed to overall technological advancements, capital market liberalization, and economic integration.

But the cross-country distribution of international banking flows also varies depending on host country economic and institutional characteristics, including the stringency of banking regulation and supervision (Houston, et al., 2010).

The global financial crisis highlighted international financial linkages within and between banking organizations, and exposed limitations associated with material cross-border differences in regulatory environments.

- Significant policy attention now paid to improved international regulatory coordination through the FSB and BCBS.

One important issue is “regulatory arbitrage” – when countries with weak regulatory environments attract capital flows from banking organizations domiciled in countries with stricter rules.

This Paper

Studies whether U.S. bank holding companies (BHCs) engage in regulatory arbitrage through their subsidiary location choices.

- Focus on subsidiaries because (unlike branches) these are separate legal entities incorporated in host countries and subject to local regulatory regimes.

Relate to regulatory stringency measures from Barth et al. (2013) – focus on activities restrictions, capital requirements, and supervision.

Finding: BHCs are more likely to have subsidiaries in countries with weaker regulatory environments, although such activity is positively related to the strength of BHC risk management.

Study whether foreign subsidiary location choices are related to BHC-specific risk and contribution to systemic risk (as measured by VaR and ΔCoVar).

Finding: BHCs operating subsidiaries in countries with weaker regulatory environments have higher risk and contribute more to systemic risk. Effects are muted for BHCs with stronger risk management.

Literature:

International Banking and Regulatory Arbitrage

Locational Choices:

Houston et al. (2012): Banks tend to transfer funds (capital flows) from markets with strict regulatory environments to markets with weaker ones.

Karolyi and Toboada (2015): Weak regulatory environments attract international capital flows and increase cross-border acquisition volumes.

Temesvary (2016): U.S. banking organizations lend less in host countries with stricter regulations.

Risk Implications:

Ongena et al. (2013): For European banks, tighter banking regulation at home is associated with lower lending standards abroad.

Karolyi et al. (2016): Bank flows from strong to weak regulatory environments lower systemic risk in recipient markets.

Literature: International Banking Activity

Institutional, economic, and cultural characteristics: Golberg and Saunders (1980); Focarelli and Pozzolo (2005); Mian (2006); Sengupta (2007); Temesvary (2014)

Informational asymmetries and customer relationships: Focarelli and Poszzolo (2001); Buch (2003).

Bank Risk-Taking: Amihud et al. (2002); Cetorelli and Goldberg (2011); Buch et al. (2013); Berger et al. (2016).

Data

Regulatory Stringency. Barth et al. (2013) provide World Bank global banking regulation and supervision indices based on four surveys conducted in 2001 (I), 2003 (II), 2007 (III), and 2011 (IV).

- Time period to survey mapping: 1995-2001 (I), 2002-2005 (II), 2006-2009 (III), and 2010-2013 (IV).
- Transform indices such that larger values reflect a weaker regulatory environment.
- Focus on three dimensions of regulation and supervision: *Activities Restrictions*, *Capital Regulation*, and *Supervisory Power*. Also study their first principal component: *Regulation & Supervision*.

Country Controls (various sources). Log(GDP), GDP growth, Log(GDP_PC), bilateral trade, country governance, offshore financial center indicator, borrower and creditor rights, credit-to-GDP, banking concentration, banking profitability, physical distance, and indicators for English speaking and contiguous to US.

Key Variables:

Sample Statistics & Correlations

Panel A: Summary Statistics

	Mean	SD	Min	Max	Observations
PresSub	0.069	0.253	0	1	44,377
Ln(NSub)	0.099	0.434	0	5.468	44,377
Regulation & Supervision	3.107	1.147	0	6.027	44,377
Activities Restrictions	4.585	2.065	0	9	44,377
Capital Regulation	3.434	1.804	0	8	44,377
Supervisory Power	5.084	2.420	0	12	44,377

Panel B: Correlations

	PresSub	Ln(NSub)	Regulation and Supervision	Activities Restrictions	Capital Regulation	Supervisory Power
PresSub	1.000					
Ln(NSub)	0.836***	1.000				
Regulation and Supervision	0.119***	0.100***	1.000			
Activities Restrictions	0.155***	0.145***	0.729***	1.000		
Capital Regulation	0.037***	0.028***	0.554***	0.166***	1.000	
Supervisory Power	0.054***	0.042***	0.742***	0.264***	0.146***	1.000

Empirical Strategy:

Subsidiary Locations and Regulatory Stringency

Estimate regressions of the following form:

$$\text{Subsidiary}_{ij,t} = \alpha_i * \alpha_t + \beta \text{Regulation \& Supervision}_{j,t-1} + \delta X_{j,t-1} + \varepsilon_{ij,t}$$

- i indexes BHCs, j the host country, and t the year.
- Subsidiary_{ijt} is either *Subsidiary Presence* or $\text{Log}(1+N_Subsidiaries)$
- $\text{Regulation \& Supervision}_{j,t-1}$ is the first principal component of host country *Activities Restrictions*, *Capital Regulation*, *Supervisory Power*; also look at individual measures.
- $X_{j,t-1}$ represents our set of host country controls.
- $\alpha_i * \alpha_t$ represents a set of BHC-year fixed effects.

Estimate linear probability models due to large number of fixed effects (incidental parameter problem). Standard errors clustered at the BHC-Country level.

Results:

Subsidiary Locations and Regulatory Stringency

U.S. BHC tend to operate foreign subsidiaries in countries with weaker regulatory and supervisory environments.

- Finding is consistent across subsidiaries engaged in traditional versus non-traditional activities (e.g., securities, insurance).
- Finding robust to various IV approaches. And pseudo placebo test with branches reveals no relationship.

	PresSub				Ln(NSub)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Regulation & Supervision	0.011*** (0.000)				0.017*** (0.000)			
Activities Restrictions		0.006*** (0.000)				0.011*** (0.000)		
Capital Regulation			0.003*** (0.005)				0.003*** (0.000)	
Supervisory Power				0.003*** (0.000)				0.004*** (0.000)
Observations	44,377	44,377	44,377	44,377	44,377	44,377	44,377	44,377
Adj. R2	.30	.30	.30	.30	.29	.29	.29	.29

Subsidiary Locations and Risk Management

Ellul and Yerramilli (2013) provide evidence suggesting that the strength of BHC risk management functions is associated with reduced risk taking.

We explore the relationship between the strength of BHC risk management and their foreign subsidiary location choices.

Use a proprietary supervisory risk management rating from the Federal Reserve that ranges from 1-5. Weak risk management is indicated by WRM, an indicator = 1 if the rating is a 3, 4, or 5.

- Preferred measure because it includes public and private information.
- Also use an index measure from Ellul and Yerramilli (2013) that is based on public disclosures (RMI).

Interact these risk management measures with *Regulation & Supervision* (BHC-year fixed effects preclude adding the measures alone).

Results:

Subsidiary Locations and Risk Management

U.S. BHC's operating foreign subsidiaries in countries with weaker regulatory environments tend to have stronger risk management.

- May reflect BHC choices or supervisory limitations on cross-border activity by institutions with weak risk management.
- Mitigates some concern about regulatory arbitrage and excessive risk-taking.

	PresSub		Ln(NSub)	
	(1)	(2)	(3)	(4)
Regulation & Supervision	0.013*** (0.000)	0.019*** (0.000)	0.021*** (0.000)	0.043*** (0.000)
WRM × Regulation & Supervision	-0.025*** (0.000)		-0.042*** (0.000)	
RMI × Regulation & Supervision		-0.009* (0.051)		-0.030*** (0.000)
Observations	38,406	23,685	38,406	23,685
Adj. R2	.30	.33	.29	.33

Bank Holding Company Risk and Regulatory Stringency

To this point we have identified a relationship between BHC foreign subsidiary location choices and the laxity of the host country's regulatory environment.

However, this behavior seems largely confined to those BHCs perceived as having strong risk management functions.

We now examine whether having subsidiary operations in foreign markets with weaker regulatory environments is related to BHC risk and contribution to systemic risk.

Also study whether the perceived strength of BHC risk management influences any relationship.

Bank Holding Company Risk and Regulatory Stringency

Focus on only a subset of our data – observations that indicate a BHC's presence in a particular country. Then further transform the original data as follows:

- 1.) Expand to quarterly observations to match the frequency of BHC financial data.
- 2.) Collapse to the BHC-quarter level using subsidiary count weights.
 - Results are robust to other weighting schemes.

Dependent variables are risk measures from Adrian and Brunnermeier (2016):

- 1.) VaR: The unconditional maximum loss in equity returns at the 99% level.
- 2.) Δ CoVar: The difference between the financial system's VaR conditional on an institution being distressed and the financial system's VaR conditional on the median state of the institution.

Key Variables: Summary Statistics and Correlations

Panel A: Summary Statistics

Country	Mean	SD	Min	Max	Observations
VaR	5.644	2.232	2.560	16.013	1, 502
Δ CoVaR	1.577	0.650	0.365	3.854	1, 502
Regulation & Supervision	4.243	0.874	1.572	6.027	1, 502
Activities Restrictions	6.931	1.233	2.200	9	1, 502
Capital Regulation	3.793	1.122	1	6.667	1, 502
Supervisory Power	6.304	1.783	2.800	10	1, 502

Panel B: Pairwise Correlations

	Regulation and Supervision	VaR	Δ CoVaR
Regulation & Supervision	1.000		
VaR	0.080***	1.000	
Δ CoVaR	0.099***	0.656***	1.000
	0.000	0.000	

Bank Holding Company Risk and Regulatory Stringency

We include the full set of country level controls in this analysis – weighted averages at the BHC-level.

Also include controls for U.S. financial market volatility and BHC characteristics (e.g., size, leverage, market-to-book ratio, foreign asset share, ratio of non-interest income to interest income, deposits-to-assets).

Data limitations reduce the number of BHCs in the cross-section from 135 to 64.

Regression specification:

$$\text{Risk}_{i,t} = \alpha_i + \beta \text{Regulation \& Supervision}_{i,t-1} + \delta \mathbf{X}_{i,t-1} + \varepsilon_{i,t}$$

- i indexes BHCs, and t the quarter; $\text{Risk}_{i,t}$ is either $\text{VaR}_{i,t}$ or $\Delta \text{CoVar}_{i,t}$
- $\text{Regulation \& Supervision}_{i,t-1}$ is as before (but averaged at the BHC-level).
- $\mathbf{X}_{i,t-1}$ represents our set of (BHC-averaged) host country and BHC controls.
- α_i is a set of BHC fixed effects; standard errors clustered at the BHC-level.

BHC Risk and Regulatory Stringency

U.S. BHCs more exposed (via subsidiaries) to jurisdictions with weaker regulation and supervision have higher stand-alone risk and contribution to systemic risk

- Driven by capital regulation and supervisory power (not activities restrictions).
- Finding is consistent across subsidiaries engaged in traditional versus non-traditional activities (e.g., securities, insurance).
- Finding robust to various IV approaches.

	VaR				Δ CoVaR			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Regulation & Supervision	0.768*** (0.000)				0.178*** (0.000)			
Activities Restrictions		0.057 (0.712)				0.015 (0.635)		
Capital Regulation			0.581*** (0.000)				0.129*** (0.000)	
Supervisory Power				0.303*** (0.000)				0.070*** (0.000)
Observations	1,502	1,502	1,502	1,502	1,502	1,502	1,502	1,502
Adj. R2	.53	.51	.52	.53	.70	.69	.69	.70

BHC Risk and Risk Management: Baseline

The association between BHC risk and operating foreign subsidiaries in countries with more lax regulatory environments is stronger for institutions identified as having weaker risk management practices.

	VaR		Δ CoVaR	
	(1)	(2)	(3)	(4)
Regulation & Supervision	0.786*** (0.000)	0.532*** (0.000)	0.185*** (0.000)	0.124*** (0.000)
Regulation & Supervision \times WRM	0.409*** (0.000)		0.065** (0.012)	
WRM	0.625 (0.124)		0.219*** (0.004)	
Regulation & Supervision \times RMI		0.120** (0.041)		0.037** (0.021)
RMI		-0.163 (0.793)		-0.054 (0.738)
Observations	1,481	1,290	1,481	1,290
Adj. R2	.53	.53	.70	.69

BHC Risk and Risk Management: Entry

BHC risk and contribution to U.S. systemic risk also increases upon establishing subsidiaries in countries with weaker regulatory environments.

- For each event, data is averaged into pre-entry and post-entry observations.
- Examine various event windows (4, 8, 12, and 16 quarters).

	+/- 4 Quarters		+/- 8 Quarters		+/- 12 Quarters		+/- 16 Quarters	
	VaR	Δ CoVaR	VaR	Δ CoVaR	VaR	Δ CoVaR	VaR	Δ CoVaR
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Post-entry	0.514 (0.465)	0.103 (0.453)	0.753 (0.149)	0.075 (0.596)	-0.015 (0.983)	-0.140 (0.544)	0.048 (0.930)	-0.102 (0.577)
Post-entry \times Regulation & Supervision	0.113*** (0.001)	0.025*** (0.001)	0.095*** (0.002)	0.020*** (0.003)	0.090*** (0.005)	0.020*** (0.005)	0.079** (0.010)	0.018** (0.014)
Observations	2,116	2,116	2,116	2,116	2,116	2,116	2,116	2,116
Adj. R2	.80	.90	.85	.93	.88	.95	.89	.96

Wrap-Up

U.S. BHCs are more likely to operate foreign subsidiaries in jurisdictions with lower regulatory burden.

This “regulatory arbitrage” behavior is associated with increases in BHC risk and their contribution to systemic risk.

These results also have key interactions with BHCs’ risk management functions.

- BHCs with weaker risk management are less likely to engage in regulatory arbitrage.
- But BHCs with weak risk management are the main driver of the link between regulatory arbitrage behavior and BHC risk and contribution to systemic risk.

These findings are consistent with a “race to the bottom” interpretation of regulatory arbitrage and highlight the need for greater international coordination of bank regulatory standards.