

# Unintended Consequences of the Global Derivatives Market Reform

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# Background

- Major role of unregulated OTC derivatives in the GFC ⇒ clear need for reform
- G20 Pittsburgh 2009 ⇒ Agreement on a **global reform agenda** with objectives to increase transparency and reduce systemic risk
- Then separately integrated into national regulation by participating governments with their own timing

## The G20 commitments

- 5 main regulatory blocks for OTC derivatives:
  - 1 Reporting to **trade repositories**
  - 2 **Central clearing** for standardised derivatives
  - 3 Trading on **exchanges** or **electronic trading platforms** for standardised derivatives
  - 4 Higher **capital requirements** for non centrally-cleared derivatives
  - 5 Minimum standards for **margin requirements**

## Opportunities for cross-border regulatory arbitrage from US banks...

- **Many delays and heterogeneity** in the timing of adoption of the reform in the distinct G20 jurisdictions
- US: early implementation of the reform in comparison with most other countries (Dodd-Frank Act, 2010)

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- US: early implementation of the reform in comparison with most other countries (Dodd-Frank Act, 2010)
- But regulatory loophole: foreign bank **branches** subject to US domestic regulation whereas foreign **subsidiaries** subject to the host country regulation
- Hence, derivatives market= a **global** and **liquid** market, which facilitates geographic reallocation

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- The reform is costly for banks: capital, margin requirements & infrastructure costs (= transaction costs)
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⇒ differences in timing open room for US banks' **cross-border regulatory arbitrage** through overseas affiliates to avoid these costs



## Related literature

- Large empirical evidence on banks' cross-border regulatory arbitrage
  - ⇒ in what regards **foreign bank acquisition**, international **lending flows** and **asset choices** (Houston et al. (2012), Karolyi and Taboada (2015), Temesvary (2018))

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⇒ in what regards **foreign bank acquisition**, international **lending flows** and **asset choices** (Houston et al. (2012), Karolyi and Taboada (2015), Temesvary (2018))
- However, in what regards the post-crisis OTC derivatives market reform, focus was only on direct consequences for **market efficiency and systemic risk** (e.g. Benos et al. (2016), Faruqui et al. (2018))

## Research question

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⇒ Use of **unexplored disaggregated data** from the Federal Reserve on securities holdings of US banks' foreign subsidiaries

## Contribution of the paper

- 1 Document **cross-country disparities** in the implementation of the reform and **changes in the geography** of US banks' derivative activity
- 2 Study the **factors driving cross-border differences** in the implementation of the reform to account for potential endogeneity of the regulation
- 3 Link **geographical reallocation** of US dealers' derivative activity to local **reform progress** to provide evidence of cross-jurisdictional regulatory arbitrage
- 4 Discuss **alternative forms** of regulatory arbitrage

## Preliminary evidence 1/3: unequal progress in the implementation of the reform across G20 countries

- Construction of time series of **national indices of reform progress** based on FSB reports
- Quarterly indices **for each block** for 18 countries + the EU for Q1 2010-Q4 2019, ranging from 0 to 4 (higher value= more reform progress)

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- Quarterly indices **for each block** for 18 countries + the EU for Q1 2010-Q4 2019, ranging from 0 to 4 (higher value= more reform progress)
- + **Global regulatory index** that equals the number of the 5 regulatory blocks for which the reform is fully adopted

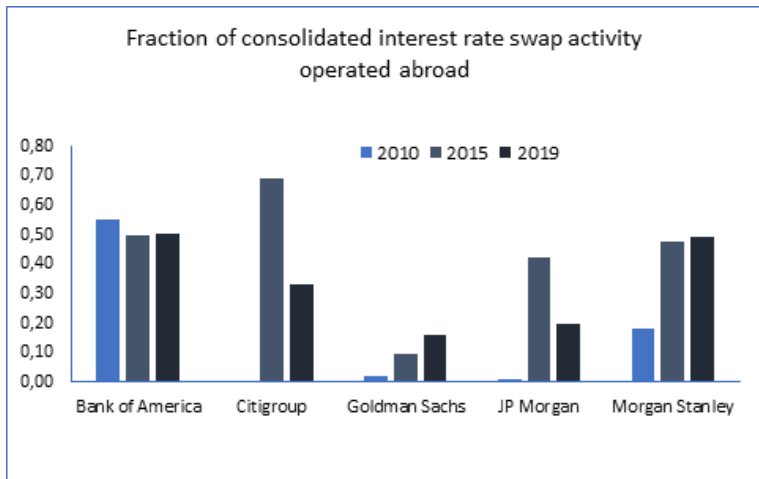
Table 1: value of the indices in Q4 2015 (and Q4 2019)

Country	Trade Reporting	Central Counterparty Clearing	Electronic Trading	Capital Requirements	Margin Requirements	Derivreg Index
Argentina	3 (4)	1 (1)	3 (3)	4 (4)	1 (1)	1 (2)
Australia	4 (4)	4 (4)	3 (4)	4 (4)	1 (4)	3 (5)
Brazil	4 (4)	4 (4)	1 (1)	4 (4)	1 (4)	3 (4)
Canada	4 (4)	3 (4)	2 (2)	4 (4)	3 (4)	2 (4)
China	4 (4)	4 (4)	3 (3)	1 (4)	0 (1)	2 (3)
European Union	4 (4)	3 (4)	3 (4)	4 (4)	2 (4)	2 (5)
Hong Kong	3 (4)	2 (4)	1 (4)	4 (4)	2 (4)	1 (5)
India	4 (4)	3 (3)	1 (3)	4 (4)	1 (2)	2 (2)
Indonesia	4 (4)	3 (3)	3 (3)	1 (4)	1 (1)	1 (2)
Japan	4 (4)	4 (4)	4 (4)	4 (4)	2 (4)	4 (5)
Mexico	4 (4)	2 (4)	2 (4)	4 (4)	1 (3)	2 (4)
Republic of Korea	4 (4)	3 (4)	0 (1)	3 (4)	1 (4)	1 (4)
Russia	4 (4)	2 (3)	1 (2)	4 (4)	2 (3)	2 (2)
Saudi Arabia	4 (4)	1 (1)	1 (1)	4 (4)	1 (4)	2 (3)
Singapore	4 (4)	4 (4)	1 (4)	4 (4)	2 (4)	3 (5)
South Africa	2 (3)	2 (4)	1 (1)	4 (4)	2 (2)	1 (2)
Switzerland	1 (4)	1 (4)	1 (4)	4 (4)	1 (4)	1 (5)
Turkey	1 (4)	1 (2)	1 (1)	4 (4)	1 (1)	1 (2)
United States	4 (4)	4 (4)	4 (4)	3 (3)	3 (4)	3 (4)

⇒ substantial heterogeneity across jurisdictions



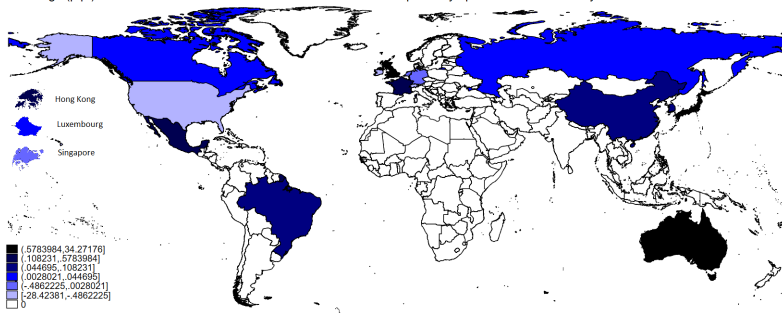
## Preliminary evidence 2/3: US banks' response: the shift abroad in IRS positions (Fed data)



## Preliminary evidence 3/3: geographic reallocation of IRS positions of US banks

- Change in share of consolidated US banks' IRS activity operated in a given country (through subsidiaries) between 2010 and 2015:

Change (p.p.) in the share of US banks' consolidated interest rate swap activity operated in each country between Q1 2010 and Q4 2015



## Challenges for identification of cross-border regulatory arbitrage

- Concern that host countries could actively delay the reform to attract US dealers' derivative activity
- Unobserved country characteristics could simultaneously affect progress of the reform and US banks' propensity to trade in a given country

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⇒ To address them, we show that determinants of reform progress are primarily **structural**, we **instrument** reform progress and proceed to several **robustness checks**

# 1- Determinants of reform progress: discrete time multilevel logit model with random effects (for repeated events)

$$\log\left(\frac{p_{i,j,t}}{1 - p_{i,j,t}}\right) = \log(d_{i,j,t})\alpha + x'_{i,j,t}\beta + u_i + \varepsilon_{i,j,t}$$

- $p_{i,j,t}$  = probability of progress in implementation of reform (=increase in regulatory index) in country  $i$  during interval  $t$  of an episode  $j$
- $d_{i,j,t}$  = cumulative duration by interval  $t$  since last progress in reform
- $x_{i,j,t}$  = vector of covariates, both cyclical and structural
- $u_i \sim N(0, \sigma_u^2)$  controls for unobserved heterogeneity between countries due to time-invariant omitted variables

## Baseline specification

	(1)	(2)	(3)	(4)	(5)	(6)
	DERIVREG	TR	CCP	ETP	KA	MA
GDP Growth	-0.040 (0.257)	-0.393 (0.353)	-0.126 (0.435)	0.394** (0.182)	-0.581 (1.292)	-0.075 (0.251)
Log(GDP per capita)	1.448** (0.675)	1.985 (1.629)	2.708 (9.223)	2.208*** (0.734)	2.367 (2.331)	1.558** (0.754)
Log(duration)	3.984*** (1.160)	7.987*** (1.663)	4.567 (19.30)	1.834*** (0.435)	14.62 (29.91)	2.575*** (0.931)
Constant	-28.03*** (9.559)	-40.81** (17.76)	-43.67 (168.0)	-32.67*** (7.478)	-63.69 (88.11)	-25.78*** (9.427)
N	760	398	610	725	391	706

## Additional determinants (included 1 at a time)

	(1) DERIVREG	(2) TR	(3) CCP	(4) ETP	(5) KA	(6) MA
<b>Secular factors</b>						
Log(turnover)	0.487**	2.096	1.907**	0.990***	0.253	0.213
Regulatory quality	1.619***	2.948*	5.482	2.037***	-0.086	0.546
Central bank regulator	-2.293**	-2.288	-1.319	-2.365**	-0.534	-0.524
Government effectiveness	1.577***	3.358**	4.876***	2.013***	-0.353	0.218
Crisis cost (public debt rise)	0.019	0.234	0.204***	0.107***	0.076	-0.013
Crisis cost (output loss)	0.020	0.203	0.167***	0.092***	0.017	-0.009
Banking sector assets/GDP	0.016**	0.040	0.040***	0.010	0.003	-0.009
<b>Cyclical factors</b>						
NPL	-0.075 (-0.014)	0.153 (0.202)	0.175 (0.116)	0.196* (0.197**)	0.287 (0.712)	0.015 (0.038)
Z-score	0.191*** (0.172**)	0.597 (0.550)	0.314* (0.303***)	0.206*** (0.203***)	0.114 (0.101)	0.055 (0.067)

⇒ Reform progress: positively associated with institutional quality and depth of the local OTC derivative market (sluggish variables)

## 2- US banks' response to the regulatory loophole

- We proceed to test for the impact of reform progress on the geography of US banks' derivative activity:

$$s_{i,j,t} = I_{j,t}\alpha + x'_{i,j,t}\beta + FE + \varepsilon_{i,j,t},$$

- with  $s_{i,j,t}$  the share of US bank  $i$ 's IRS activity in country  $j$  in quarter  $t$
- with  $I_{j,t}$  one of our reform progress index
- with  $x'_{i,j,t}$  a vector of variables which controls for local market conditions



	(1)	(2)	(3)	(4)	(5)
					2010-2019
Derivreg index	-0.112** (0.045)	-0.106** (0.053)	-0.091*** (0.030)	-0.032*** (0.011)	-0.032*** (0.008)
Inflation			-0.076*** (0.022)	-0.016 (0.011)	-0.029*** (0.007)
Log(GDP per capita)			0.282* (0.148)	-0.440*** (0.141)	-0.629*** (0.179)
GDP Growth			-0.033** (0.013)	-0.005 (0.008)	-0.000 (0.006)
Log(turnover)			0.051*** (0.009)	-0.051 (0.048)	0.035 (0.046)
Interest rate volatility			0.863** (0.385)	-0.062 (0.043)	-0.071* (0.037)
Political stability				0.261** (0.107)	0.010 (0.088)
Stock market volatility				-0.011 (0.009)	-0.009 (0.006)
Banking sector assets/GDP				-0.004*** (0.001)	-0.001 (0.001)
<i>Bank FE</i>	yes	no	no	yes	yes
<i>Quarter FE</i>	yes	no	no	yes	yes
<i>Bank*quarter FE</i>	no	yes	yes	no	no
<i>Country FE</i>	no	no	no	yes	yes
R <sup>2</sup>	0.56	0.70	0.81	0.84	0.82
N	946	946	939	626	963

## Specific regulation blocks

	(1)	(2)	(3)	(4)
		2010-2019		2010-2019
Trade reporting	-0.012 (0.049)	0.064 (0.056)	0.002 (0.046)	0.079 (0.048)
Central clearing	-0.115*** (0.041)	-0.151*** (0.033)	-0.158*** (0.043)	-0.151*** (0.040)
Capital requirements	-0.150** (0.059)	-0.142** (0.063)	0.005 (0.066)	-0.019 (0.064)
Electronic trading	0.029 (0.034)	0.024 (0.020)	0.048 (0.030)	0.015 (0.020)
Margin requirements	0.108 (0.077)	-0.075** (0.038)	0.052 (0.064)	-0.073** (0.034)
Inflation	-0.077*** (0.015)	-0.063*** (0.013)	-0.083*** (0.017)	-0.055*** (0.018)
Log(GDP per capita)	0.330*** (0.114)	0.361*** (0.098)	0.233* (0.136)	0.265** (0.112)
GDP Growth	-0.038*** (0.009)	-0.040*** (0.008)	-0.043*** (0.012)	-0.034*** (0.012)
Log(turnover)	0.042*** (0.008)	0.041*** (0.007)	0.050*** (0.009)	0.049*** (0.008)
Interest rate volatility	0.785*** (0.253)	0.576*** (0.159)	0.823** (0.371)	0.498*** (0.188)
<i>Bank FE</i>	yes	yes	no	no
<i>Quarter FE</i>	yes	yes	no	no
<i>Bank*quarter FE</i>	no	no	yes	yes
R <sup>2</sup>	0.72	0.58	0.83	0.70
N	939	1,713	939	1,667

## 4- Alleviating endogeneity concerns: several steps

- **Comparison before/after** the implementation of the distinct blocks of the reform in the US (interaction effects with adoption of US regulation)
- We **instrument** reform progress with measures of the destination countries' regulatory independence and cost of crisis (Houston et al. (2012), Karolyi & Taboada (2015))
- **Placebo regression** on FXS positions (not concerned by 3 of the 5 reform blocks)
- **Interaction effects** between reform progress and measures of market turnover and institutional quality to identify mitigating factors

## Regulatory arbitrage

	(1)	(2)	(3)	(4)	(5)	(6)
	US adoption	US adoption 2010-2019	2SLS	2SLS 2010-2019	FX Swaps	FX Swaps 2010-2019
Derivreg	0.035 (0.027)	0.026 (0.024)	-0.121*** (0.028)	-0.121*** (0.020)	0.033 (0.095)	0.083 (0.079)
Derivreg*US TR	-0.019* (0.010)	-0.018* (0.009)			-0.062 (0.069)	-0.038 (0.048)
Derivreg*US CCP	-0.035 (0.025)	-0.031 (0.023)			0.075 (0.047)	0.026 (0.041)
Derivreg*US ETP	-0.032* (0.017)	-0.042*** (0.012)			-0.057 (0.038)	-0.032 (0.041)
Derivreg*US MA		0.039*** (0.015)				0.046 (0.031)
Inflation	-0.021** (0.009)	-0.025*** (0.009)	-0.037*** (0.009)	-0.028*** (0.007)	-0.019 (0.022)	-0.022 (0.020)
Log(GDP per capita)	-1.108*** (0.332)	-0.663*** (0.215)	-0.241*** (0.053)	-0.190*** (0.052)	-0.560 (1.009)	0.171 (0.649)
GDP Growth	-0.018 (0.011)	-0.019* (0.010)	0.001 (0.010)	0.002 (0.008)	-0.045** (0.017)	-0.031 (0.021)
Log(turnover) IRS	0.343*** (0.062)	0.234*** (0.057)	0.086*** (0.011)	0.085*** (0.007)		
Interest rate volatility	0.134 (0.119)	0.173** (0.080)	-0.071 (0.059)	-0.002 (0.044)		
Log(turnover) FXS					0.171* (0.095)	0.305*** (0.101)
Exchange rate volatility					-5.256 (6.105)	-3.596 (3.433)
Bank FE	yes	yes	yes	yes	yes	yes
Quarter FE	yes	yes	yes	yes	yes	yes
Country FE	yes	yes	no	no	yes	yes
First stage F-statistic			10.41	17.59		
Hansen J-statistic			0.19	0.79		
R <sup>2</sup>	0.83	0.82	0.82	0.80	0.88	0.86
N	939	1,667	826	1,448	754	1,422

## Regulatory arbitrage

	(1)	(2)	(3)	(4)
Derivreg index	-0.162*** (0.027)	-0.131*** (0.037)	-0.111*** (0.026)	-0.360*** (0.053)
Inflation	-0.042*** (0.006)	-0.052*** (0.006)	-0.037*** (0.007)	0.002 (0.007)
Log(GDP per capita)	-0.388*** (0.115)	-0.485*** (0.125)	-0.488*** (0.127)	-0.931*** (0.252)
GDP Growth	-0.007 (0.007)	-0.006 (0.007)	-0.005 (0.007)	-0.009 (0.008)
Log(turnover) IRS	0.025 (0.069)	0.015 (0.064)	-0.012 (0.054)	0.341*** (0.054)
Interest rate volatility	-0.060 (0.042)	-0.054 (0.041)	-0.053 (0.036)	0.063 (0.086)
Derivreg*Rule of law	0.077*** (0.020)			
Rule of law	-0.132 (0.270)			
Derivreg*Government effectiveness		0.055** (0.025)		
Government effectiveness		-0.114 (0.135)		
Derivreg*Regulatory quality			0.046** (0.019)	
Regulatory quality			0.330** (0.159)	
Derivreg*Log(turnover) IRS				0.028*** (0.004)
R <sup>2</sup>	0.83	0.83	0.83	0.84
N	801	801	801	939

## Conclusion: main findings

- Delays and cross-country heterogeneity in adoption of derivatives market reform mainly driven by country-specific **structural** factors
- US banks appear to have taken advantage of these differences by moving their IRS activity to **less tightly regulated** foreign subsidiaries (ceteris paribus)
- Findings driven by **blocks** of the reform that are **costliest** for banks

## Discussion: alternative forms of regulatory arbitrage in the derivatives market?

- No evidence of higher risk-taking in subsidiaries located in countries with stronger regulation
- But we can suspect migration to shadow banks and "futurization"

## Implications for regulators

- **Transaction costs** matter as a driver of regulatory arbitrage
- Regulation of **global and liquid markets** such as the derivatives market particularly at risk of **cross-border** regulatory arbitrage in particular



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- **Transaction costs** matter as a driver of regulatory arbitrage
- Regulation of **global and liquid markets** such as the derivatives market particularly at risk of **cross-border** regulatory arbitrage in particular
- Regulatory response to the crisis: designed to contain the cross-border propagation of risks
  - ⇒ But **unintended consequences**: in the absence of worldwide coordination ⇒ financial risk moves around
  - ⇒ Need for a level playing field in international financial regulation