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SPATIAL DEPENDENCE AND INTERNAL CAPITAL MARKETS

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This presentation is work in progress and is in collaboration with Carmela D'Avino, ICN Business School and University of Lorraine, Nancy, France

INTRODUCTION I

- Global banks play a role in cross-border shock contagion
 - What is the link between the presence of global banks and local financial stability? Are local shocks amplified? Are foreign shocks imported?
- Network analysis approach, *systemic risk* focused
 - BIS bilateral data for measurement of financial interconnections across geographical regions
- Empirical models centred on lending of foreign affiliates, *loans* focused
 - Panel models

INTRODUCTION II

- Limitations:
 1. International claims (cross-border and local) are gross exposures of banks but do not allow to single out inter-office transactions of global banks
 - Banks actively manage liquidity across the borders through internal capital markets and making inter-office transaction an important channel of shock transmission (Cetorelli and Goldberg, 2012)
 2. Spatial dependence not modelled
 - Non-spatial models may suffer from misspecification if spatial dependence exists within the data
 - *proximity* matters in explaining trends in local lending
 - important interlinkages across locations arising from foreign branches' reliance on internal capital markets

CONTRIBUTIONS

- This paper investigates the spatial dependence of loans granted by foreign branches of US banks in a given location. Proximity is measured by the degree of inter-office lending between two locations via internal capital markets.
 1. Focus on the lending of foreign branches
 2. Account explicitly for the spatial dependence of the lending of branches of global banks

Table 1: Internal capital markets: Interoffice assets and liabilities of foreign branches of US banks, ranking of host countries, 2015.

Interoffice Assets			Interoffice Liabilities		
<i>Country</i>	as % of total assets	\$Bn	<i>Country</i>	as % of total assets	\$Bn
JERSEY	100%	1,30	SWITZERLAND	91%	14,15
PUERTO RICO	98%	61,14	FRANCE	81%	3,30
CAYMAN ISLANDS	97%	367,31	JAPAN	81%	53,79
MALAYSIA	89%	0,66	TAIWAN	75%	6,76
BRAZIL	82%	1,33	SPAIN	72%	1,13
B. VIRGIN ISLANDS	76%	0,86	BRAZIL	72%	1,16
BELGIUM	71%	15,29	ITALY	68%	2,10
VIETNAM	69%	2,33	GERMANY	65%	5,23
NETHERLANDS	65%	1,61	BAHRAIN	65%	0,77
UNITED KINGDOM	56%	541,51	SOUTH KOREA	62%	8,24

Notes: Authors' calculations based on the FFIEC 030 report, end 2015 data. Interoffice assets are calculated as the sum of "Gross due from head office, U.S. branches, and other foreign branches of this bank" (FORBC482) and "Gross due from consolidated subsidiaries of this bank" (FORBC483). Interoffice liabilities are equal to the sum of "Gross due to head office, U.S. branches, and other foreign branches of this bank" (FORBC485) and "Gross due to consolidated subsidiaries of this bank" (FORBC486).

THE NETWORK OF GLOBAL BANKS

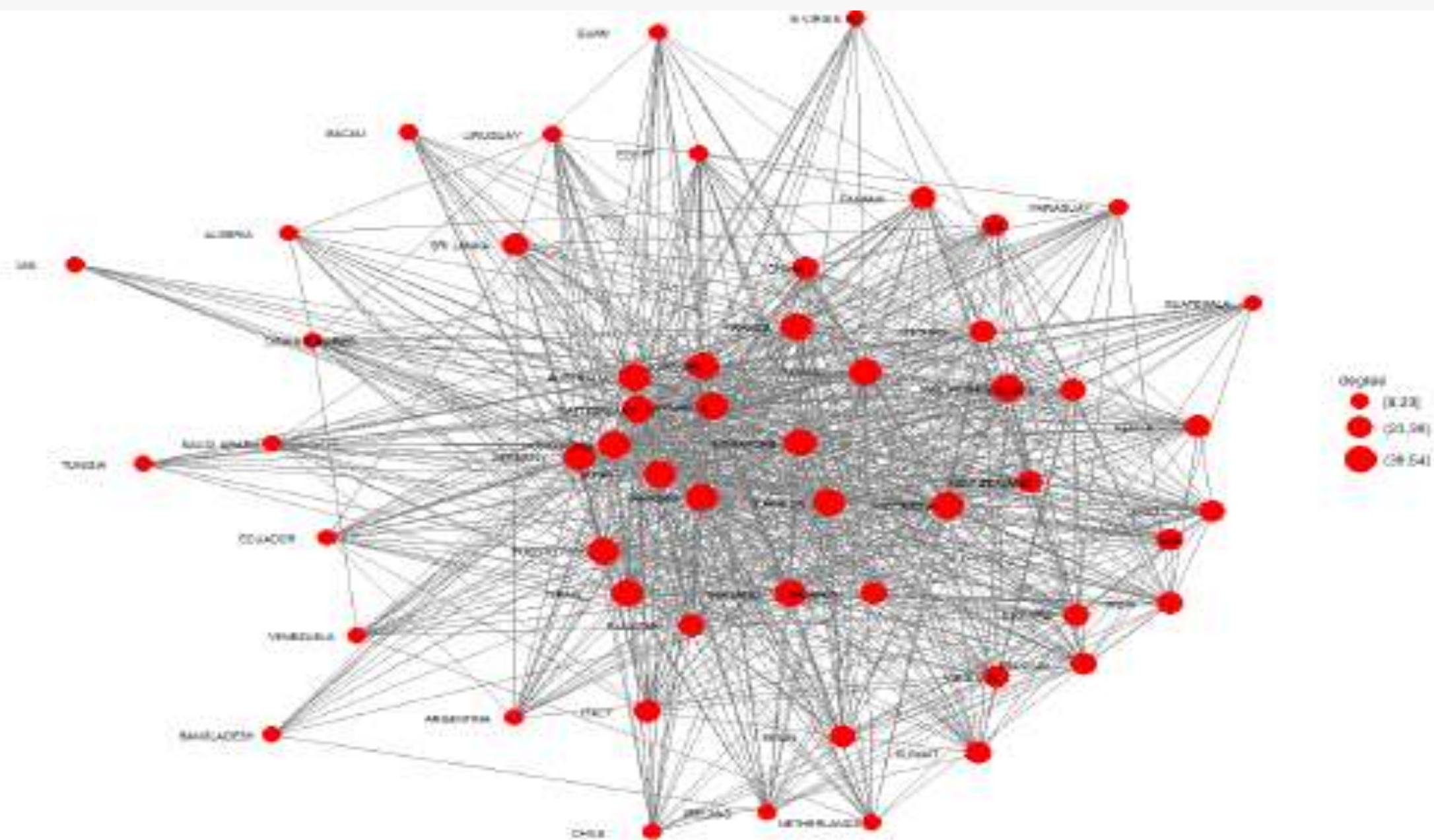
- Minoiu and Reyes (2013) assess the properties of the global banking network created by global banks using locational banking data on cross-border positions of banks in flows (BIS)
- Hattori and Suda (2007) use the BIS consolidated banking claims to construct the bilateral matrix of financial linkages which are collected on a nationality basis.
- Peltonen et al (2015) focusing of EU countries construct a *macro-network*. Bilateral loans, deposits and securities holdings are used to evaluate cross-country exposure and obtained from the ECB's Balance Sheet Items statistics (BSI) by counterparty country.

DE HAAS AND LELYVELD (2014)

- Sample of 48 bank holding companies look at the differences between the lending of domestic banks and subsidiaries of foreign banks.
- In previous episodes, during **local crisis** subsidiaries, with the necessary capital and liquidity support from their parent bank, were able to stabilize local lending and hence offset the fall in supply of credit by domestic banks.
- The reverse is observed during the 2008-09 crisis, whereby the lending of subsidiaries fell by much more than local banks.
- This was mainly because of the inability of parent banks to provide **internal capital** given the funding constraints they faced in frozen short-term wholesale markets.

DATA I: WEIGHTING MATRIX

- Geographically-segmented balance sheet data of foreign branches of US banks (FFIEC 030)
- The higher the transactions in internal capital markets between any two locations, the closer these two locations are
- The matrix of bilateral exposure is estimated by means of the Minimum Density (MD) approach (Anand et al., 2014)
- Every entry of the matrix $w_{ij,t}$ represent the outstanding amount branches of US banks located in country i have lent to branches of US banks located in country j in year t .



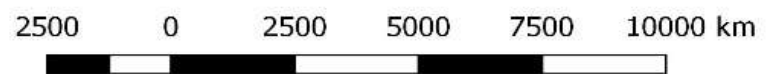
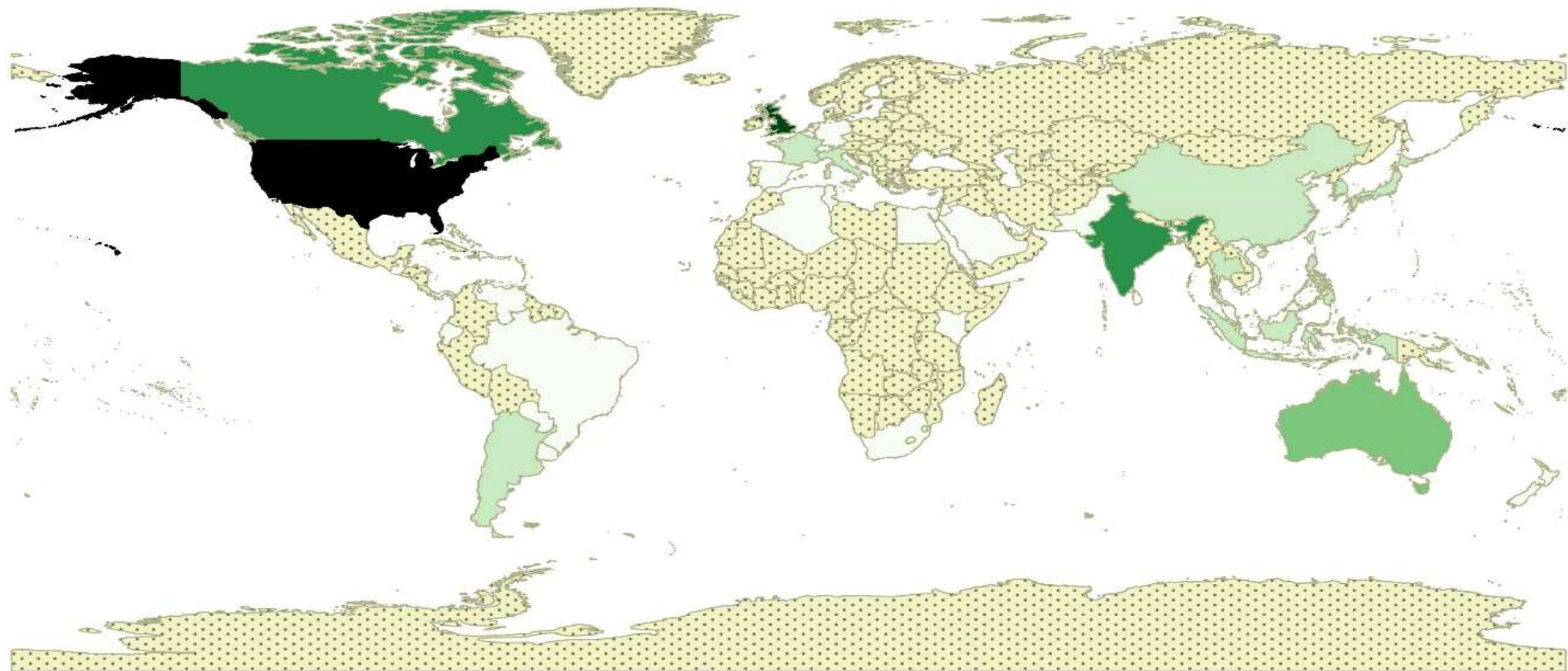
SUMMARY OF W

Matrix	Description
Dimensions	54 x 54
<i>Links</i>	
total	601
min	2
mean	11
max	29

DATA II: SPATIAL DEPENDENCE OF GLOBAL BANKS' LENDING

- Lending data on foreign branches of US banks (FFIEC 030) from the FFIEC on demand
- The theoretical framework by Morgan et al. (2003, 2004) to analyse capital allocation decisions across the borders whether international banking leads to loan stabilisation.
- Control variables (De Haas and Lelyveld, 2010):
 - host country's bank lending interest rates (%), $interest_{it}$,
 - real GDP growth rate (%) in host countries, gdp_{it} ,
 - the ratio of deposits (including interbank) to total assets as proxy for liquidity, $liquid_{it}$
 - The log of total assets of branches located in country i , namely $size_{it}$, is also included in the vector of control variables in some specifications, as well as a time-invariant proxy for the prudential regulatory stance in the host country, reg_i

$$loans_{it} = \rho Wloans_t + X_{it}\beta + WX_t\varphi + \mu_i + \epsilon_{it}$$



Dependent variable: log of loans in host country i, $loans$				
	<i>Pooled OLS</i>	<i>Pooled OLS</i>	<i>Fixed-effect</i>	<i>Fixed-effect</i>
	(1)	(2)	(3)	(4)
interest	0.024** (0.010)	0.021** (0.011)	0.024** (0.010)	0.021** (0.010)
GDP	0.011 (0.013)	0.006 (0.013)	0.011 (0.013)	0.006 (0.012)
liquidity	-0.072 (1.447)	-0.042 (1.489)	-0.072 (1.391)	-0.042 (1.430)
reg	-1.668*** (0.263)	-1.688*** (0.263)		
Host-country dummies	Yes	Yes	No	No
Time fixed dummies	No	Yes	No	Yes
Observations	702	702	702	702
R-squared	0,862	0,864	0,034	0,02
Notes: This table reports the estimates of panel regressions. A constant term is included in every specification but unreported. The statistical significance of results is indicated by * = 10% level, ** = 5% level and *** = 1% level using robust standard errors clustered at the host country-level.				

Spatial Panel Autocorrelation Tests		
	<i>Pooled OLS</i>	<i>Fixed-effect</i>
H0: Error has No Spatial AutoCorrelation		
Global Moran MI, p-value	0.000	0.000
Global Geary GC, p-value	0.000	0.000
Global Getis-Ords, p-value	0.000	0.000
Moran MI Error Test	18.7217***	18.6950***
LM Error (Burridge)	348.0064***	347.0114***
LM Error (Robust)	-11.8391***	
H0: Spatial Lagged Dependent Variable has No Spatial AutoCorrelation		
LM Lag (Anselin)	348.0064***	347.0114***
LM Lag (Robust)	-11.8391***	
H0: No General Spatial AutoCorrelation		
LM SAC	336.1674***	

Dependent variable: log of loans in host country i , $loans$						
	<i>FE-SAR</i>		<i>FE-SDM</i>		<i>FE-SEM</i>	
	(1)	(2)	(3)	(4)	(5)	(6)
interest	0.019** (0.009)	0.020** (0.011)	0.015* (0.009)	0.016* (0.009)	0.024** (0.010)	0.021** (0.010)
GDP	0.006 (0.013)	0.006 (0.013)	0.007 (0.012)	0.006 (0.012)	0.012 (0.012)	0.006 (0.012)
liquidity	-0.220 (1.453)		-0.285 (1.433)	-0.282 (1.436)	-0.060 (1.407)	-0.042 (1.415)
W*interest			0.147* (0.088)	0.151* (0.088)		
W*GDP			-0.037 (0.036)	-0.031 (0.036)		
W*liquidity			1.761 (1.532)	1.764 (1.543)		
W*size			0.743*** (0.299)	0.723** (0.300)		
W*loans	0.210*** (0.079)	0.199*** (0.072)	0.352*** (0.077)	0.175** (0.084)		
Lambda					0.035 (0.171)	0.008 (0.184)
Sigma2	0.700	0.701	0.692	0.693	0.667	0.657
Time fixed- effect	Yes	Yes	No	Yes	No	Yes
Spatial fixed-effect	No	No	Yes	Yes	Yes	Yes
Log-likelihood	799.8019	780.0648	788.1778	786.7549	788.1778	788.1779
Observations	702	702	702	703	702	703

Notes: This table reports the estimates of fixed-effect spatial panel regressions. Space-time lagged dependent variables are included in specifications 1-4 (unreported). The statistical significance of results is indicated by * = 10% level, ** = 5% level and *** = 1% level using robust standard errors clustered at the host country-level.

CONCLUSIONS

- Spatial dependence arising from internal capital markets explains significantly changes in lending of US global banks
- Existence of positive spillovers in lending activities of banks located in interconnected host countries
- Further research to investigate the implication of the channel arising via interest rates.