

# Banking Integration Indicators: Is Full Integration Desirable?

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# Outline

- 1 Background
- 2 Motivation
- 3 Indicators of banking integration
  - Degree of bank openness
  - Degree of bank connectedness
  - Degree of banking integration
- 4 Controlling for distance
- 5 Statistical sources and selected variables
- 6 Results
  - Degree of bank openness, connectedness and integration
  - Banking integration and economic performance
- 7 Concluding remarks

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- Part of a larger initiative consisting of constructing **indicators** of economic integration which take into account:
  - The new approaches which try to measure the **different aspects of globalization** (e.g., the KOF index).
  - The new approaches which try to measure economic globalization from a **network analysis perspective** (e.g., De Benedectis and Tajoli, 2010; Kali and Reyes, 2007; etc.).
  - The approaches which define a **Standard of Perfect International Integration** (e.g., Frankel, 2000).
  - The approaches which consider **geographic neutrality** ideas (Kunimoto, 1977; Krugman, 1996).
  - The interest was not only to measure **trade** but also **financial integration** and **banking integration**.

- The results have been disseminated using different ways, including:
  - Constructing a **database** (INTEGRA), which is available via the **Ivie** and **BBVA Foundation**'s webpages.
  - **Monograph**, which collects all the different results.

# LA MEDICIÓN DE LA INTEGRACIÓN COMERCIAL EN UNA ECONOMÍA GLOBALIZADA

Francisco Pérez García (Dir.)

Fundación BBVA



Unfortunately, it's in Spanish.

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- International **economic** integration has **advanced rapidly** both in **trade** and **finance**:
  - Trade globalization (trade in **goods and services**):
    - Rapid advances before 1914, and over the last 50 years.
    - Much of the progress of the last half-century **has offset** the inter-war decline.
  - Financial globalization (trade in **assets**):
    - Rapid advances over the last 35 years.
    - Its progress depends on the **market considered**—financial/banking.

- Europe: an explicit agenda to enhance **monetary** and **financial** integration (**SEM**, 1992; **FSAP**, 1998; **euro**).
  - Expected results of **enhanced financial integration** and **removal of barriers** to the cross-border financial trade:
    - **Price convergence** between different geographic markets.
    - **Increasing cross-border allocation of investment**.
- However, the **international financial crisis** is casting **doubts** on the **alleged benefits** of financial integration.

- The crisis has actually fuelled the debate on the impact of international financial integration (IFI) on growth:
  - Some authors conclude it is a stylized fact that there is actually no correlation between long-run economic growth and financial integration (Rodrik and Subramanian, 2009).
  - Others argue that failing to find the expected positive effects of IFI on growth is not a failure but an opportunity (Kose, Prasad, Rogoff and Wei).

- We argue that, under these circumstances, **measuring** financial integration is still relevant, and that there is still scope for its improvement.

- Actually, there is a **lack of consensus** as to **how to measure** the **extent** of financial integration:
  - Price-based indicators:
    - *Advantages:* a great deal of information (equity and bonds markets).
    - *Disadvantages:* arbitrage may not always work; in the case of banking, it is often impossible to verify whether the LOOP holds (lack of data and wide differences in banking products).
  - Quantity-based indicators:
    - *Advantages:* closer concept to *de facto* financial integration—as opposed to *de jure* financial integration.
    - *Disadvantages:* less information, more difficult to collect and compare.

- We focus on **quantity-based** indicators:
  - More appropriate when evaluating **retail** banking integration.
  - This type of integration is particularly relevant in some specific contexts such as Europe—where talks about **deeper banking integration** are underway.

- Our **quantity-based indicators** of integration take into account some recent approaches by the network analysis literature to study the **World Trade Web**.
- Specifically, among their most prominent features we find that:
  - 1 It is a benchmark that considers not only **openness** but also the architecture of financial banking **connections**.
  - 2 It establishes that integration requires the development of a **complete** and **geographically unbiased** network that connects banking systems.
  - 3 It allows to measuring the **gap** between the **actual** and **potential** levels of banking integration.

- Even Nobel laureates have advocated for **measures of IFI** that consider the international financial system as a **network**:
  - For instance, Stiglitz makes a comparison with the design of **electric networks**, where a failure in one part of the system can lead to **system-wide** failure.
  - Analogously, in the **international financial network**, a failure in one part of the global economic system might cause a global “meltdown”.



- Under these circumstances, our goals are as follows:
  - ① To introduce a **modified version** of our **quantity-based indicators** of banking integration taking into account:
    - The **role of distance**.
    - A **richer set of countries**—22 bank countries and 207 customer countries.
    - A more updated sample which includes **pre-crisis** and **crisis** years.
  - ② To present some **(preliminary)** results on the links between banking integration and economic performance:
    - For this, we will use quantile regression (Koenker, 1978), since the effects might differ for richer and poorer countries.

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## Degree of bank openness

- Degree of bank openness of  $i \in N$ :

$$DBO_i = \sum_{j \in N} DBO_{ij} = \frac{\sum_{j \in N} X_{ij}}{\hat{X}_i} \quad (1)$$

where

$X_{ij}$  : cross-border bank asset trade between  $i$  and  $j$

$X_i$  : size of  $i$ 's banking system, i.e. total bank assets of  $i$

$\hat{X}_i = X_i - a_i X_i$  (home bias-corrected bank assets)

$a_i = X_i / \sum_{j \in N} X_j$

$X_{ii} \neq 0$

## Degree of bank connectedness

- Cross-border bank asset trade between two countries in a “perfectly” connected network is proportional to the **size** of the banking system in the **customer** country.
- $\alpha_{ij} = X_{ij} / \sum_{j \in N} X_{ij}$ : relative asset trade between  $i$  and  $j$ .  
 $A = (\alpha_{ij})$ : matrix of actual relative asset trade volumes.
- $\beta_{ij}$ : relative weight of  $j$ 's banking system when  $i$  is excluded,

$$\beta_{ij} = \frac{X_j}{\sum_{k \in N \setminus i} X_k}$$

$B = (\beta_{ij})$ : matrix of potential or theoretical relative asset trade volumes.

- Our indicator of **connectedness** measures the gap between actual and potential asset trade volumes.
- Degree of bank connectedness:

$$DBC_i = \frac{\sum_{j \in N} \alpha_{ij} \beta_{ij}}{\sqrt{\sum_{j \in N} (\alpha_{ij})^2} \sqrt{\sum_{j \in N} (\beta_{ij})^2}}. \quad (2)$$

- $DBC_i \rightarrow 0$  if asset trade takes place “disproportionately”.
- $DBC_i \rightarrow 1$  if  $i$  is proportionally connected—i.e. according to the theoretical potential.

## Degree of banking integration

- Degree of banking integration:

$$DBI_i = \sqrt{DBO_i \cdot DBC_i} \quad (3)$$

- Ranges in the  $(0, 1)$  interval.
- Decomposing  $1 = \sqrt{DBO_i / DBI_i} \sqrt{DBC_i / DBI_i}$  allows ascertaining which the largest component is.

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- Some recent contributions have stressed the **high correlation** between **trade in goods** and **trade in assets**, including:
  - Aviat and Coeurdacier (JIE, 2007).
  - Coeurdacier (JIE, 2009).
  - Coeurdacier and Martin (JJIE, 2009).
- Simultaneously, **trade** is still **strongly determined by distance**, as shown in numerous contributions—notably, those focusing on the persistence of distance (Disdier and Head, 2008).

These arguments would imply that **distance may be playing a role** as a **determinant of cross-border asset holdings**.



- Therefore, we construct **distance-corrected indicators**, in order to control for this **distance effect**.

Country  $i$ 's share of bank assets **correcting for distance**, based on Samuelson's iceberg transportation costs:

$$r_i = \frac{(X_i/d_{ii}^\theta)}{\sum_{j \in N} (X_j/d_{ij}^\theta)} \quad (4)$$

where

$d_{ii}$ : internal distance for country  $i$ .

$d_{ij}$ : distance from country  $i$  to country  $j$ .

$\theta$ : distance's weight (0: distance is irrelevant/geographic neutrality/zero-gravity model; 1: distance matters).

- Using  $r_i$  instead of  $a_i$  indicates that if a banking system  $j$  of size  $X_j$  gets as close to banking system  $i$  as possible, then its size will be reduced to  $X_j/d_{ij}$ .
- We are “obliged” to use internal distances ( $d_{ij}$ ) in order to avoid the distance effect to be affected by the **units of measurement**.

## Degree of bank openness, distance-corrected

- Degree of openness of  $i \in N$ :

$$DBO_i^d = \sum_{j \in N} DBO_{ij}^d = \frac{\sum_{j \in N} X_{ij}}{\widehat{X}_i^d} \quad (5)$$

where

$X_{ij}$  : cross-border bank asset trade between  $i$  and  $j$

$\widehat{X}_i^d = X_i - r_i X_i$  (home and distance bias-corrected bank assets)

$X_{ii} \neq 0$

## Degree of balanced connectedness, distance-corrected

- Relative weight of  $j$  in a world where  $i$  is not considered:

$$\beta_{ij}^d = \frac{X_j/d_{ij}^\theta}{\sum_{k \in N \setminus i} (X_k/d_{ik}^\theta)} \quad (6)$$

- The rest of indicators and expressions remain **unchanged**, or are changed equivalently—so we also have  $DBC^d$  and  $DBI^d$ .

# Outline

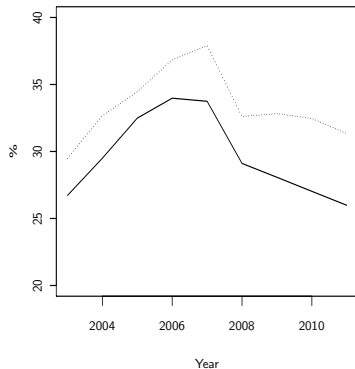
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- We use data on **bilateral bank asset trade** (foreign claims).
- Database: BIS (*Bank for International Settlements*), ECB and other central banks.
- 22 bank countries, accounting for:
  - 79.7% of international banking markets.
  - Includes most OECD countries.
- 207 customer countries.
- Period: 2003 to 2011.
- Variable selected to measure banking integration: cross-border claims (assets held abroad by banks of a given country).

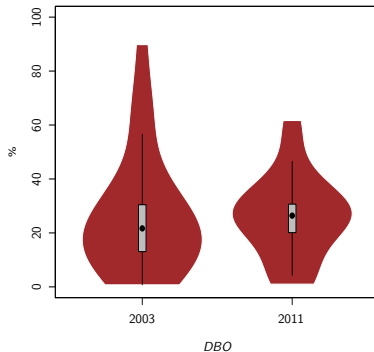
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## Degree of bank openness, *DBO*

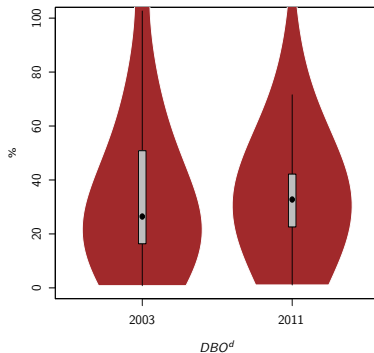
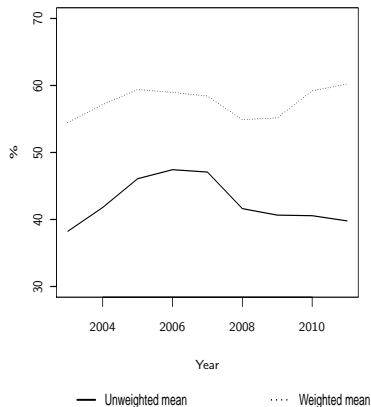


— Unweighted mean      .... Weighted mean

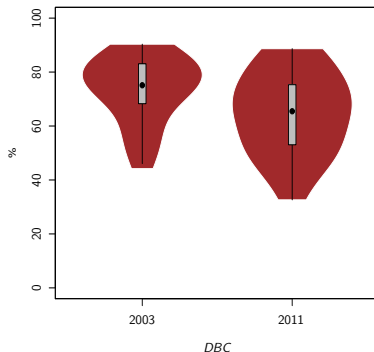
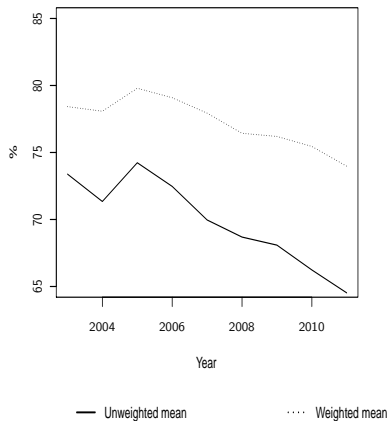




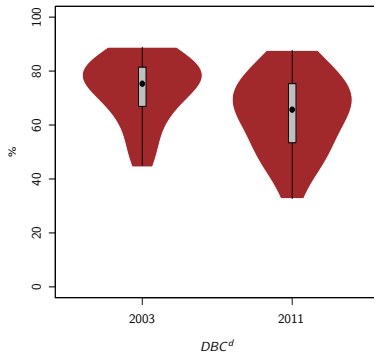
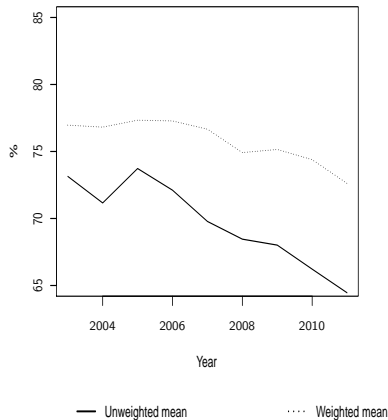
## Degree of bank openness, distance-corrected, $DBO^d$



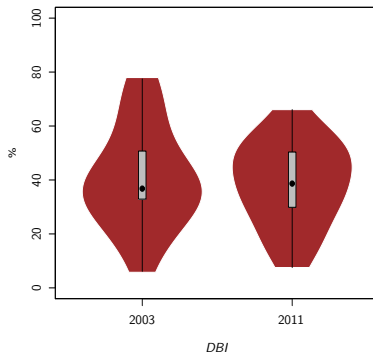
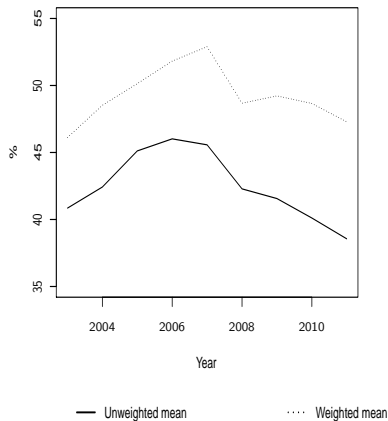
## Degree of bank connectedness, *DBC*



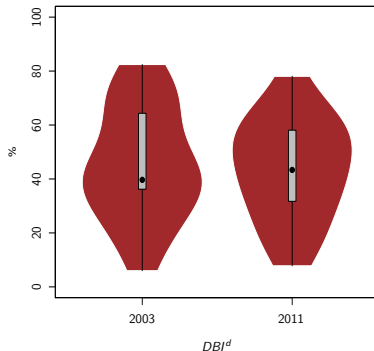
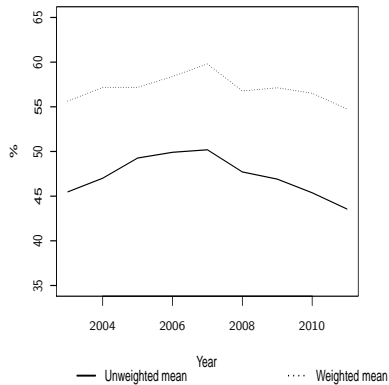
## Degree of bank connectedness, distance-corrected, $DBC^d$



## Degree of bank integration, *DBI*



## Degree of bank integration, distance-corrected, $DBI^d$



# 1<sup>st</sup> summary of results

## Evolution of descriptive statistics

- On average, the crisis has had a remarkable effect—both weighted and unweighted.
- The violin plots indicate that dispersion is shrinking—although the median is actually higher.
- The trends are corroborated both for *DBO* and *DBC*—the decline is sharper for *DBC*.
- Controlling for distance show different results—the effect of the crisis is dimmed, and dispersion is much higher.
  - This might suggest the crisis is affecting particularly asset trade with faraway countries.

## 2<sup>nd</sup> summary of results

### Results for individual countries

- **Disparities are strong**, for both *DBO* and *DBC*. Some specific trends:
  - The indicators for some countries have declined sharply—IRL, BEL, NLD, DEU, CHE.
  - In other cases, the decline is **less marked**, or focuses in one indicator only (FRA, SWE, DNK).
  - Non-euro area countries (GBR) and non-EU countries (USA, JPN, CAN) show **positive tendencies** during the crisis years.

# Degree of bank openness, $DBO^{\theta=0}$ and $DBO^{\theta=1}$

Years 2003, 2007 and 2011

Country	$DBO^{\theta=0}$			$DBO^{\theta=1}$		
	2003	2007	2011	2003	2007	2011
Belgium	64.23	75.11	21.02	72.16	85.04	23.37
Canada	24.52	25.88	26.25	25.35	26.98	27.57
Denmark	7.92	31.06	22.67	9.28	36.95	27.31
France	29.83	42.61	35.80	35.08	50.53	42.75
Ireland	47.74	38.89	12.19	55.37	48.13	14.65
Japan	20.92	37.04	30.68	140.64	162.25	190.57
Netherlands, The	66.46	79.52	37.37	80.43	96.82	47.81
Sweden	30.60	53.39	55.38	33.55	58.87	62.54
Switzerland	89.80	86.79	61.67	125.89	120.50	87.00
United Kingdom	30.03	36.07	41.76	43.42	53.92	62.50
United States	13.46	18.24	28.47	19.44	24.97	38.95



# Degree of bank connection, $DBC^{\theta=0}$ and $DBC^{\theta=1}$

Years 2003, 2007 and 2011

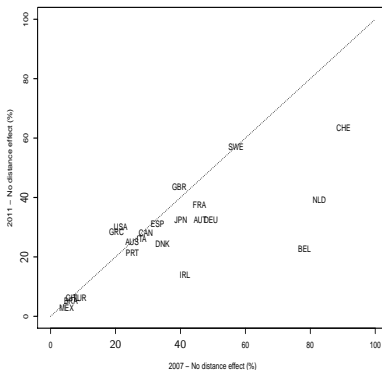
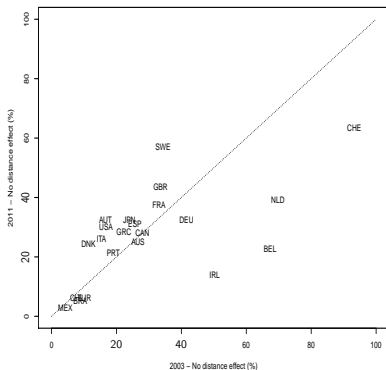
Country	$(DBC^{\theta=0})$			$(DBC^{\theta=1})$		
	2003	2007	2011	2003	2007	2011
Belgium	73.60	78.80	70.41	87.14	90.55	78.21
Canada	59.10	57.19	54.45	65.22	64.09	61.33
Denmark	75.14	58.10	42.60	77.13	70.64	53.19
France	90.34	89.39	82.66	90.55	92.81	88.17
Ireland	81.02	80.64	48.81	90.89	87.20	53.00
Japan	75.05	73.99	70.92	78.40	80.78	76.05
Netherlands, The	84.69	90.55	85.15	87.80	90.47	88.47
Sweden	72.56	60.58	45.86	80.59	81.95	72.02
Switzerland	67.71	70.02	70.80	85.23	86.87	81.91
United Kingdom	70.00	71.70	77.93	75.17	76.98	81.68
United States	85.85	85.80	88.68	86.27	86.81	89.11

# 3<sup>rd</sup> summary of results

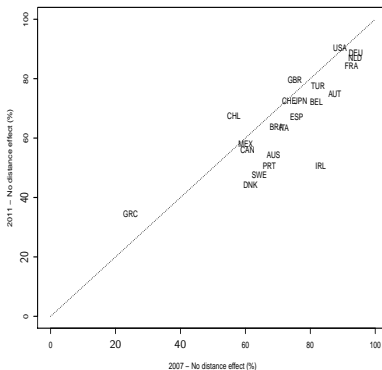
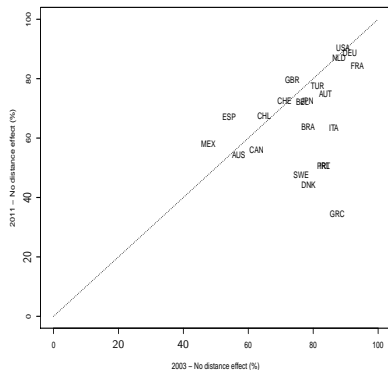
## The role of distance

- When **controlling for distance**, the effects are **different** for *DBO* and *DBC*:
  - *DBO* vs. *DBO*<sup>d</sup>: for some particular countries the effect is strong (JPN and, to a lesser extend, CHE).
    - This would indicate that the **cross-border assets trade** of JPN with its neighbors is *too high*—according to our **benchmark**.
  - *DBC* vs. *DBC*<sup>d</sup>: for most countries, the effect is irrelevant.
    - However, some particular countries are actually less integrated when controlling for distance (USA, GBR). This would indicate that their asset trade is *too high* with **small** and **distant** countries.

## Degree of bank openness (*DBO*), pre-crisis and crisis years



## Degree of bank connectedness (*DBC*), pre-crisis and crisis years



## 4<sup>th</sup> summary of results

### Pre-crisis vs. crisis years

- In the case of **distance-uncorrected** indicators:
  - For both time comparisons (2003 vs. 2007, 2007 vs. 2011) euro area countries dominate the area below the main diagonal—**strongly affected by the crisis**.
  - This result holds for both *DBO* and *DBC*, yet in the case of *DBO* there are **some countries strongly affected** (NLD, BEL, IRL and, outside the euro area, CHE).
- In the case of **distance-corrected** indicators:
  - The impact of the crisis is alleviated for euro area countries—suggesting the **cross-border asset trade** is **shifting** towards more distant countries.

# An empirical model of growth

- The choice of variables of our starting model is based on recent contributions by Henderson et al. (EJ 2012; EER 2013):

$$y_{it} = \alpha + \beta_i + \gamma_t + \delta DBX_{it} + \nu Z_{it} + \epsilon_{it} \quad (7)$$

where

- $y_{it}$  : GDP/N, GVA/L, K/L of country  $i$  in time  $t$
- $\beta_i, \gamma_t$  : individual and time effects
- $DBX_{it}$  : banking integration variables ( $DBO, DBC, DBI, DBO^d, DBC^d, DBI^d$ )
- $Z_{it}$  : control variables
- $\epsilon_{it}$  : error term

## Using regression quantiles

- Given the **concerns** raised in the literature as to the **differential effects** of IFI at **different stages of economic development** we use a different empirical strategy based on **quantile regression**:
  - Results are **more robust to departures from normality**, outliers and fat tails.
  - It yields results **more informative than the average**—we will understand whether the effect of banking integration varies for **richer** and **poorer** countries.

## Summarizing regression results:

- Results can be exploited from several angles:
  - Integration indicator considered: *DBO*, *DBC* or *DBI*.
  - Distance parameter: distance-corrected vs. distance-uncorrected indicators (i.e. *DBO*, *DBC* and *DBI* vs. *DBO<sup>d</sup>*, *DBC<sup>d</sup>* and *DBI<sup>d</sup>*).
  - Economic performance measure: *GDP/N*, *GDP/L* (*VA/L*) or *K/L*.
  - Levels/growth rates.
  - Quantile ( $\tau$ ), taking into account that both **significance** and **magnitude** can vary according to the quantile.



# Results using regression quantiles

Effect on GDP/N, levels

Covariates	Quantile ( $\tau$ )						
	0.05 (poorest)	0.10	0.25	0.50	0.75	0.90	0.95 (richest)
<i>DBO</i>	2.162 (1.961, 2.218)	2.144 (2.091, 2.412)	1.570 (1.292, 2.368)	1.080 (0.741, 1.725)	0.601 (0.456, 1.218)	0.595 (0.194, 0.867)	0.586 (0.343, 1.727)
<i>DBO</i> <sup>d</sup>	0.881 (0.696, 0.910)	0.675 (0.644, 0.901)	0.412 (0.284, 0.792)	0.371 (0.172, 0.560)	0.347 (-0.003, 0.671)	0.232 (0.109, 0.574)	0.337 (0.100, 1.929)
<i>DCB</i>	3.559 (2.038, 4.176)	3.546 (2.153, 3.758)	0.917 (0.397, 2.075)	-0.058 (-0.456, 0.201)	-0.437 (-0.631, -0.160)	-0.170 (-0.365, 0.260)	0.216 (-0.482, 0.764)
<i>DCB</i> <sup>d</sup>	3.497 (2.065, 4.003)	3.384 (1.875, 3.763)	0.603 (-0.004, 2.124)	-0.071 (-0.471, 0.207)	-0.452 (-0.666, -0.145)	-0.209 (-0.707, 0.566)	0.667 (-1.202, 0.939)
<i>DBI</i>	2.558 (2.538, 2.675)	2.680 (2.519, 2.743)	2.698 (1.942, 2.749)	1.882 (1.241, 2.705)	1.154 (0.586, 1.912)	0.765 (0.303, 1.325)	0.651 (0.453, 2.021)
<i>DBI</i> <sup>d</sup>	2.325 (2.187, 2.618)	2.371 (2.310, 2.519)	2.341 (2.014, 2.531)	2.021 (1.023, 2.556)	1.204 (0.249, 1.615)	0.689 (3.520000e-01, 1.150)	0.517 (0.367, 2.021)

# Results using regression quantiles

Effect on GDP/L, levels

Covariates	Quantile ( $\tau$ )						
	0.05 (poorest)	0.10	0.25	0.50	0.75	0.90	0.95 (richest)
<i>DBO</i>	2.303 (2.161, 2.361)	2.244 (2.181, 2.331)	1.836 (1.625, 2.379)	1.116 (0.914, 1.869)	0.884 (0.572, 1.433)	1.199 (0.766, 1.476)	1.281 (0.995, 1.487)
<i>DBO<sup>d</sup></i>	0.840 (0.670, 0.858)	0.717 (0.636, 0.882)	0.437 (0.277, 0.915)	0.237 (0.081, 0.782)	0.443 (0.052, 0.638)	0.558 (0.473, 1.007)	0.828 (0.469, 1.205)
<i>DCB</i>	3.379 (1.670, 4.189)	3.469 (2.092, 3.801)	0.968 (0.251, 1.535)	-0.091 (-0.264, 0.089)	-0.266 (-0.418, 0.020)	-0.114 (-1.226, 0.444)	0.108 (-1.973, 1.232)
<i>DCB<sup>d</sup></i>	3.284 (1.623, 4.045)	3.420 (1.972, 3.739)	0.838 (0.157, 1.397)	-0.128 (-0.261, 0.080)	-0.272 (-0.420, 0.038)	-0.204 (-1.829, 0.432)	0.268 (-2.477, 1.119)
<i>DBI</i>	2.379 (2.324, 2.996)	2.709 (2.420, 2.917)	2.813 (2.587, 3.009)	2.112 (1.113, 2.850)	1.528 (0.481, 1.816)	1.464 (1.170, 1.809)	1.553 (1.217, 1.733)
<i>DBI<sup>d</sup></i>	2.251 (2.088, 2.633)	2.452 (2.239, 2.586)	2.386 (2.263, 2.648)	1.426 (0.727, 2.769)	1.296 (0.298, 1.925)	1.441 (1.187, 1.616)	1.416 (1.193, 1.551)

# Results using regression quantiles

Effect on K/L, levels

Covariates	Quantile ( $\tau$ )						
	0.05 (poorest)	0.10	0.25	0.50	0.75	0.90	0.95 (richest)
<i>DBO</i>	1.725 (1.699, 2.010)	1.981 (1.724, 2.602)	1.689 (1.482, 2.021)	0.970 (0.482, 1.222)	0.845 (0.669, 1.282)	1.033 (0.788, 1.608)	1.122 (0.724, 2.587)
<i>DBO</i> <sup>d</sup>	0.846 (0.743, 0.899)	0.737 (0.723, 0.971)	0.401 (0.345, 0.724)	0.178 (0.115, 0.560)	0.448 (0.085, 0.674)	0.673 (0.464, 1.176)	0.531 (0.429, 2.207)
<i>DCB</i>	2.611 (1.333, 3.571)	3.198 (1.521, 3.417)	0.756 (-0.032, 1.418)	-0.202 (-0.461, -0.017)	-0.540 (-0.742, -0.254)	-0.929 (-1.411, 0.002)	0.576 (-1.830, 1.046)
<i>DCB</i> <sup>d</sup>	2.492 (1.388, 3.453)	3.284 (1.406, 3.426)	0.789 (0.149, 1.419)	-0.184 (-0.496, 0.050)	-0.426 (-0.823, -0.140)	-0.905 (-1.477, 0.085)	0.502 (-1.896, 1.053)
<i>DBI</i>	2.124 (1.963, 2.954)	2.541 (2.019, 2.721)	2.454 (2.102, 2.593)	1.257 (0.663, 3.050)	1.338 (0.948, 1.893)	1.431 (1.149, 2.153)	1.214 (1.007, 2.215)
<i>DBI</i> <sup>d</sup>	1.813 (1.782, 2.661)	2.276 (1.870, 2.491)	2.213 (1.918, 2.420)	1.497 (0.591, 2.712)	1.266 (0.378, 1.937)	1.548 (1.063, 1.750)	1.419 (0.901, 1.893)

# Summary of regression results:

## Levels

- In the case of **distance-uncorrected** indicators:
  - DBO: the impact is **positive** throughout quantiles—although it is much stronger for poorer countries. This result holds for  $GDP/N$ ,  $GDP/L$  and  $K/L$ .
  - DBC: the impact is positive only for the **poorest** countries, and it can be even negative for the richest ones. The result is similar for  $GDP/N$ ,  $GDP/L$  and  $K/L$ .
  - DBI: the effect of *DBO* dominates, and the impact of *DBI* is positive across quantiles, and across macroeconomic indicator. However, the discrepancy between richer and poorer countries holds.
- In the case of **distance-corrected** indicators:
  - When controlling for distance, results are similar—with the exception that for *DBO* the discrepancies among richer and poorer countries diminish.

# Results using regression quantiles

Effect on GDP/N, growth rates

Covariates	Quantile ( $\tau$ )						
	0.05 (slow growth)	0.10	0.25	0.50	0.75	0.90	0.95 (high growth)
<i>DBO</i>	0.065 (−0.240, 0.122)	0.000 (−0.014, 0.054)	0.002 (−0.024, 0.022)	−0.024 (−0.042, 0.011)	−0.055 (−0.116, −0.018)	−0.174 (−0.196, −0.059)	−0.099 (−0.220, −0.066)
<i>DBO<sup>d</sup></i>	−0.049 (−0.079, −0.030)	−0.041 (−0.069, −0.004)	−0.019 (−0.060, −0.001)	−0.015 (−0.039, 0.008)	−0.031 (−0.049, −0.001)	−0.066 (−0.087, 0.000)	−0.064 (−0.076, 0.032)
<i>DCB</i>	0.020 (−0.063, 0.208)	0.019 (−0.051, 0.105)	0.006 (−0.044, 0.093)	−0.019 (−0.042, 0.039)	−0.079 (−0.152, 0.002)	−0.250 (−0.371, 0.033)	−0.261 (−0.507, 0.198)
<i>DCB<sup>d</sup></i>	0.020 (−0.057, 0.215)	0.022 (−0.040, 0.109)	0.016 (−0.050, 0.118)	−0.021 (−0.042, 0.041)	−0.069 (−0.143, 0.002)	−0.256 (−0.373, 0.031)	−0.271 (−0.507, 0.209)
<i>DBI</i>	0.125 (−0.179, 0.185)	0.030 (−0.044, 0.148)	0.007 (−0.043, 0.045)	−0.044 (−0.075, −0.006)	−0.104 (−0.154, −0.041)	−0.231 (−0.242, −0.148)	−0.178 (−0.261, −0.110)
<i>DBI<sup>d</sup></i>	0.000 (−0.174, 0.193)	−0.003 (−0.103, 0.122)	0.006 (−0.045, 0.049)	−0.038 (−0.063, −0.005)	−0.094 (−0.152, −0.040)	−0.215 (−0.224, −0.107)	−0.097 (−0.269, −0.087)

# Results using regression quantiles

## Effect on GDP/L, growth rates

Covariates	Quantile ( $\tau$ )						
	0.05 (slow growth)	0.10	0.25	0.50	0.75	0.90	0.95 (high growth)
<i>DBO</i>	0.067 (−0.244, 0.110)	0.010 (0.006, 0.061)	0.008 (−0.010, 0.027)	−0.023 (−0.046, −0.007)	−0.048 (−0.083, −0.013)	−0.157 (−0.175, −0.065)	−0.136 (−0.220, −0.057)
<i>DBO<sup>d</sup></i>	−0.054 (−0.092, −0.021)	−0.031 (−0.064, 0.006)	−0.007 (−0.045, 0.000)	−0.014 (−0.044, −0.005)	−0.030 (−0.042, 0.007)	−0.056 (−0.068, −0.011)	−0.059 (−0.076, 0.012)
<i>DCB</i>	0.012 (−0.136, 0.132)	−0.016 (−0.057, 0.055)	0.003 (−0.044, 0.055)	−0.026 (−0.045, 0.004)	−0.103 (−0.161, −0.012)	−0.214 (−0.314, −0.033)	−0.268 (−0.516, 0.192)
<i>DCB<sup>d</sup></i>	0.017 (−0.100, 0.185)	−0.008 (−0.059, 0.060)	0.004 (−0.030, 0.057)	−0.026 (−0.046, 0.003)	−0.106 (−0.160, −0.012)	−0.216 (−0.308, −0.060)	−0.257 (−0.506, 0.190)
<i>DBI</i>	0.068 (−0.216, 0.192)	0.040 (0.005, 0.130)	0.014 (−0.015, 0.045)	−0.040 (−0.074, −0.016)	−0.091 (−0.140, −0.053)	−0.209 (−0.227, −0.128)	−0.163 (−0.274, −0.127)
<i>DBI<sup>d</sup></i>	0.042 (−0.165, 0.152)	0.023 (−0.072, 0.063)	0.008 (−0.029, 0.045)	−0.042 (−0.083, −0.017)	−0.092 (−0.137, −0.042)	−0.189 (−0.222, −0.102)	−0.117 (−0.276, −0.098)

# Results using regression quantiles

Effect on K/L, growth rates

Covariates	Quantile ( $\tau$ )						
	0.05 (slow growth)	0.10	0.25	0.50	0.75	0.90	0.95 (high growth)
<i>DBO</i>	0.077 (−0.331, −0.175)	0.021 (−0.231, 0.138)	0.016 (−0.034, 0.051)	−0.002 (−0.041, 0.017)	−0.036 (−0.083, 0.013)	−0.106 (−0.213, 0.002)	−0.001 (−0.239, 0.105)
<i>DBO<sup>d</sup></i>	−0.044 (−0.169, −0.019)	−0.065 (−0.085, −0.034)	−0.040 (−0.081, 0.014)	−0.001 (−0.052, 0.015)	−0.026 (−0.054, 0.007)	−0.030 (−0.071, 0.040)	0.003 (−0.101, 0.054)
<i>DCB</i>	0.102 (−0.313, 0.303)	−0.006 (−0.111, 0.208)	−0.040 (−0.148, 0.057)	−0.027 (−0.117, 0.025)	−0.104 (−0.135, −0.030)	−0.231 (−0.386, −0.035)	−0.365 (−0.536, −0.060)
<i>DCB<sup>d</sup></i>	0.102 (−0.321, 0.421)	0.068 (−0.130, 0.205)	−0.009 (−0.133, 0.122)	−0.028 (−0.109, 0.025)	−0.096 (−0.146, −0.031)	−0.234 (−0.403, −0.045)	−0.426 (−0.541, −0.061)
<i>DBI</i>	−0.131 (−0.355, 0.270)	0.009 (−0.240, 0.216)	−0.016 (−0.076, 0.047)	−0.024 (−0.073, 0.006)	−0.069 (−0.151, −0.025)	−0.248 (−0.262, −0.092)	−0.251 (−0.332, −0.015)
<i>DBI<sup>d</sup></i>	−0.103 (−0.260, 0.176)	−0.143 (−0.225, 0.081)	−0.035 (−0.143, 0.031)	−0.031 (−0.108, 0.003)	−0.082 (−0.171, −0.030)	−0.193 (−0.275, −0.131)	−0.266 (−0.284, −0.006)

## Summary of regression results: Growth rates

- In the case of **distance-uncorrected** indicators:
  - DBO: the impact varies depending on the quantile. It is negative and significant **only** for high-growth countries. This result holds for  $GDP/N$  and  $GDP/L$ —for  $K/L$  it is not significant.
  - DBC: similarly to *DBO*, the impact is negative yet only for the highest-growth countries. The result is similar for  $GDP/N$ ,  $GDP/L$  and, in this case,  $K/L$  as well.
  - DBI: since the effects of *DBO* and *DBC* are similar, the impact of DBI is also negative and significant only for the highest quantiles. The result is robust to the macroeconomic indicator considered.
- In the case of **distance-corrected** indicators, results change only slightly.



# Outline

- 1 Background
- 2 Motivation
- 3 Indicators of banking integration
  - Degree of bank openness
  - Degree of bank connectedness
  - Degree of banking integration
- 4 Controlling for distance
- 5 Statistical sources and selected variables
- 6 Results
  - Degree of bank openness, connectedness and integration
  - Banking integration and economic performance
- 7 Concluding remarks

- 1 This article has dealt with the analysis of **international banking integration** using indicators of both **openness** and **connectedness**.
  - Our effort takes into account the contributions of recent approaches based on **network analysis**, i.e. treating the international banking system as a **web**.
- 2 Our paper has made some contributions to previous analysis, namely,
  - Analyzing the **role of distance**.
  - Evaluating the **evolution of the indicators** in **pre-crisis** and **crisis** years.
  - Analyzing the **effect of the indicators** on economic performance.

### 3 Regarding the indicators,

- Overall, they are dominated by a **great deal of heterogeneity**.
- There is a clear **euro area (and Europe) effect**—the countries most affected by the crisis.
- **Both indicators** (openness and connectedness) are affected, yet to different degrees.
- The **distance** seems also to be playing a role, especially for some particular countries—although *DBO* is more affected than *DBC*.

- ④ Regarding the effects of indicators on economic performance:
  - The effects vary strongly when analyzing **levels** or **growth rates**.
    - In the case of levels, the effect is generally positive; in the case of growth rates, it is negative—but only for high-growth countries.
  - Results also vary strongly **across quantiles**—both the significance or magnitude.
  - The impact of the different indicators (*DBO*, *DBC* and *DBI*) also varies.
  - Results are also quite robust across the different economic performance magnitudes considered—especially *GDP/N* and *GDP/L*.

Therefore, is (full) financial integration desirable?