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What affects bank market power in the euro area?

CONFERENCE ON "BANK REGULATION, COMPETITION AND RISK"
Brunel University, 11th July 2018

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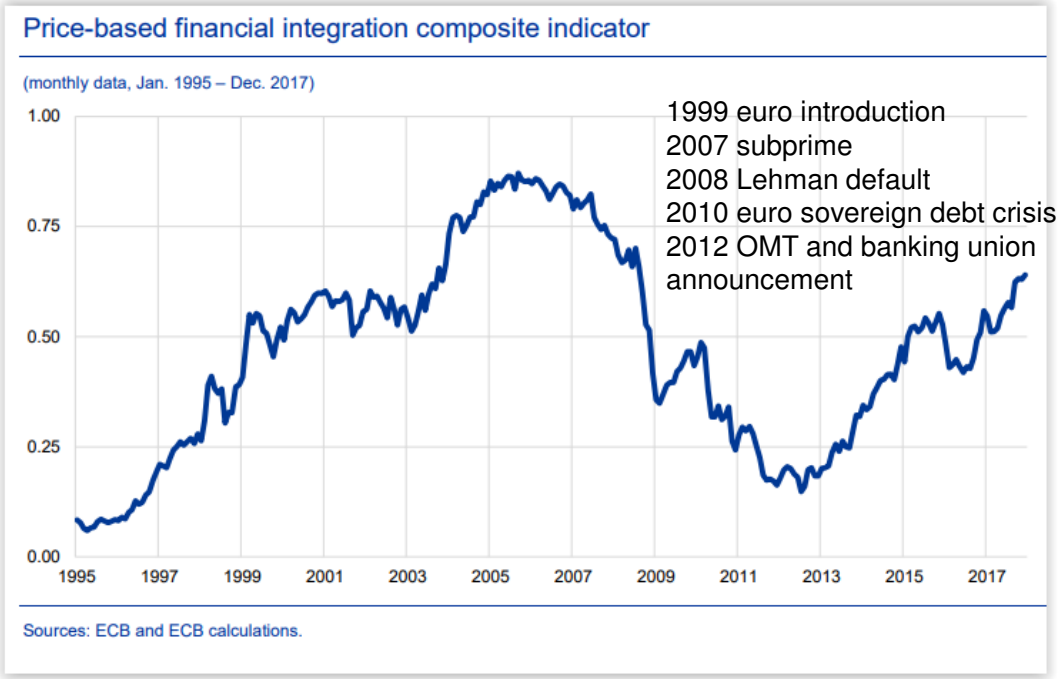
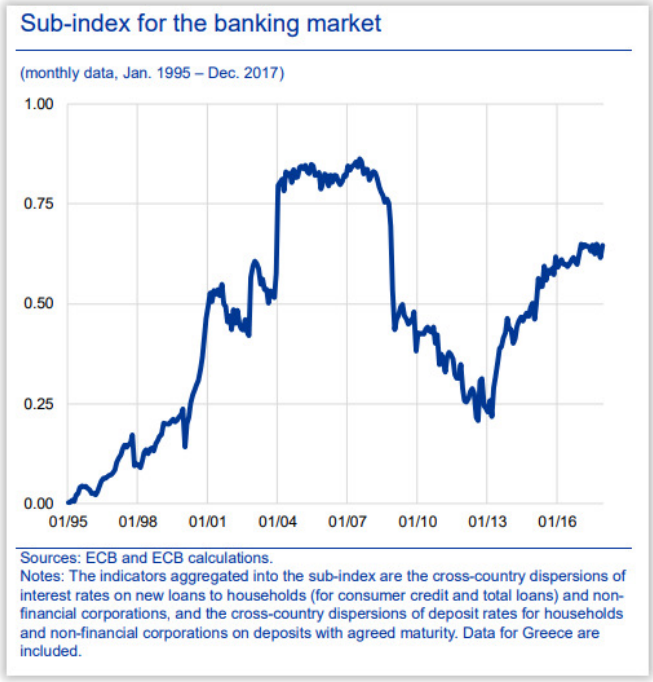
Background

- With greater integration, contestability/competition should increase and differences across countries should reduce
- Financial crises and economic recession significantly affected the process of integration in the euro area
- The banking union announcement in 2012 revived the trend towards greater integration
- ECB (2018) suggested that recent "post crisis reintegration trend" is mainly driven by convergence in equity returns and, to a lesser extent, bond yields and retail banking markets

ECB financial integration -trends





Source: ECB (2018) Financial Integration in Europe, May.

Overview of literature

- Large body of literature measuring competition use structural (SCP) and more recently non-structural (NEIO) approaches (e.g. Claessen and Laeven, 2004)
- Some recent studies (e.g. Weill, 2013; Apergis et al., 2016; Cruz et al. 2017) focus on evolution of competition in the EU
- Findings show that competition has started slightly improving only in the most recent years (after 2010). There is some evidence of convergence across countries
- On the factors affecting market power, usually the focus is on the crisis. Pre-crisis EU studies typically find that size, efficiency and the economic cycle are significant explanatory variables; for concentration results are mixed (e.g., Maudos et al 2007)
- Common methods: from SCP to (more recently) Lerner, Boone, H-statistic
- There are no recent studies on the euro area using other methods

Aims of paper

- To explore factors affecting bank market power and look at trends over the most recent years
- To employ the Bresnahan-Lau mark-up test developed in the context of the NEIO with variations
- To check whether there has been a movement towards integration, i.e. a reduction of the differences in market power across countries and a process of convergence

The model

Profit maximization

In country *c* at time *t*, profit-maximizing banks choose their output level *q* (loans) where *MR* = *MC*.

- In a *perfectly competitive market* with *n* firms, *MR* coincides with *P*.
- In case of *perfect collusion* among the *n* firms, *MR* is equal to the *MR* of the whole market.

Demand for loans

$$Q_{ct} = Q_{ct}(P_{ct}, X_{ct}, \delta)$$

where

Q_{ct} = aggregate level of loans
P_{ct} = interest rate on loans charged by local banks
X_{ct} = vector of exogenous variables shifting the demand curve
δ = vector of unknown parameters to be estimated

The model

Marginal revenue

The industry's *true* marginal revenue function is the well-known *MR* formula for a monopoly:

$$MR = P + \frac{\partial P}{\partial Q} Q$$

Here it can be written as

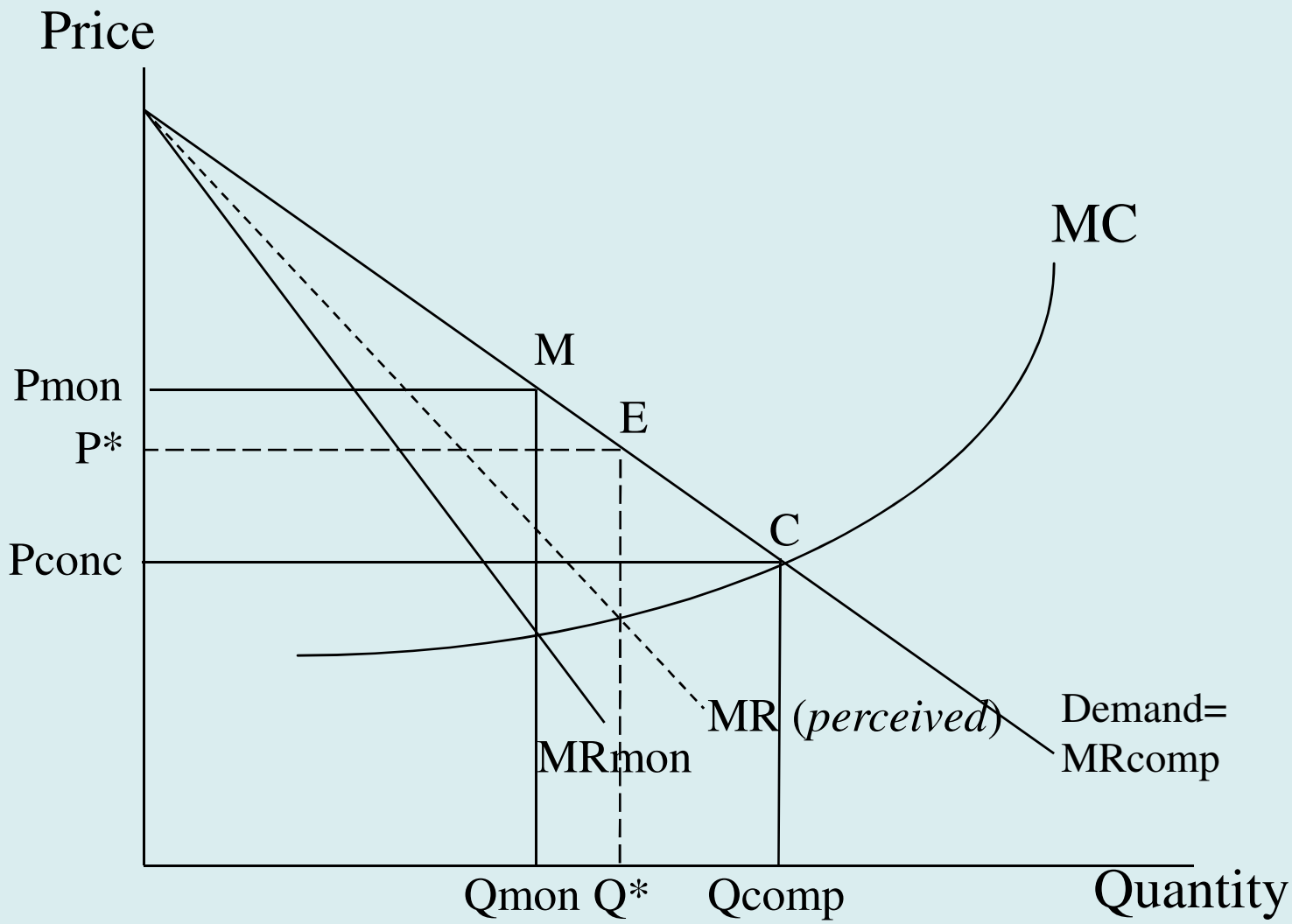
$$MR_{ct} = P_{ct} + Q_{ct} \Big/ \frac{\partial Q_{ct}}{\partial P_{ct}}$$

The firm's *perceived* marginal revenue function for the generic bank *i* operating in country *c*, and supplying the quantity of loans q_{ict}, is

$$MR_{ict} = P_{ct} + \lambda_{ict}\, q_{ict} \Big/ \frac{\partial Q_{ct}}{\partial P_{ct}}$$

where λ_{ict} (to be estimated) is *the competitiveness of oligopoly conduct*.

Monopoly


Price
MC
M
Pmon
E
P*
C
Pconc
MR (*perceived*)
Demand=
MRcomp
MRmon
Qmon Q*
Qcomp
Quantity

The model

Conduct (market power) parameter

$$MR_{ict} = P_{ct} + \lambda_{ict}\, q_{ict} \Big/ \frac{\partial Q_{ct}}{\partial P_{ct}}$$

It is $0 \leq \lambda_{ict} \leq 1$.

- When $\lambda_{ict} = 0$, each bank acts as though $MR = P$ (*perfectly competitive behaviour*).
- When $\lambda_{ict} = 1$, banks choose price and output according to the industry marginal revenue curve (*joint monopoly* or *perfect collusion*).
- Intermediate values of λ_{ict} indicate *various degrees of imperfect competition or market power*.

The overparametrization of this model (i.e. too many λ_{ict}'s) can be solved by *aggregation*, so:

- we can *use country industry data* for both demand and cost variables;
- we are then *left with a single parameter* λ_{ct}, which measures *the average conduct of the banks* operating in country *c* at time *t*.

The model

Equilibrium condition

After aggregating for the *n* banks in the market, the *MR* = *MC* condition becomes

$$P_{ct} + \lambda_{ct} Q_{ct} \Big/ \frac{\partial Q_{ct}}{\partial P_{ct}} = MC_{ct}$$

Empirically, with reference to the behavioural parameter λ_{ct}, we estimate *two different specifications of the two-equation system*:

- λ_{ct} **constant** (the customary Bresnahan-Lau mark-up test)
- λ_{ct} as a function of the **five** banking market characteristics

Advantages of Bresnahan–Lau's mark-up test

- It provides *an easily interpreted test statistic*
- It allows *to use aggregate industry data*
- The model *does not rely on any particular definition of local banking markets* within a country (the estimate of λ represents the average degree of market power of the banks across those separate markets)
- The estimation of the market power parameter *is not biased*, because our sample spans complete markets rather than only a subset of the relevant industries

Data & estimation methods

Data: 155 observations

17 EU countries

10 years (2007-2016)

Sources : ECB & Eurostat

Methods: System of equations using **nonlinear 3-stage least squares.**

The instruments are:

- all exogenous variables (including time trend);
- first lagged values of Q_{ct} and P_{ct};
- the level of total assets of the banking sector;
- national investment.

The last two instruments proxy for additional aspects of (supply and demand) market size.

Integration: **beta and sigma convergence**

Main methodology

Two-equation systems:

a) with a *constant lambda*;

b) with *lambda as a function of 5 banking market factors*.

The system b) to be estimated is the following:

$$\begin{cases} \ln Q_{ct} = a_0 + a_1 P_{ct} + a_2 POP_{ct} + a_3 Z_{ct} + a_4 YPERCAP_{ct} & [1] \\ P_{ct} = \dfrac{C_{ct}}{Q_{ct}}\left[b_Q + b_{QQ} \ln Q_{ct} + b_{Q1} \ln\left(W_{1ct} / W_{3ct}\right) + b_{Q2} \ln\left(W_{2ct} / W_{3ct}\right) + b_{QT} \ln TIME \right] - & [2] \\ \qquad - \dfrac{\left(\lambda_0 + \lambda_1 CR5_{ct} + \lambda_2 LIQUIDITY_{ct} + \lambda_3 LEVERAGE_{ct} + \lambda_4 TBTF_{ct} + \lambda_5 ATMPERCAP_{ct}\right)}{a_1} \end{cases}$$

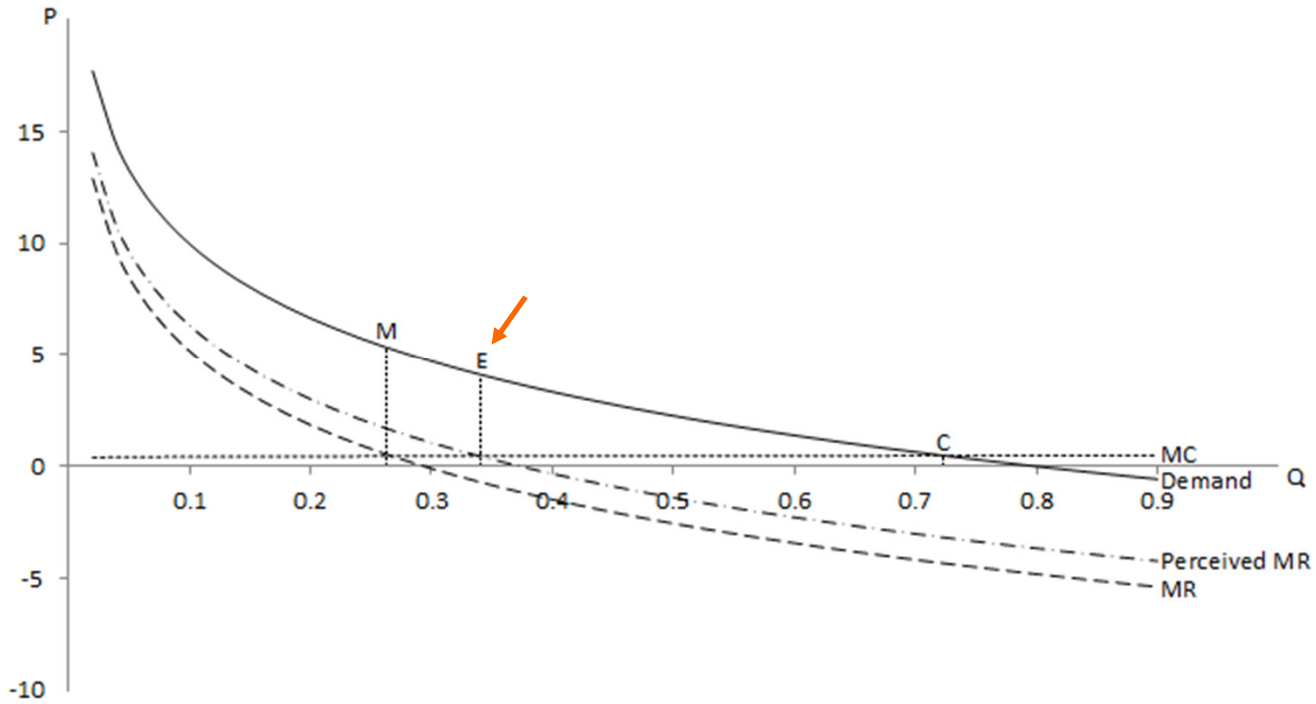
Results: constant lambda 1/2

Demand equation	**Model 1**		
	Coef.	z	
Constant	-2.8487	-8.47	***
P	-0.2080	-6.49	***
POP	0.0539	23.20	***
Z	0.1010	4.61	***
YPERCAP	0.0392	7.28	***
R^2	0.7923		
Obs.	155		

MC equation	**Model 1**		
	Coef.	z	
Constant	-0.9899	-5.98	***
lnQ	0.0034	0.29	
lnW1W3	0.1251	3.87	***
lnW2W3	-0.3044	-6.87	***
lnTIME	-0.0537	-2.23	**
Lambda	0.7604	6.05	***
R^2	0.3686		
Obs.	155		

- *Downward-sloping* loan demand function
- *POP* ⇨ *wider markets guarantee banks a higher loan demand*
- The coefficient of *Z* is *positive* ⇨ the interest rate of government bonds is a *good measure* of the price of a substitute for bank loans
- *YPERCAP* ⇨ *per capita GDP plays a major role in stimulating loan demand*
- The coefficients of all variables of the marginal cost function (except lnQ) are *significant*
- In this specification, where λ is treated as constant, it is $\lambda = 0.7604$ ⇨ *banks' perceived MR has been about 76% of the MR that would be taken into consideration by a monopolistic firm or a cartel*
- λ is significantly different from zero and one ⇨ we can *reject the hypotheses of both perfect collusion and perfect competition*

Results: constant lambda 1/2



Average situation of EU banking markets when λ = 0.7604

Point E = equilibrium (*MC = perceived MR*).

The calculated Q is 339.9 billion euro (very close to the median value of the sample, 372.1 billion euro).

Banks did not behave as joint profit-maximizing firms.

Results: lamba as a function of 5 determinants 2/2

	Model 2		
	Coef.	z	
Demand equation			
Constant	-3.0282	-9.15	***
P	-0.1863	-5.77	***
POP	0.0542	23.25	***
Z	0.1092	4.96	***
YPERCAP	0.0411	7.70	***
Marginal cost equation			
Constant	-1.0379	-4.21	***
lnQ	0.0701	3.62	***
lnW1W3	0.1895	5.97	***
lnW2W3	-0.3399	-4.82	***
lnTIME	-0.0562	-2.11	**
Lambda constant	0.3093	2.10	**
CR5	0.1878	1.94	*
LIQUIDITY	1.0024	3.66	***
LEVERAGE	-0.0143	-2.83	***
TBTF	0.0662	3.67	***
ATMPERCAP	-0.2115	-3.14	***
R^2 *demand*	0.7953		
R^2 *marginal cost*	0.5625		

The coefficients in both the demand and the marginal cost equations do not significantly change.

<u>*Market power determinants*</u>

- *CR5* ⇨ *market power is directly linked with local market concentration* (conforming to the SCP paradigm), although at a 10% level of significance;
- *LIQUIDITY* ⇨ *a higher deposits/assets ratio helps to mitigate rivalry among banks*;
- *LEVERAGE* ⇨ more leveraged (i.e. less capitalized) banks enjoy *a lower degree of market power*;
- *TBTF* ⇨ banking markets with notably large banks are characterized by *higher market power*;
- *ATMPERCAP* ⇨ financial inclusion *increases competition in the banking industry*.

Results: lamba as a function of 5 determinants 2/2

Estimated elasticities of P with respect to the market power determinants

CR5 $\rightarrow$ *not significant*

LIQUIDITY $\rightarrow$ *significant and equal to 0.71* (i.e., a 10% increase in the deposits to assets ratio causes an increase of about 7% in the value of the interest rate charged to customers by banks)

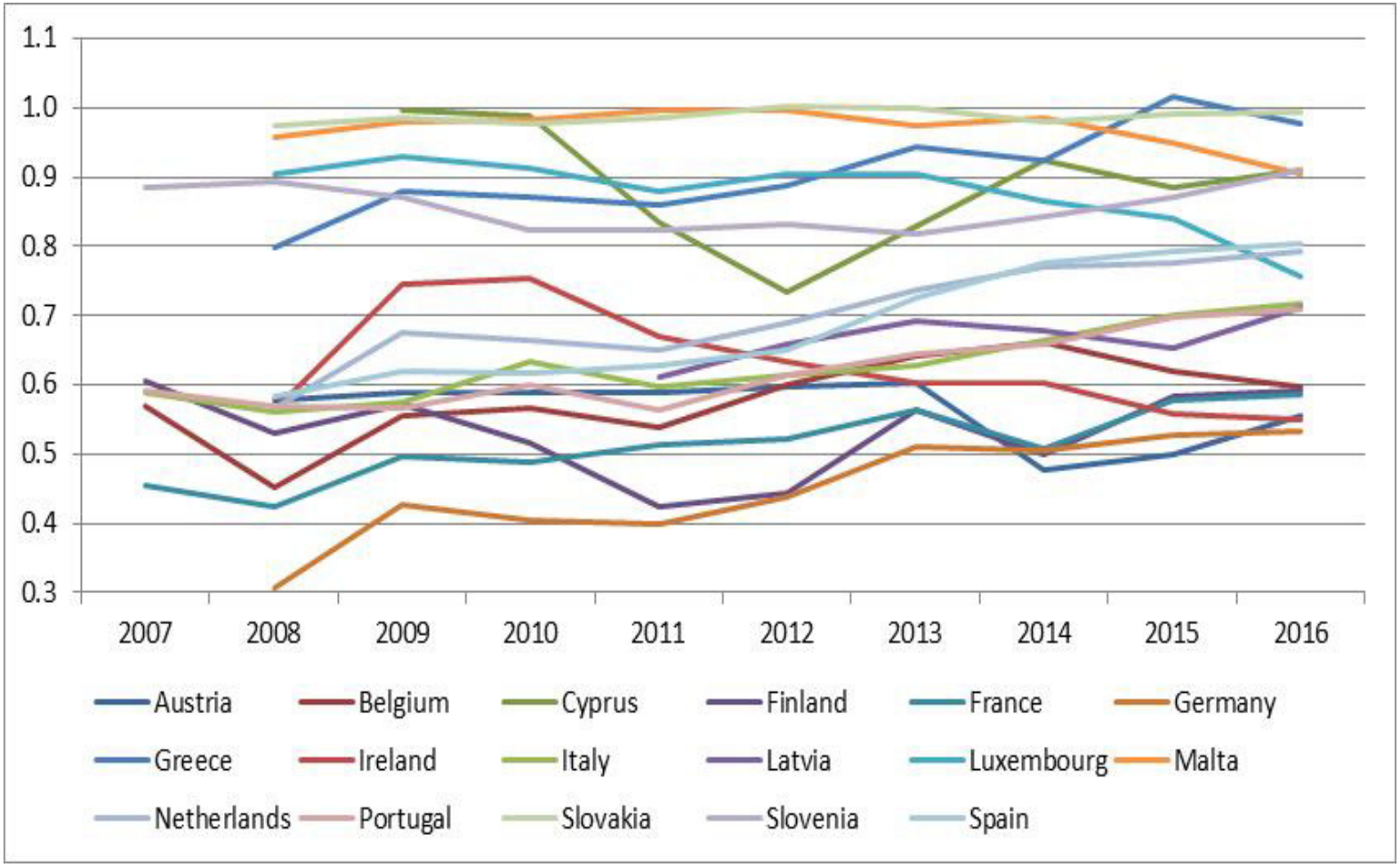
LEVERAGE $\rightarrow$ *significant and equal to -0.30* (i.e., a 10% increase in the equity multiplier ratio generates a price drop of about 3%)

TBTF $\rightarrow$ *significant and equal to 0.20* (i.e., a 10% increase in the ratio between the assets of the 5 largest banks and GDP increases price by 2%)

ATMPERCAP $\rightarrow$ *significant and equal to -0.24* (i.e., increasing ATMs by 10% causes a fall of the price of 2.4%)

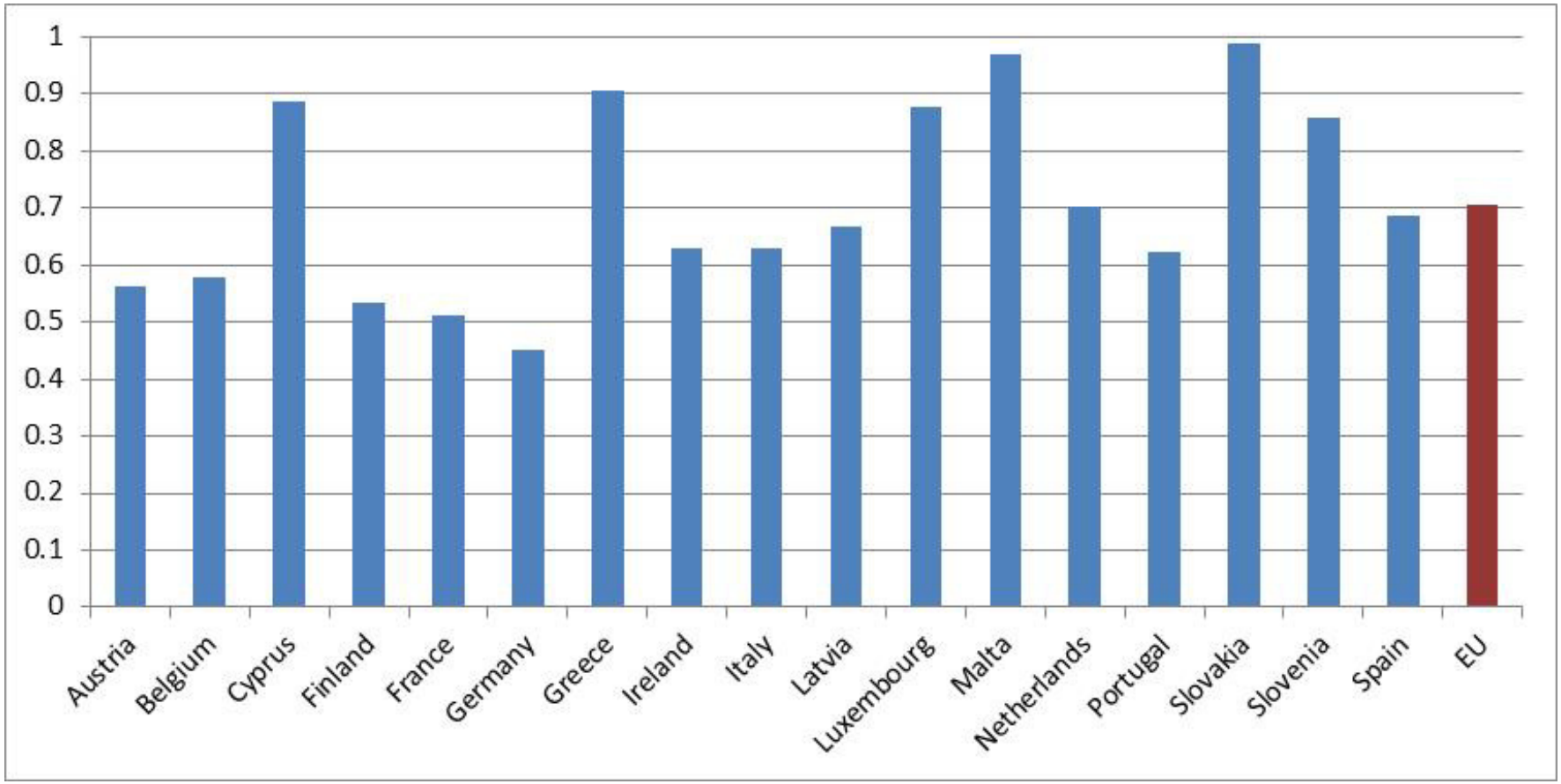
Results: lamba as a function of 5 determinants 2/2

Estimated indices by country and year



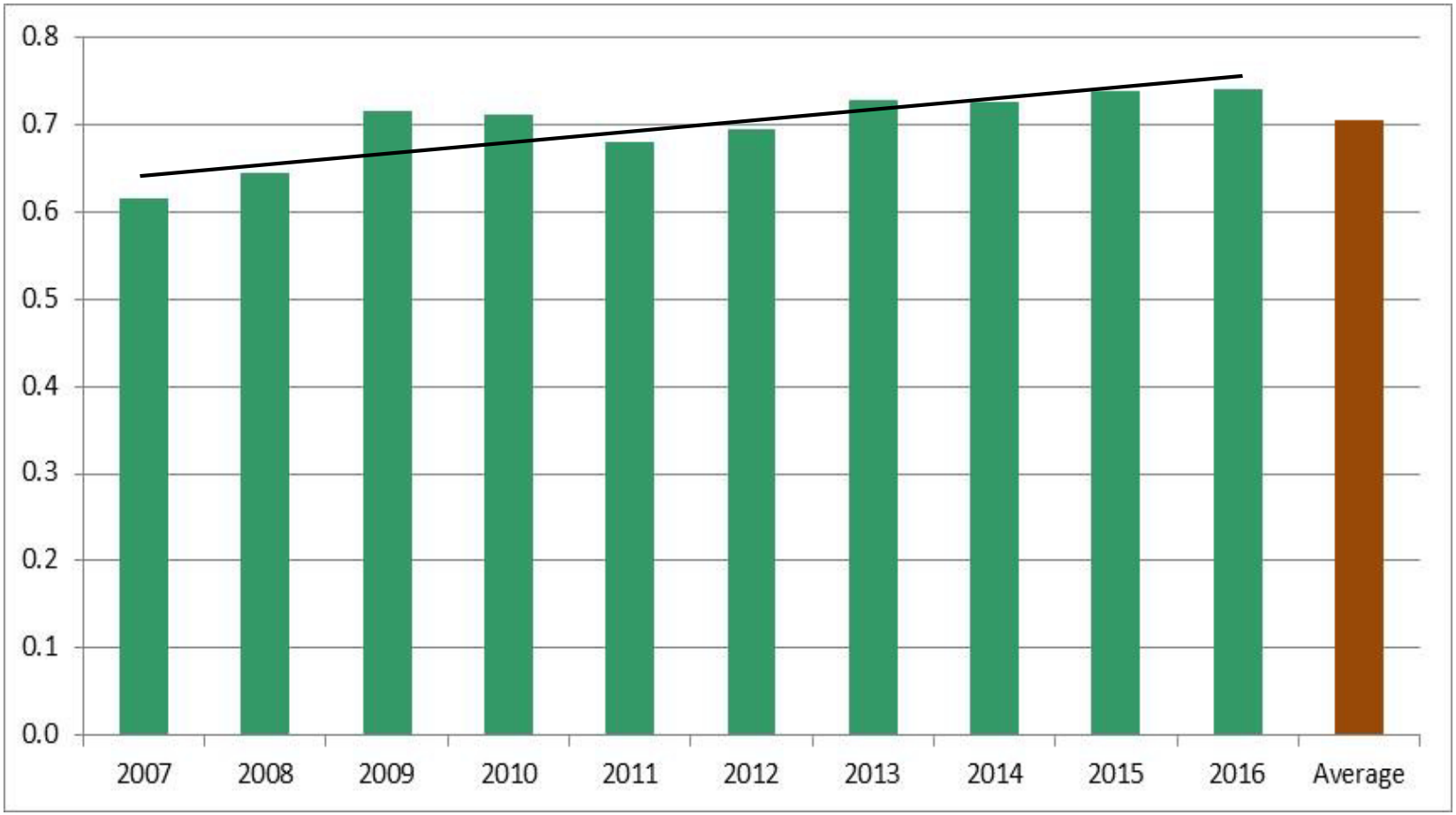
Results: lamba as a function of 5 determinants 2/2

Average indices by country



Results: lamba as a function of 5 determinants 2/2

Average indices by year



Results: lamba as a function of 5 determinants 2/2

Tests of convergence (Barro and Sala-I-Martin, 1992)

β-convergence	Coef.	z	
Constant	-0.1600	-5.72	***
$\ln(\lambda_{i,t-1})$	-0.4485	-6.36	***
Adjusted R^2	0.2123		
Obs.	138		

There is β-convergence

• ***β-convergence*** → As the coefficient of $\ln(\lambda_{i,t-1})$ is *negative and significant*, **the less competitive banking sectors have experienced a lower improvement of market power than the more competitive ones**.

σ-convergence	Coef.	z	
Constant	-0.0065	-1.20	
$\ln(\lambda_{i,t})$ - mean($\ln(\lambda_t)$)	-0.4389	-6.50	***
Adjusted R^2	0.2348		
Obs.	138		

There is σ-convergence

σ-convergence → Results suggest an increase in the speed of convergence as the σ coefficient is negative and statistically significant. **There has been a convergence in the various national banking market power indexes, because the dispersion of the mean values of λ between countries has reduced.**

Sum-up

- We employ the mark up test developed in the context of the NEIO and find that
  - Where lambda is assumed constant, it is = 0.7604 → banks' perceived MR has been about 76% of the MR that would be taken into consideration by a monopolistic firm or a cartel
  - The above lambda is significantly different from 0 and 1 → we reject the hypotheses of both perfect collusion and perfect competition
  - When lambda is function of 5 determinants: liquidity (-), leverage (-) TBTF (+) and ATMs (-); concentration (+) but only weakly significant
- Market power has slightly increased over time
- There has been a significant movement towards integration i.e. a reduction of the differences in market power across countries and a process of convergence