

## **Competition in the banking sector and economic growth: panel-based international evidence**

*E. Gaffeo, R. Mazzocchi*

ISSN 2282-2801 DEM discussion papers [online]



**ISSN 2282-2801 DEM Discussion Papers [online]  
Università degli Studi di Trento**

Department of Economics and Management, University of Trento, Italy.

**Editors**

Luciano ANDREOZZI                      luciano.andreozzi@unitn.it

Roberto GABRIELE                      roberto.gabriele@unitn.it

**Technical officer**

Marco TECILLA                          marco.tecilla@unitn.it

**Guidelines for authors**

Papers may be written in Italian or in English. Faculty members of the Department must submit to one of the editors in pdf format. Management papers should be submitted to R. Gabriele. Economics Papers should be submitted to L. Andreozzi. External members should indicate an internal faculty member that acts as a referee of the paper.

Typesetting rules:

1. papers must contain a first page with title, authors, abstract, keywords and codes. Page numbering starts from the following page;
2. a template is available upon request from the managing editors.

# Competition in the banking sector and economic growth: panel-based international evidence

Edoardo Gaffeo\* Ronny Mazzocchi  
*Department of Economics and Management*  
*University of Trento*

March 24<sup>th</sup>, 2014

## Abstract

This paper employs panel techniques to empirically examine the link between the competitiveness of the banking sector and real economic growth, using data from a sample of OECD economies during 1997-2010. We employ a dynamic GMM model to find that an increase in the efficiency of banks driven by fiercer competition is robustly associated with higher real growth. The issue of Granger-causality is then explored by means of a panel-based testing procedure addressing heterogeneity. While there is a strong evidence of causality running from real growth to banking competitiveness, a bi-directional causality appears clearly only for lags higher than 1.

**Keywords:** Banking competition; Financial development; Economic growth

**JEL classification:** C33; G21; O16

## 1. Introduction

Recent contributions on the empirics of the finance-growth nexus have persuasively argued that it is not the size *per se*, but rather the quality of the services supplied by the financial industry to the rest of the economy that really matters in shaping the relationship between financial development and economic growth (Hasan *et al.*, 2009; Beck *et al.*, 2013). In fact, the effectiveness of financial services in intermediating funds and thereby sustaining an efficient allocation of resources is tightly related to the ability of banking institutions to solve the moral hazard and adverse selection problems typical of credit relationships on the one hand, and to the incentives banks face in taking risks on the other one. A crucial feature affecting both margins is the degree of competition in the banking sector, as the competitive environment affects banks' organizational structures as well as the strategic choices regarding both sides of their balance sheet.

From a theoretical viewpoint, however, the nature of the link between bank competition, systemic stability and growth is ambiguous (Beck, 2008). While a fiercer competition can yield at one time the financing of a larger number of investment projects and a lower charter value making banks more willing to take risks, less competitive markets present both a bright side given by large banks being more able to

---

\* Corresponding author.

*E-mail addresses:* edoardo.gaffeo@unitn.it (E. Gaffeo); ronny.mazzocchi@unitn.it (R. Mazzocchi).

diversify and to invest in soft information about clients, therefore reducing firms' financial constraints, and a dark side represented by the hold-up problem faced by borrowers, which may force them to reduce their demand for external finance.

The available empirical evidence on the relationship between the degree of competition in the banking sector and real economic growth has been so far not conclusive. Cetorelli and Gambera (2001) find that banking concentration has a negative effect on growth but for young firms operating in sectors most dependent on external finance, a result confirmed by Claessens and Laeven (2005) who show that industries most dependent on banking finance grow faster in countries with stiffer banking competition. Fernandez de Guevara and Madous (2011), in turn, argue that bank monopoly power has an inverted U-shaped effect on economic growth, suggesting that market power has indeed a positive effect, which exerts its highest potential at intermediate levels.

This paper contributes to the cross-country literature on the relationship between bank competition and economic growth in two ways. First, we exploit an innovative measure of competition in the banking sector – the so-called *Boone Indicator* (Boone, 2008) – that associates performance with differences in efficiency. The key idea is that more efficient banks achieve higher profits at the expense of their less efficient competitors, and this reallocation effect tends to increase monotonically as banks compete more fiercely and entry barriers decline. We will argue that, contrary to the indicators employed so far in the literature, this measure allows us to capture consistently how the degree of competitiveness in the banking market impacts on its ability to supply quality services. Second, in addition to an estimate of the sign of the relationship between bank competition and growth obtained employing a dynamic Generalized Method of Moments (GMM) panel model, we explore the direction of causality by means of a panel-based testing procedure allowing for heterogeneity.

On a sample of OECD countries over the period 1997-2010, we find that the relationship between the degree of competition-driven bank efficiency and aggregate economic growth is positive, a result which proves to be remarkably robust as we check for a large set of controls. The direction of causality flows from real growth to an improvement of the competitive conditions on the banking sector, while a reverse non-causality relationship cannot be robustly rejected.

## 2. Measuring competition and efficiency in the banking sector

Traditionally, in empirical studies the degree of competition in the banking sector has been proxied by measures of market concentration (like the Herfindhal-Hirschmann and the *C3* indexes) or price-cost margins (like the Lerner index and the Panzar-Rosse *H*-statistic). Both sets of indicators are potentially misleading, however. While a high market concentration may well be consistent with fully contestable markets,<sup>1</sup> measures of the weighted average price-cost margin can increase if the surge in the market share of the most efficient firms overcompensates a generalized decrease at an individual level. Moreover, the *H*-statistic requires restrictive assumptions about the market being in a long-run equilibrium.

---

<sup>1</sup> This is especially true in modern banking (Boot and Ratnovski, 2012).

An alternative approach to measure competitive conditions at a sectoral level with superior theoretical properties has been advanced by Boone (2008). The main intuition is that fiercer competition enables more efficient firms to earn relatively higher profits than less efficient competitors, where efficiency is usually defined as the possibility to produce the same output with lower marginal costs. In a model in which each bank decides whether or not to enter the market and then – knowing how many banks have already entered in the first stage – all competitors choose strategically to maximize their after-entry profits, a subgame perfect equilibrium can be identified in which the firm’s profits are related to its efficiency and are conditional on a measure of the aggressiveness of the firms’ conduct in the market (Deygun *et al.*, 2013). Thus, comparing the relative profits between an arbitrarily efficient bank and a bank with greater efficiency contains information about the level of competition within the industry, given that the more competitive the market is, the stronger should be the relationship between efficiency differences and performance differences.

Operationally, the Boone indicator is calculated on firm-level data as the percentage change in profits  $\pi$  due to 1 percent change in marginal costs  $MC$  according to the equation:

$$\ln \pi_{it} = \alpha_i + \lambda_t + \beta_i \ln MC_{it} + \varepsilon_{it} \quad (1)$$

where  $\alpha$  is the firm fixed effect,  $\lambda$  is a time dummy and  $\varepsilon$  is an idiosyncratic shock. Of course, since theoretically profits and marginal costs have a negative relationship the elasticity  $\beta$  should be negative. Moreover, a larger  $\beta$  in absolute value reflects a more competitive industry and can be interpreted as a reduction in the ability of the bank to affect its losses due to an increase in competition.

Two properties make the Boone indicator appealing. First, it has a robust theoretical foundation as a measure of competition, meaning that it correctly depicts the level of competition both when competition becomes more intense through more aggressive interactions between firms and when entry barriers are reduced. Second, it has the same data requirements as measures of competition based on price-cost margins. Schaek and Cihák (2010) show that the Boone indicator reflects more than 80 percent of the information contained in other variables such as the H-statistic, government ownership of banks and the Financial Freedom index. This result reinforces the idea of employing the Boone indicator for our purposes.

### 3. Data

The sample in this study includes fifteen OECD countries over the period 1997-2010.<sup>2</sup> The dependent variable is the growth rate of the per-capita real GDP (*Gdp*), converted to U.S. dollars using purchasing power parities. The independent variable of focal interest is the Boone indicator (*Boone*) for the aggregate of banks operating in each country. A lower negative value of the index indicates fiercer competition in the banking sector.

---

<sup>2</sup> Namely: Austria, Belgium, Canada, Denmark, France, Germany, Ireland, Italy, Japan, Netherlands, Norway, Spain, Sweden, UK and USA.

For robustness purposes, we consider four groups of control variables. First, structural macroeconomic characteristics are caught by government spending (*Gov*) and total saving (*Saving*) as a fraction of GDP, and the percentage of gross secondary school enrollment (*Edu*), respectively. Second, we employ two traditional measures of financial deepness capturing both bank-based and market-based intermediation, that is total domestic credit to the private sector (*Credit*) and the stock market capitalization (*Stock*), in both cases expressed as a fraction of GDP. Third, the quality of the institutional environment is controlled for by means of relative factor scores measuring the quality of legal (*Legal*), economic (*Econ*) and political (*Polit*) institutions (Kuncic, 2014). Higher values of these variables represent a higher quality of the institutional environment along each of the three dimensions. Finally, in order to check for issues related to the profitability and soundness of the banking sector potentially not caught by the Boone indicator we consider aggregate measures of the cost to income ratio (*Costinc*), the return on equity (*Roe*), the return on assets (*Roa*) and the distance from failure measured by the *z*-score (*Zscore*) of banks, respectively.

Table 1 report descriptive statistics and the relative source of the variables.

#### 4. Panel regression analysis

The key question we address in this study consists in exploring whether the degree of competitiveness of the banking sector affects real economic growth. In order to reduce potential problems associated with simultaneity biases and unobservable factors, we follow Beck and Levine (2004) in applying a dynamic GMM panel methodology.

The benchmark econometric model takes the following form:

$$y_{i,t} = \delta y_{i,t-1} + \lambda b_{i,t} + \gamma' X_{i,t} + \mu_i + \varepsilon_{i,t} \quad (2)$$

where  $y_{i,t}$  is real per capita GDP growth,  $b_{i,t}$  is the Boone indicator,  $X_{i,t}$  represents a set of control variables, while  $i$  and  $t$  represents country and time period, respectively.

The estimation results<sup>3</sup> presented in Table 2 show that, regardless of the conditioning information set one employs, an increase of competitiveness of the banking sector exerts a highly significant positive effect on real growth,<sup>4</sup> and that this effect turns out to be considerably stable as the set of controls is varied. Point estimates are also economically significant. Increasing banking competitiveness as measured by the Boone indicator from its second quartile (whose average is  $-0.0314$ ) to the first one (whose average is  $-0.0646$ ) would contribute 165 basis points to real per capita growth, according to the lowest coefficient estimate ( $-0.497$ ).

In order to check for the issue of Granger-causality between banking competition and growth, we recur to the heterogeneous panel-based methodology proposed by Dumitrescu and Hurlin (2012). Their testing approach takes into account two dimensions of heterogeneity: the heterogeneity of the regression model used to test the Granger causality on the one hand, and the possible heterogeneity of the causality relationships

---

<sup>3</sup> In order to remove individual effects we use a forward orthogonal deviation method instead of a first difference approach, given the former higher performance (Hayakawa, 2009).

<sup>4</sup> Recall that a lower negative value of the Boone indicator signals a fiercer competitive environment.

over the cross-section dimension on the other one. Under the null hypothesis that there is no causal relationship for any of the units of the panel (i.e., homogeneous non-causality), three test statistics can be computed: *i*) the average of the individual Wald statistics for the  $i^{th}$  cross-section units,  $W_{HNC}$ ; *ii*) the corresponding standardized statistic based on the asymptotic moments,  $Z_{HNC}$ ; *iii*) an approximated standardized statistic capable to accommodate the small-sample problem,  $\tilde{Z}_{HNC}$ .

Results of the test applied to the variables *Gdp* and *Boone* are shown in Table 3, where the three statistics are tabulated for a lag order going from 1 to 3. We find strong evidence of a bi-directional causal relationship between banking competition and growth for lags equal or higher than 2, while for a lag order equal to 1 the testing procedure suggests that the causality runs from real growth to banking competition but not the other way round as the standardized statistic based on the approximation of the moments in a finite  $T$  sample is used.

## 5. Conclusions

This paper aims to provide empirical evidence on the relationship between economic growth and the performance of banking institutions - in particular of bank efficiency - measured by the so-called Boone Indicator, an innovative measure of competitiveness. Our results confirm that an increase in the efficiency of banks driven by fiercer competition will contribute positively to economic growth. In addition, a panel-based Granger-causality test shows a strong causality running from real growth to the competitiveness of the banking sector, whereas a bi-directional causality appears clearly only for lags higher than 1.

Our findings may be useful in shedding light on two relevant policy issues. First, our results suggest that policies promoting competition in the banking sector may have positive impacts on efficiency and thus on economic growth, but also that these effects tend to show up only after a certain period of time. Second, a set of policies that sustains a higher growth of GDP would seem to be able to generate a virtuous cycle with beneficial effects on the efficiency of the banking sector, which in turn feeds back on real growth itself.

## References

- Beck, T. (2008), Bank competition and financial stability: friends or foes, World Bank Policy Research Working Paper N.4656.
- Beck, T., Degryse, H. and Kneer, K. (2013), Is more finance better? Disentangling intermediation and size effects of financial systems, *Journal of Financial Stability*, **10**:50-64.
- Beck, T. and Levine, R. (2004), Stock markets, banks, and growth: panel evidence, *Journal of Banking and Finance*, **28**:423-442.
- Boone, J. (2008), A new way to measure competition, *Economic Journal*, **118**:1245-1261.
- Boot, A. and Ratnovski, L. (2012), Banking and trading, IMF Working Paper N.12/238.

- Cetorelli, N. and Gambera, M. (2001), Banking market structure, financial dependence and growth: international evidence from industry data, *Journal of Finance*, **56**:617-648.
- Claessens, S. and Laeven, L. (2005), Financial dependence, banking sector competition, and economic growth, *Journal of the European Economic Association*, **3**:179-207.
- Deygun, M., Shaban, M. and Weyman-Jones, T. (2013), Measuring competition using the Boone relative profit difference indicator: an application to banking systems in emerging economies, Discussion Paper N.05, Department of Economics, Loughborough University.
- Dumitrescu, E. and Hurlin, C. (2012), Testing for Granger non-causality in heterogeneous panels, *Economic Modelling*, **29**:1450-1460.
- Fernandez de Guevara, J. and Maudos, J. (2011), Banking competition and economic growth: cross-country evidence, *The European Journal of Finance*, **17**:739-764.
- Hasan, I., Koetter, M. and Wedow, M. (2009), Regional growth and finance in Europe: Is there a quality effect of bank efficiency?, *Journal of Banking and Finance*, **33**:1446–1453.
- Hayakawa, K. (2009), First difference or forward orthogonal deviation - Which transformation should be used in dynamic panel data models? A simulation study, *Economics Bulletin*, **29**:2008-2017.
- Kuncic, A. (2014), Institutional quality dataset, *Journal of Institutional Economics*, in press.
- Schaeck, K. and Cihák, M. (2010), Competition, efficiency, and soundness in banking: an industrial organization perspective, Discussion Paper No.2010-68S, Center for Economic Research, Tilburg University.



Table 1 – Descriptive statistics

<b>Variable</b>	<b>Obs</b>	<b>Mean</b>	<b>S.D.</b>	<b>Min</b>	<b>Max</b>	<b>Source</b>
<i>Gdp</i>	210	0.021	0.025	-0.07	0.109	U.S. Department of Labor - Bureau of Labor Statistics
<i>Boone</i>	210	-0.034	0.032	-0.094	0.087	World Bank - Financial Development and Structure Dataset
<i>Gov</i>	210	0.206	0.035	0.143	0.298	IMF - Financial Statistics
<i>Edu</i>	204	1.098	0.138	0.903	1.623	World Bank - Development Indicators
<i>Saving</i>	210	0.244	0.059	0.113	0.417	IMF - Financial Statistics
<i>Credit</i>	200	1.302	0.477	0.321	2.335	World Bank - Financial Development and Structure Dataset
<i>Stock</i>	210	0.774	0.368	0.139	1.796	World Bank - Financial Development and Structure Dataset
<i>Legal</i>	210	1.381	0.377	-0.103	1.933	Kuncic (2014) - Institutional Quality Dataset
<i>Econ</i>	210	1.201	0.350	0.370	1.888	Kuncic (2014) - Institutional Quality Dataset
<i>Polit</i>	210	1.491	0.270	0.615	1.985	Kuncic (2014) - Institutional Quality Dataset
<i>Costinc</i>	209	0.618	0.147	0.120	1.338	World Bank - Financial Development and Structure Dataset
<i>Roe</i>	195	0.081	0.131	-0.885	0.352	World Bank - Financial Development and Structure Dataset
<i>Roa</i>	195	0.005	0.007	-0.043	0.023	World Bank - Financial Development and Structure Dataset
<i>Zscore</i>	195	0.155	0.075	0.004	0.409	World Bank - Financial Development and Structure Dataset

Table 2 – GMM estimates

Regressors	I	II	III	IV	V	VI	VII	VIII	IX
<i>Gdp(t-1)</i>	-0.3546*** (0.1948)	-0.4093* (0.1454)	-0.2513** (0.1124)	-0.3691* (0.1140)	-0.3011 (0.2079)	-0.3699 (0.3584)	-0.2894** (0.1166)	-0.3535*** (0.2043)	-0.3619** (0.1956)
<i>Boone</i>	-0.5542* (0.1521)	-0.6166* (0.1027)	-0.5971* (0.1360)	-0.5648* (0.1567)	-0.4972* (0.1593)	-0.5615* (0.1614)	-0.5696* (0.1878)	-0.5524* (0.1746)	-0.6274* (0.1655)
<i>Gov</i>	1.1419 (0.7933)	0.1861 (0.6897)	-0.3979 (0.5392)	0.5509 (0.6730)	-0.0171 (1.2281)	1.1303 (0.8069)	0.8513 (0.9125)	1.0063 (0.9652)	0.8622 (0.9250)
<i>Edu</i>	0.0283 (0.0577)	0.0368 (0.0399)	0.0081 (0.0728)	0.0425 (0.0464)	0.1078 (0.0798)	0.0281 (0.0397)	0.0241 (0.0724)	0.0295 (0.0690)	-0.0209 (0.1309)
<i>Saving</i>	1.1223** (0.5723)	1.3407 (0.4422)	0.1588 (0.3528)	0.7295 (0.4790)	0.2717 (0.6133)	1.1084** (0.5845)	0.8674 (0.5057)	1.0044*** (0.6008)	1.3074** (0.5050)
<i>Credit</i>	-0.0553* (0.0156)	-0.0439* (0.0167)	--	-0.0474* (0.0134)	-0.0666* (0.0171)	-0.0559** (0.0257)	-0.0482** (0.0216)	-0.0528* (0.0192)	-0.0453** (0.0186)
<i>Stock</i>	0.0654** (0.0336)	--	0.0698* (0.0218)	0.0886* (0.0238)	0.0924** (0.0396)	0.0667** (0.0301)	0.0640*** (0.0359)	0.0683** (0.0371)	0.0557*** (0.0330)
<i>Legal</i>	0.0697** (0.0324)	0.0876* (0.0296)	0.0234 (0.0299)	--	--	0.0670** (0.0323)	0.0678** (0.0331)	0.0665*** (0.0335)	0.0639 (0.0454)
<i>Econ</i>	--	--	--	0.0042 (0.0322)	--	--	--	--	--
<i>Polit</i>	--	--	--	--	0.1279 (0.1499)	--	--	--	--
<i>Costinc</i>	--	--	--	--	--	0.0007 (0.0345)	--	--	--
<i>Roe</i>	--	--	--	--	--	--	-0.0466 (0.1143)	--	--
<i>Roa</i>	--	--	--	--	--	--	--	-0.5907 (1.9603)	--
<i>Zscore</i>	--	--	--	--	--	--	--	--	-0.1999 (0.4863)
J-statistic <sup>a</sup>	4.8088 (0.6833)	9.6429 (0.2910)	7.4674 (0.4871)	8.9331 (0.2575)	7.6186 (0.3674)	4.8417 (0.5643)	4.3428 (0.6304)	4.6692 (0.5869)	4.5300 (0.6053)

\*, \*\*, \*\*\* Statistically significant at the 1%, 5% and 10% level, respectively. Standard errors in parenthesis.  
<sup>a</sup> p-values in parenthesis.  $H_0$ : the model is valid.

Table 3 – Panel-based Granger causality tests

<b>Lag order</b>	<b>Causality from Boone to GDP</b>			<b>Causality from GDP to Boone</b>		
	<b>K=1</b>	<b>K=2</b>	<b>K=3</b>	<b>K=1</b>	<b>K=2</b>	<b>K=3</b>
$W_{\text{HNC}}$	1.7585	4.3850	8.9312	3.5537	4.8832	7.5489
$Z_{\text{HNC}}$	2.0773 (0.0378)	9.2372 (0.0000)	28.1340 (0.0000)	6.9936 (0.0000)	11.1665 (0.0000)	21.5782 (0.0000)
$\tilde{Z}_{\text{HNC}}$	1.0054 (0.3147)	2.0360 (0.0418)	3.2721 (0.0011)	4.3708 (0.0000)	2.5952 (0.0095)	2.3161 (0.0206)

*p*-values in parenthesis.

List of recent papers published un the same series

- 2013/01 A regular multidistance among fuzzy numbers, Franco Molinari
- 2013/02 Employer moral hazard and wage rigidity. The case of worker-owned and investor-owned firms, Marina Albanese, Cecilia Navarra and Ermanno Tortia
- 2013/03 Origins and prospects of the Euro existential crisis, Luigi Bonatti and Andrea Fracasso
- 2013/04 Uses And Motivations For Credit Derivatives: An Empirical Investigation Into Italian Banks, Eleonora Broccardo, Maria Mazzuca and Elmas Yaldiz
- 2013/05 At the core of the international financial system, Valentina Feroldi, Edoardo Gaffeo
- 2013/06 Reassessing the spatial determinants of the growth of Italian SMEs, Roberto Gabriele, Diego Giuliani, Marco Corsino, Giuseppe Espa
- 2013/07 A spatial and sectoral analysis of firm demography in Italy, Giuseppe Espa, Danila Filippini, Diego Giuliani, Davide Piacentino
- 2013/08 Using information markets in grantmaking. An assessment of the issues involved and an application to Italian banking foundations, Edoardo Gaffeo
- 2013/09 Interbank contagion and resolution procedures: inspecting the mechanism, Edoardo Gaffeo e Massimo Molinari
- 2013/10 Transatlantic contagion 2010-..., Roberto Tamborini
- 2013/11 Do middle managers matter?, Elena Feltrinelli, Roberto Gabriele, Sandro Trento
- 2013/12 Approximate Maximum Likelihood Estimation of the Autologistic Model, Marco Bee, Diego Giuliani, Giuseppe Espa
- 2013/13 Scope and Flaws of the New Neoclassical Synthesis, Ronny Mazzocchi
- 2013/14 Investment-Saving Imbalances with Endogenous Capital Stock, Ronny Mazzocchi
- 2013/15 Intertemporal Coordination Failure and Monetary Policy, Ronny Mazzocchi

2013/16 Monetary Policy when the NAIRI is unknown: The Fed and the Great Deviation, Ronny Mazzocchi

2013/17 Resilience and specialization in volatile environments: evidence from the Italian Air Force Tornado crews learning practices, M. Laura Frigotto, Marco Zamarian

2013/18 Bio-Economics of Allocatable Pollination Services: Sequential Choices and Jointness in Sites, L. Pilati and V. Boatto

2014/01 Macroprudential Consolidation Policy in Interbank Networks, E. Gaffeo and M. Molinari

