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Market structure, efficiency and profitability in the Italian banking sector

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Abstract

In this paper we investigate the relationship between market structure and profitability for the Italian banking industry over the period 1999-2016, taking into account also banks' efficiency. Our empirical results provide support to the 'efficient-structure' hypothesis, while market structure variables – and the related noticeable concentration process of the last decades – seem not to have affected banks' returns.

JEL classification numbers: G21, L11
Keywords: Banking industry, Market structure, Efficiency, Profitability

1. Introduction

In this paper we explore the link between market structure and profitability for the Italian banking industry over the period 1999-2016, taking into account also banks' efficiency. The topic is worth of investigation because, according to the European Central Bank, during the sample years in Italy there has been a drop of operating banks (from 890 to 611), an increase of their network size (the average number of branches per bank passed from 30.5 to 48), and an outstanding rise of both the share of total assets of the five largest banks (from 25% to 43%, the highest in the EU) and the related Herfindahl-Hirshman index (HHI, from 220 to 452, the third highest). Did this increase of concentration produce effects on banks' profitability?
According to the "structure-conduct-performance" (SCP) paradigm (Mason, 1939; Bain, 1951), the performance of an industry depends on the behaviour of incumbent banks, which in turn is determined by the market structure, usually proxied by the

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concentration level. Accordingly, more concentrated industries improve banks' market power, positively influencing their profits but with negative consequences on customers (less favorable interest rates, higher service fees). However, the 'efficient-structure' (ES) hypothesis (Demsetz, 1973; Peltzman, 1977) maintains that greater market concentration could result from differences in efficiency among banks: more efficient banks get both higher market shares and profits, so a spurious positive relationship between profits and concentration may emerge, unless we control for efficiency.

Regarding Italy, past studies have shown that concentration and competition may coexist (e.g. Coccorese, 2005, 2009), however they have normally employed methodologies developed within the New Empirical Industrial Organization (NEIO), e.g. the estimation of conjectural variation parameters or Lerner indices, while there is quite few evidence based on structural measures and especially concerning the very last years and the related sharply increasing concentration.

In what follows, Section 2 describes our econometric strategy and data, Section 3 discusses the empirical findings, and Section 4 concludes.

2. Model specification

So as to assess the SCP and ES hypotheses for the Italian banking market, we estimate the following equation:

$$\pi_{it} = \beta_0 + \beta_1 HHI_{it} + \beta_2 MS_{it} + \beta_3 X\_EFF_{it} + \beta_4 S\_EFF_{it} + \boldsymbol{\gamma}'\mathbf{X} + \delta_t + \lambda_i + \varepsilon_{it}, \qquad (1)$$

where, for each bank *i* and year *t*, π is a performance measure, *HHI* is a weighted average of the HHI of regions where it operates (computed taking into account the number of banks' branches, due to lack of data on banks' deposits and loans at the local level; for multi-regional banks, *HHI* is weighted by their branches), *MS* is again a weighted average of bank's regional market shares, *X_EFF* is a X-efficiency measure (capturing the capability of producing the output at minimum cost due to better management or technology), *S_EFF* is a scale efficiency measure (indicating the ability of producing the output at lower unit costs for a given technology), **X** is a vector of control variables affecting banks' performance, δ_t and λ_i are year and bank dummies, respectively, and ε_{it} is the error term.

As performance indices, we employ the return-on-assets ratio (*ROA*), the ratio between net interest margin and total assets (*NIMTA*), and a measure of the role of non-interest returns (*NIR*), calculated as (1+*ROA*)/(1+*NIM*) (Goldberg and Rai, 1996, p. 752). The first captures banks' ability to generate profits through their overall business, the second concentrates on their pricing capacity (i.e. the ability of charging higher loan rates and/or lower deposit rates), the third focuses on their potential to earn from non-traditional services.

Regarding *X_EFF*, we make use of bank-level cost efficiency scores derived from an ad-hoc estimation of a translog stochastic cost frontier function (Aigner et al., 1977; Meeusen and van den Broeck, 1977), where the specification of the error term is made up of two components: inefficiency (the deviation between the observed output and the 'frontier' output, i.e. the efficient output from a given input set; this term, u_{it}, is assumed to be distributed as a positive half-normal random variable) and unobserved heterogeneity (due to stochastic shocks and measurement errors). The efficiency scores (calculated as $X\_EFF_{it} = E\left[\exp\left(-u_{it}\right) | \varepsilon_{it}\right]$, where ε_{it} is the overall error term) range from 0 to 1, with 1 characterizing the fully efficient bank.[3] From the same estimation we get also the variable *S_EFF*. We first compute returns to scale (RTS_{it}) as the reciprocal of the cost elasticity with respect to output. When $RTS_{it} > 1$ ($RTS_{it} < 1$), banks are enjoying economies (diseconomies) of scale, i.e. they are operating below (above) optimal scale levels of production, and may lower costs by increasing (decreasing) output further; $RTS_{it} = 1$ indicates the quantity minimizing average costs (i.e. constant returns to scale). In order to have an indicator of scale economies ranging between 0 and 1 (with increasing values meaning that banks are closer and closer to their efficient scale), we set $S\_EFF = RTS$ when $RTS \leq 1$, and $S\_EFF = 2–RTS$ when $RTS > 1$. In this way, both $RTS > 1$ and $RTS < 1$ indicate inefficiency, with higher values of *S_EFF* implying increasing scale efficiency.

In line with Goldberg and Rai (1996) and Berger and Hannan (1997), we use our model to test some hypotheses. If $\beta_1 > 0$ and $\beta_2 \geq 0$, while $\beta_3 = 0$ and $\beta_4 = 0$, there would be confirmation of the SCP hypothesis, as banks gain higher profits as a result of non-competitive conduct due to market concentration. If $\beta_1 \geq 0$ and $\beta_2 > 0$, but again $\beta_3 = 0$ and $\beta_4 = 0$, market conditions would be compatible with the relative market power hypothesis (RMP), according to which banks are able to exert market power (and gain more profits) thanks to larger market shares. Note that this hypothesis may occur also in less concentrated markets.

In case $\beta_1 = 0$ and $\beta_2 = 0$, but $\beta_3 > 0$ and/or $\beta_4 > 0$, there is signal that the ES hypothesis is at work. Now more efficient banks enjoy higher profits and, because of their superior efficiency, can gain higher market share and likely operate in markets with higher concentration. However, we can also disentangle the role of X-efficiency and scale efficiency. When $\beta_3 > 0$, banks with superior management or better production processes can operate with lower costs thus obtaining higher profits (X-efficiency hypothesis, ESX). When $\beta_4 > 0$, banks may be characterized by similar technology and management but operate at different levels of scale economies, and those closer to the optimal level have lower costs (scale efficiency hypothesis, ESS). Both ESX and ESS, as told, postulate an alternative reason for the positive link between market structure and profitability.

However, when *NIMTA* is the dependent variable, the above hypotheses imply that $\beta_3 < 0$ and/or $\beta_4 < 0$ (Goldberg and Rai, 1996, p. 756); actually, it is plausible that,

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[3] Specifically, we estimate a standard translog specification with three inputs (interest expenses, personnel expenses, and other operating costs) and one output (loans). Details are not reported here due to space limitations, but are available from the authors upon request.

the greater the efficiency, the lower the interest margin, because banks can provide their credit services at a lower price than other competitors.

As control variables, we include: banks' total assets (*lnTOTAST*), accounting for differences related to bank size; the equity-to-assets ratio (*EQAST*), which captures the role of capitalization; the loans-to-assets ratio (*LOANAST*), that helps to control for the influence of banks' core activity, i.e. loan management; the share of non-performing loans (*NPL*), a proxy for credit risk that we expect to negatively impact performance; the average cost per employee (*lnWAGE*), supposed to negatively affect banks' performance; and banks' age (*lnBANKAGE*), which should catch their business experience and length of relationship with borrowers, both exerting positive influence on performance. We also add two macroeconomic variables: the per capita GDP of the regions where banks are located (*lnGDPPERCAP*), gauging the impact of local economic conditions (as before, for multi-region banks weights are given by their branches); and the yearly rate of GDP growth (*GDPGROWTH*), controlling for the speed of economic development in the business area.

Descriptive statistics of the above variables (including description and data sources) are provided in Table 1. Our sample period is 1999 to 2016 and considers 838 Italian banks (9,360 observations).

Table 1: Summary statistics and data description

Variable	**Mean**	**Std. dev.**	**Min**	**Median**	**Max**	**N. obs.**
ROA	0.6557	0.8118	-5.1534	0.7273	2.7566	9,360
NIMTA	2.6671	0.7906	-1.1394	2.6609	8.7862	9,360
NIR	98.0441	0.8246	91.6892	98.1338	102.5618	9,360
HHI	15.3146	131.2330	0.0002	0.2330	3,344.80	9,360
MS	1.4865	3.3942	0.0149	0.4766	56.6469	9,360
X_EFF	0.8455	0.0474	0.4367	0.8519	0.9661	9,360
S_EFF	0.9011	0.0677	0.0127	0.9114	0.9999	9,360
TOTAST	3,517.70	21,432.82	6.1090	336.3801	439,130.80	9,360
EQAST	0.1055	0.0407	0.0299	0.0981	0.7794	9,360
LOANAST	0.7141	0.1271	0.2566	0.7247	0.9499	9,360
NPL	0.0242	0.0232	0.0010	0.0166	0.2481	9,360
WAGE	69.0944	8.7295	24.0589	68.2920	158.95	9,360
BANKAGE	54.4256	23.4561	1	65	80	9,360
GDPPERCAP	29.0544	6.7704	15.3257	30.5457	38.2323	9,360
GDPGROWTH	0.0484	2.6286	-24.9173	0.3622	23.0408	9,360

Variable	**Description**	**Source**
ROA	Income before tax/Total assets (%)	ABI
NIMTA	Net interest margin/Total assets (%)	ABI
NIR	(1+ROA)/(1+NIMTA) (%)	ABI
HHI	Weighted HHI for the bank	Own calculations
MS	Weighted bank's market share	Own calculations
X_EFF	X-efficiency (based on a stochastic cost frontier estimation)	Own calculations
S_EFF	Scale efficiency (based on a stochastic cost frontier estimation)	Own calculations
TOTAST	Total assets (million euro at constant 2010 values)	ABI
EQAST	Total equity/Total assets	ABI
LOANAST	Total loans/Total assets	ABI
NPL	Bad loans/Total customer loans	ABI
WAGE	Average labour cost (thousand euro at constant 2010 values)	ABI
BANKAGE	Age of bank	Bank of Italy
GDPPERCAP	Regional per capita GDP (thousand euro at constant 2010 values)	Istat
GDPGROWTH	Regional GDP yearly rate of growth (%)	Istat

3. Empirical evidence

We have first estimated a fixed effects version of Equation (1), whose results are shown in Table 2. When *ROA* is the dependent variable (first column), among the regressors of interest (*HHI*, *MS*, *X_EFF*, *S_EFF*) only *X_EFF* is significant (at the 1% level) with positive coefficient. This evidence rules out both the SCP and RMP hypotheses for the Italian banking industry, and supports the ESX version (but not the ESS version) of the ES hypothesis: higher profits seem to have characterized only more efficient banks, particularly those with superior skill in minimizing the production costs of their output bundle, i.e. much closer to the minimum cost that could be achieved on the efficient frontier.

Table 2: Estimation results: panel regressions

	Dep. var.: ROA			Dep. var.: NIMTA			Dep. var.: NIR		
	Coef.	t		Coef.	t		Coef.	t	
HHI	-0.0004	-1.11		-0.0013	-1.60		0.0008	1.07	
MS	-0.0132	-0.65		0.0656	2.54	**	-0.0008	-2.52	**
X_EFF	3.5981	5.95	***	-3.3014	-7.76	***	0.0668	11.38	***
S_EFF	0.4497	0.57		-2.4196	-4.19	***	0.0272	3.09	***
Ln TOTAST	-0.0918	-1.35		-0.3434	-6.17	***	0.0024	3.95	***
EQAST	-2.7414	-5.00	***	1.2152	2.46	**	-0.0383	-6.48	***
LOANAST	-0.7675	-3.75	***	2.2093	13.63	***	-0.0287	-14.17	***
NPL	-9.8873	-12.35	***	-1.6382	-2.78	***	-0.0810	-11.66	***
Ln WAGE	-0.3268	-2.30	**	0.8743	7.67	***	-0.0115	-8.26	***
Ln BANKAGE	0.2121	3.38	***	0.0282	0.44		0.0017	2.70	***
Ln GDPPERCAP	0.1239	0.26		1.2856	4.44	***	-0.0111	-2.27	**
GDPGROWTH	0.0079	1.70	*	-0.0073	-2.25	**	0.0001	2.97	***
R^2 within	0.4399			0.7319			0.2674		
N. obs.	9,360			9,360			9,360		

Significance for the parameter estimates: *** = 1% level; ** = 5% level; * = 10% level. All regressions include year dummies and bank fixed effects (coefficients are not reported). *t*-values are based on robust standard errors.

The regression results with *NIMTA* and *NIR* as dependent variables (second and third columns) highlight additional important features of Italian banks. First, the market share variable (*MS*) is significant with positive and negative coefficients, respectively. Therefore, a higher level of profitability comes from traditional activities of banks with higher market share, and from non-traditional activities of banks with lower market share. In the first case (*NIMTA*), we are focusing on banks' ability of setting prices for deposits and loans far from the competitive levels, so the positive coefficient of *MS* indicates that banks with larger market share have priced their products in an anti-competitive fashion. In the second case (*NIR*), the negative coefficient of *MS* suggests that banks with reduced market share have had to balance their lower weight in credit markets with a stronger – and successful – business diversification.

Moreover, in both regressions *X_EFF* and *S_EFF* exhibit significant coefficients – negative for *NIMTA*, positive for *NIR* – meaning that the most efficient banks gained higher profits both lowering their margin on intermediation activity and exploiting the provision of other services.

Putting together the previous results, we are led to accept the 'modified efficient structure hypothesis' (Shepherd, 1986; Maudos, 1998), which claims that the variance in performance is explained by efficiency as well as by the residual influence of market share. Actually, market share captures the impact of factors that are not related to efficiency, like market power and/or product differentiation, while market concentration does not directly affect business performance.

Looking at the coefficients of control variables, bank size (*lnTOTAST*) does not significantly influence *ROA*, but its impact is positive on *NIMTA* and negative on *NIR*: this may signal that the diversification of larger banks leads to higher returns and lower risk, but the latter effect implies also lower yields in the credit market (Goldberg and Rai, 1996, p. 757). Bank capitalization (*EQAST*) negatively affects both *ROA* and *NIR*, but positively *NIMTA*: hence, less capital and greater leverage allow higher profits thanks to a more aggressive management of assets and liabilities, but imply also increased borrowing costs that reduce interest margins. Higher loans-to-assets ratios (*LOANAST*) significantly reduce profitability (*ROA* and *NIR*) because of the higher interest expenses paid on gathered funds, but guarantee also higher margins (*NIMTA*). As expected, performance is adversely and significantly influenced by non-performing loans (*NPL*) and labour costs (*lnWAGE*; in the *NIMTA* regression this coefficient is positive, showing that banks with higher costs per employee are able to pass on them on customers through loan rates). The coefficient of *lnBANKAGE* is always positive, but significant only for *ROA* and *NIR*, meaning that older banks are characterized by higher overall profits especially in non-traditional services. Finally, the per capita GDP (*lnGDPPERCAP*) is positively associated with *NIMTA*, and negatively with *NIR*, while the reverse happens for *GDPGROWTH*; therefore, higher incomes but slower rates of GDP growth increase profits from lending activities (probably because in more rich areas as well as in bad times banks are not forced to compete aggressively to preserve or even grow their customer base) but not from the other types of business.[4]

Some authors hold that banks' profits show a tendency to persist over time (e.g.: Berger, 1995; Goddard et al., 2004), due to hurdles to market competition, problems

[4] As a robustness check, we have replaced the *X_EFF* variable with the ratio between non-interest operating costs and total assets, an accounting indicator for quick assessment of banks' operational efficiency (interest expenses were ignored because they may correlate more with market rates than with management ability). The related results substantially confirm the previous evidence, so we do not report them (but are available from the authors upon request).

of asymmetric information in credit provision, or sensitivity to autocorrelated macroeconomic shocks (Athanasoglou et al., 2008). One way to cope with the possibility of persistence of bank profitability is using a dynamic model specification, also because the ordinary least squares regression with the lagged dependent variable may generate biased and inconsistent coefficients (Baltagi, 2001, pp. 129-130). Here we employ a two-step system GMM estimator (Arellano and Bover, 1995; Blundell and Bond, 1998), where the first differenced values and lagged values are used as instruments for the lagged dependent variables. This approach allows also to control for possible endogeneity and reverse causality between our bank variables and profitability.

The results of the system-GMM estimations of Equation (1) are shown in Table 3. They largely confirm the previous indications. In addition, *S_EFF* appears to positively impact only *ROA* (at the 10% level), while market concentration negatively affects *NIMTA* (although at the 10% significance level) and positively influences *NIR*. Overall, we get a further proof that the situation of the Italian banking industry is compatible with the ES hypothesis, with a prominent role played by X-efficiency.

Table 3: Estimation results: GMM regressions

	Dep. var.: ROA			Dep. var.: NIMTA			Dep. var.: NIR		
	Coef.	t		Coef.	t		Coef.	t	
ROA_LAGGED	0.2732	5.76	***						
NIMTA_LAGGED				0.3786	2.46	**			
NIR_LAGGED							0.2326	4.71	***
HHI	0.0003	1.32		-0.0003	-1.75	*	0.0007	2.41	**
MS	-0.0232	-1.57		0.0206	2.24	**	-0.0491	-2.84	***
X_INEFF	4.2938	5.32	***	-3.2161	-5.26	***	7.5173	8.89	***
S_INEFF	0.9728	1.68	*	0.2193	0.84		0.3867	0.68	
lnTOTAST	0.0613	2.25	**	-0.1476	-3.90	***	0.2376	7.12	***
EQAST	-1.0853	-1.12		1.9903	4.33	***	-3.0861	-2.79	***
LOANAST	-1.7811	-6.44	***	1.4424	5.14	***	-3.2832	-10.37	***
NPL	-12.1078	-10.05	***	-1.0730	-2.47	**	-11.3294	-9.70	***
lnWAGE	-0.6664	-2.60	***	0.3002	2.34	**	-0.9447	-3.93	***
lnBANKAGE	0.1008	4.71	***	0.0202	1.43		0.0858	4.13	***
lnGDPPERCAP	-0.5535	-6.42	***	-0.3854	-3.58	***	-0.0986	-1.10	
GDPGROWTH	0.0045	0.87		0.0021	0.75		0.0019	0.35	
N. obs.	9,356			9,359			9,356		
AR(1)	-3.41			-2.48			-3.32		
AR(1) (p-value)	0.00			0.01			0.00		
AR(2)	0.83			-3.08			0.71		
AR(2) (p-value)	0.41			0.00			0.48		
Hansen J test	732.17			737.90			729.50		
Hansen J test (p-value)	0.22			0.18			0.25		

Significance for the parameter estimates: *** = 1% level; ** = 5% level; * = 10% level.
t-values are based on two-step standard errors incorporating the Windmeijer correction. All regressions include year fixed effects (coefficients are not reported). Lagged dependent variables are treated as endogenous; bank variables are treated as predetermined; economic variables and year dummies are treated as exogenous. Regressors have been instrumented by their second and third order lags. AR(1) and AR(2) statistics test first-order and second-order serial correlation in the residuals of the estimated equations, respectively. The Hansen *J* statistic tests the instruments' joint validity.

The control variables also exhibit generally coherent coefficients. We just note that *lnGDPPERCAP* has always a significantly negative coefficient, hence now banks appear to gain higher profits in less economically developed areas. The coefficients of the lagged dependent variables confirm profit persistence. However, the estimated coefficients range between 0.23 and 0.38, indicating that persistence of profitability for Italian banks is rather low (which foreshadows a good degree of

competition).
Table 3 highlights that the AR(1) test is always rejected (high first-order autocorrelation), while the AR(2) test cannot be rejected at the 5% significance level in two over three estimations (no evidence of second-order autocorrelation). Under this respect, our GMM specification is broadly consistent. Finally, the Hansen tests of overidentifying restrictions is never rejected, thus confirming the validity of instruments.

4. Conclusions

In this paper we have examined the link between market power and profitability for Italian banks in the light of the SCP and ES hypotheses. Using a sample of 838 banks for the period 1999-2016, we estimated both a panel regression and a GMM model, finding that market structure did not affect profitability, while a significant role has been played by efficiency, particularly X-efficiency (i.e. banks' closeness to the 'best practice' cost frontier).
Empirical results rule out any evidence of collusive behaviour among Italian banks, while profitability has been mainly driven by efficiency gains. Therefore, in spite of the recent noticeable consolidation process, they appear to confirm that in the Italian banking industry there is no apparent conflict between concentration and competition.

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