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Profitability and Risk-Taking Among Cooperative Banks in the Eurozone

Jean-Michel Sahut
IDRAC Business School

Faten Ben Bouheni
ISC Paris

Abstract

In Europe, the banking sector is mainly composed of commercial and cooperative banks. The cooperative banks are particular because they were historically founded to improve access to finance for their members and foster self-help, responsibility and solidarity. So, they can have different objective and behavior than commercial banks, especially during crisis. This paper uses a dynamic panel of 1670 cooperative banks in the euro area to investigate the effect of economic growth and economic liberalization on cooperative banks' profitability and risk-taking from 1999 to 2015. We provide evidence that cooperative banks have relatively higher financial stability with relatively less risk-taking than other banks. In addition, smallest cooperative banks are less efficient and more exposed to risk than largest banks. Deepen analysis shows that before the 2008 financial crisis, economic growth and liberalization boost banking profitability and reduce insolvency and lending risks of cooperative banks. However, after this crisis, the scanty economic growth in the euro area weakens banking profitability and increases insolvency and lending risks. Moreover, cooperative banks in countries without troika bailouts manage better their risk-taking than cooperative banks operating in countries with troika assistance. Finally, German cooperative banks' profitability and risk-taking are counter-cycle.

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Contact: Jean-Michel Sahut - jmsahut@gmail.com, Faten Ben Bouheni - Fben-bouheni@iscparis.com.
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1. Introduction

The intensity of the latest financial crisis, which has led to the emergence of the euro area sovereign debt crisis as a new phase of this global crisis, has increased concern about the relationship between finance and the real economy. Many empirical studies document a weakening of the hitherto favorable relationship between the two over the last decades. Rousseau and Wachtel (2011) found that the positive link between finance and growth is no longer robust and indeed became non-existent from 1989 onwards. Arcand et al. (2012) find that the nexus between finance and real economy is non-monotonic and conclude that too much finance can have non-positive effects on the real economy. On the other hand, Easterly et al. (2000) show that output volatility grows when the share of the financial system is too high. However, in many countries, the banking sector is not homogeneous. In Europe, it is mainly composed of commercial and cooperative banks. In Italy, France, Germany and the Netherlands, the market share of cooperative banks in loans ranges between 25% and 45% (EACB, 2016). "Cooperatives are based on the values of self-help, self-responsibility, democracy, equality, equity and solidarity. In the tradition of their founders, co-operative members believe in the ethical values of honesty, openness, social responsibility and caring for others" (ICA, 2007). Christensen et al. (2004) and Ayadi et al. (2009) argue that cooperative banks may be conceived as "dual bottom line" institutions which aim to generate profits in order to survive and expand without having profit as their sole or even primary bottom line objective. In-keeping with this line of thought, Hesse and Čihak (2007) observe that cooperative banks maximize their customer surplus rather than profits. In summary, cooperative banks can have different objectives and behaviors to commercial banks. Moreover, the effects of economic growth and liberalization on the profitability and risk-taking of these banks can also differ. In view of their key roles in financing the real economy, and more globally within the financial system, it is crucial for a lot of countries in Europe to better understand the behaviors of cooperative banks, their performance and their impact on financial stability.

This paper highlights the largest available dataset, including 1670 operating cooperative banks in the euro area, covering a significant period of time, between the adoption of the euro as a currency in 1999 until 2015. It focuses on cooperative banks operating in the Eurozone because the recent financial crisis and the European sovereign debt are both testament to the fragility of the European banking system, which requires a more in-depth understanding of the strong connections between financial markets and the real economy. Moreover, European banks became a source of risk to international financial markets during the financial crisis and focus on the European banking sector increased during the sovereign debt crisis (Black et al., 2016; Ben Bouheni and Hasnaoui, 2017).

In addition, this paper uses the Generalized Method of Moments (GMM) system technique for the dynamic panel data model in order to estimate the effects of the business cycle and economic liberalization on banking profitability and risk-taking. This method is the most consistent and efficient in estimating the coefficients, and in controlling the potential problems of endogeneity, heteroscedasticity and autocorrelation (Arellano and Bover, 1995; Lee and Hsieh, 2014). Then, persistence is another crucial feature of risk-taking and profitability among banks. The dynamic GMM estimator can control unobserved heterogeneity and the persistence of the dependent variable.

Interesting findings are reached. Firstly, cooperative banks have relatively higher financial stability with relatively less risk-taking in the euro area. Secondly, cooperative banks perform differently depending on their size. Indeed, the smallest cooperative banks are less efficient and more exposed to risk than the largest banks. Thirdly, financial crisis significantly affects the performance of cooperative banks. Indeed, before the financial crisis, economic growth boosts banking profitability and reduces insolvency and the lending risks of cooperative

banks. However, during and after this crisis, weak economic growth in the euro area weakens banking profitability and increases risk-taking.
The remainder of the paper is structured as follows: Section 2 presents the literature review; Section 3 presents the methodology and data; Section 4 presents the empirical findings and discussion and Section 4 presents concluding remarks.

2. Profitability, risk-taking and stability of Cooperative banks

The empirical evidence on bank performance in relation to different ownership types, in particular the comparison between commercial and cooperative banks, is mixed. There are arguably two main reasons to account for this. Firstly, cooperative banks have a "dual bottom line" to manage: they maximize their customer surplus rather than profits (Hesse and Čihak, 2007). Secondly, various methods, samples and time periods used in the past in order to examine the factors which influence bank profitability induce different results. Goddard et al. (2004) investigate the profitability of European banks during the 1990s. Despite intensifying competition, there is significant persistence of abnormal profit from one year to another. They also conclude that there is no convincing relationship between ownership type, size and bank performance, except in Germany. German savings banks and cooperative banks are less profitable than German commercial banks. In-keeping with this same perspective, Ianotta et al. (2007) highlight how mutual banks had lower levels of profitability but managed their loan portfolios better and had lower asset risks than commercial banks during the period between 1994 and 2004 across 15 European countries. Using a large panel of more than 300 banks over a 15 year period across 19 countries, Ferrio et al. (2010) show no significant differences in the profitability of different bank types, whereas cooperative banks slightly outperform commercial banks in cost-efficiency and loan-losses.
The financial crisis affected the banking sector in the short term by causing banks to lose money, and in the long term by spawning new regulatory actions internationally. But not all banks have suffered this crisis in the same way. So, many researchers are studying the impact of this crisis on bank performance according to their ownership structure and risk-taking behavior.
Becchetti et al. (2016) compare cooperative and non-cooperative banks on an international level during the period between 1998 and 2010 including the global financial crisis. They find that cooperative banks display higher net loans/total asset ratios, lower shares of derivatives over total assets and lower earning volatility than commercial banks. However, their difference in terms of loan intensity does not increase during the global financial crisis and slowly converges to that of non-cooperative banks in the overall sample period. They also find that a higher net loans/total assets ratio is positively correlated with the value added growth of the manufacturing sector with the exception of the two extremes of self-financing sectors and sectors in high need of external finance.
Many authors have recently questioned the traditional robust and well-established positive link between finance and growth. According to Becchetti et al. (2016) one of the explanatory factors is that the growing opportunities of purely financial activities and the increasing competition and falling profit margins in the traditional segment of credit led profit maximizing banks to reduce their traditional activity and to move to financial markets which are riskier and consequently more profitable. They claim, however, that this should not be the case for cooperative banks if they stick to their multi-stakeholder principles and statutory rules, which are much more oriented towards traditional credit. Groeneveld and de Vries (2009) find that cooperative banks had lower earning volatility in the period between 2002 and 2007 for a small sample of around 45 large European banks. In addition, Brunetti et al. (2014) found that, after the global financial crisis, the probability of depositors switching from cooperative to commercial banks was lower than the reverse situation.

Recently Allegret et al. (2017) investigated the impact of the Eurozone sovereign debt crisis on European, Japanese and U.S. banks stock returns during the period between 2007 and 2013. They analyzed the influence of the recent European sovereign debt crisis on bank equity returns across 15 countries. They found that the negative impact of the European sovereign debt crisis on bank equity returns was mostly confined to European banks, whereas U.S. banks appeared not to be affected by its direct impact and may even have benefited from it. In addition, they found some evidence of shift contagion across Europe. Ben Bouheni and Hasnaoui (2017) investigated the cyclical behavior of the financial stability of banks in the Eurozone, using the GMM two-step system and dynamic panel of commercial banks between 1999 and 2013. They found a negative relationship between the business cycle and bank risk-taking. Their study showed how lending activity increases risk-taking, but conversely, capital requirements boost financial stability. They concluded that the cyclical behavior of European banks depends firstly and foremostly on their size.

In-keeping with this perspective, this paper explores the risk/return or risk taking/profitability of cooperative banks over the economic cycle of 1999 to 2015. It then studies the banking performance of the largest and smallest banks. In addition, it estimates the performance of these banks before and after the 2007-2008 financial crisis. Lastly, given the high geographic concentration, it focuses on German and Italian cooperative banks. The goal of this paper is to show that cooperative banks, which have a business model oriented towards stakeholders, tend to have less of a propensity to take risks than commercial banks[1]. In fact, pressure from institutional investors[2] and shareholders obsessed with wealth maximization contribute to excessive risk-taking by managers, which could lead to financial instability and real economy fragility. These findings have significant implications for policy makers, regulators and supervisors to enhance the stability of the European financial industry and avoid a credit crash.

3. Methodology and data

3.1. Methodology

To assess whether and how the profitability and risk-taking behavior of cooperative banks in the euro area react to economic growth and financial liberalization, this paper uses a large sample of 1670 cooperative banks in 14 of 19 Euro area Member States[3], thanks to the availability of data between 1999 and 2015. The two-step GMM estimation is applied because the dynamic GMM method enables us to control the endogeneity bias induced by reverse causality running from financial stability to the business cycle and other explanatory variables. The GMM system technique is consistent and efficient in estimating the coefficients, and in controlling the potential problems of endogeneity, heteroscedasticity and autocorrelation (Arellano and Bover, 1995; Lee and Hsieh, 2014). In addition, persistence effect is an important feature of the banking industry. The dynamic GMM estimator can control unobserved heterogeneity and the persistence of the dependent variable. The two-step GMM estimator suggested by Arellano and Bond (1991) comprises lagged values of all

[1] For example, Ben Bouheni and Hasnaoui (2017) found that risk-taking among European commercial banks decreases (increases) during economic upturns (downturns). They state that small banks are "f*ollowers*" of the economic cycle, while large banks are "*drivers*" of the cycle.

[2] For example the governance structure of the big European banking Group BNP Paribas is as following "*Institutional investors owned 65.9% of the capital of BNP Paribas in 2011 (41.1% are European investors and 24.8% are non-Europeans). This percentage reached 79.3% in 2007 (57.1% Europeans and 22.2% non-Europeans).*" Ben Bouheni et al. (2018).

[3] This sample includes: 971 banks from Germany, 426 banks from Italy, 110 banks from Austria, 82 banks from France, 61 banks from Spain, 7 banks from Belgium, 2 banks from Cyprus, Finland, Luxembourg, Portugal and Slovenia, and 1 bank from Greece, Malta and Netherlands.

explanatory variables, including Yij t – 1, a set of instrumental variables. The present empirical specifications take the form of Arellano–Bond dynamic equations as follows:

$$Y_{ij\,t} = \mu_i + \theta_t + \alpha Y_{ij\,t-1} + \beta X_{ij\,t} + \varepsilon_{ij\,t}$$

Here, i = 1,…, N; j = 1, **…**, J; t =1,…,T; N refers to the country number (14 Euro area number States); j is the bank number (1670 cooperative banks); t is for time (1999-2015); and α and β are estimated parameters. The variables are introduced in Table 1B in the Appendix, with Yijt as the dependent variable for bank *i* in country *j* in year *t* to measure banking profitability and risk-taking, Xijt is a set of independent variables, μi is a bank fixed effect, θt is a time fixed effect and εijt is an error term.

3.2. Data

3.2.1. Dependent variables: profitability and risk-taking

Banking profitability is measured by return on assets (ROA) and return on equities (ROE). As shown in Table 2, the ROA and the ROE have average values of 0.003 and 0.040, respectively.

Risk-taking is measured by ZSCORE and LENDING. We recall that the Z-score measures the distance from insolvency (Roy, 1952). It is specified as the equation of [(the Return on Assets (ROA) + the Equity to Assets ratio (ETA))/standard deviation of ROA (σROA)]. It is calculated as the mean over 3 years. The mean of ZSCORE is 3.9, with a minimum of 1.8 and a maximum of 6.7. The second indicator of risk-taking is LENDING. This is calculated as the ratio of net loans to total assets and is used to control for the impact of the business cycle and economic freedom on lending activities. This ratio suggests high risk-taking (Jokipii and Milne, 2008). The average of LENDING is 0.607. This result is coherent with the ratio of 0.587 found by Becchetti et al. (2016) among cooperative European banks for the period between 1998 and 2010. We can expect a negative relationship between risk-taking (ZSCORE and LENDING) and economic growth.

3.2.2. Independent variables

To measure ***business cycle***, the annual gross domestic product growth (*GDPG*)[4] is used, which has a mean value of 1.1, with a minimum value of -8.5 and a maximum of 8.4 (See Table 2). The second proxy of business cycle is the annual gross domestic product per capita growth (*GDPPC*), which represents a mean value of 0.9, with a minimum of -8.9 and a maximum of 6.9. Fang et al. (2014) notice that GDP per Capita is used to capture income levels and the economic development of a country. We specify these two macroeconomic variables, the most commonly used and natural indicators of the aggregate business cycle for an economy. It is predict that profitability is positively associated with business cycle, while risk-taking is negatively correlated with business cycle.

Economic liberalization is measured using the overall score of economic freedom (*ECF*). According to Heritage Foundation (2016), *the index of economic freedom is a resource for in-depth analysis of a country's political and economic developments. It also provides a comprehensive set of principles and facts for those who wish to understand the fundamentals of economic growth and prosperity.*[5] The mean economic freedom index value is 4.2, with a range of 4.0 to 4.3 (see Table 2). Lastly, inflation (*INF*) calculated as natural logarithm of consumer price index is collected**.** We use inflation to control economic stability (Fang et al., 2014). INF has a mean of 4.5, with a minimum of 4.0 and a maximum of 4.6 (see table 2).

The Pearson correlation coefficients between variables used in this analysis are presented in

[4] See for instance the studies of Bertay et al. (2015), Creel et al. (2015); DeYoung and Jang (2016).

[5] See Heritage Foundation (2015): About the index: http://www.heritage.org/index/about

Table 3. The correlation coefficients are usually less than 0.8, indicating weak correlation between variables. Kennedy (2008) indicates that multicollinearity is a critical problem when correlation is higher than 0.8. Indeed, the correlation matrix suggests that multicollinearity issues can be safely ignored in our regressions (Ben Bouheni and Hasnaoui, 2017). In addition, the matrix offers interesting preliminary results. In fact, the correlation between banking profitability indicators (ROA and ROE) and both business cycle (GDPG) and economic liberalization (ECF) is positive. However, the correlation between risk-taking (ZSCORE and LENDING) and economic growth (GDPG) and economic openness (ECF) is negative, indicating that banking profitability is pro-cycle and risk-taking is counter-cycle (see Table 3).

4. Findings and Discussion

4.1. Profitability and risk-taking behavior among cooperative banks

In the first estimate of the effect of the real economy on banking profitability and risk-taking presented in Table 4, the gross domestic product growth (GDPG) and economic freedom (ECF), which are indicators of economic growth and prosperity, show a significant impact on banking profitability and risk-taking at a 1% level. Indeed, increasing GDPG by 1% leads to an increase in bank profitability (ROA and ROE) by 0.3% and 0.5% respectively. However, the increase in the GDPG by 1% reduces the solvency risk (ZSCORE) and lending risk (LENDING) by 9.2% and 6.9% respectively. Moreover, the gross domestic product per capita (GDPPC), which reflects the country's workforce and standard of living, exhibits the same results but the level of significance is lower. Then, this variable is removed from later regressions.

In addition, inflation (INF) is found to negatively affect banking profitability (ROA and ROE) and risk-taking (ZSCORE and LENDING) at a 1% level of significance. In fact, an increase of 1% in inflation decreases profitability (ROA and ROE by 2.4% and 9.1%) and LENDING risk by 9.8%, and 7.2% respectively.

We can conclude that during economic upturns (downturns) cooperative banks increase (decrease) their earnings and lower (increase) their risk-taking. In fact, by being a subset of stakeholder value banks, cooperative banks tend to have less of a propensity to take risks than shareholder value banks (Chaddad and Cook, 2004; Hansmann, 1996). According to CEPS (2010) this feature combined with (i) the use of customer surplus as a cushion, (ii) the affinity to a network that provides mutual support, and (iii) a reduced dependence on whole-funding markets, is likely to produce lower earning volatility and a relatively higher capacity for managing risk. Thus, cooperative banks have relatively higher financial stability with relatively less risk-taking. Furthermore, the panel dynamic estimates wholly pass the specification tests. In fact, the Sargan tests and the serial correlation tests do not reject the null hypothesis of correct specification, which means we have valid instruments and no serial correlation. Recall that instrumental variables are constituted by the lagged values of all explanatory variables.

4.2. Does the size of the cooperative bank within the euro area matter?

To test whether the effect of economic performance on banking efficiency depends on the size of a cooperative bank, the sample is divided into two sub-samples: large banks with total assets > median total assets in 2015, and small banks with total assets < median total assets in 2015. Following the study of Jokipii and Milne (2008), differentiation is made between "small" and "large" banks, defining large banks as those with total assets exceeding the 2015 median of €480 million in 2015 and small banks with total assets of less than the 2015 median of €480 million (results are presented in Tables 5 and 6). We can recall that cooperative banks

are not all small sized banks: the Crédit Agricole, for instance, ranked 9th among the top 50 banks in terms of shareholder equity in 2008, while other institutions such as Rabobank, Caisse d'Epargne, Banque Populaire, Crédit Mutuel occupied rankings between the 20th and the 40th positions (Becchetti et al., 2016).
Comparing largest and smallest cooperative banks, we find that the largest cooperative banks tend to increase (decrease) their profitability during economic upturns (downturns). Indeed, GDP growth (GDPG) and economic liberalization (ECF) enhance profitability (ROA and ROE) and increase risk-taking (ZSCORE and LENDING) by the largest cooperative banks in the euro area (see Table 5). However, for the smallest cooperative banks, economic growth and liberalization (GDPG and ECF) reduce banking profitability (ROA and ROE) and increase risk-taking (ZSCORE and LENDING) (see table 6). Local banks may suffer more from scale inefficiencies due to their smaller dimensions (Wheelock and Wilson, 2010) and can be more exposed to the risk of local political capture and higher indulgence towards local business. In addition to this, cooperative banks are more likely to end up with insufficiently diversified loan portfolios if they are small and constrained to work in geographically delimited areas with low industry diversification (Gobbi, 2005).

4.3. Before and after crisis

Two sub-periods have been identified to detect the effects of the financial crisis. The distribution of banks was calculated separately for the expansion sub-period between 1999 and 2007 and the crisis sub-period between 2008 and 2015, so as to be able to ascertain whether there had been any change in the effect of business cycle and economic liberalization on banking profitability and risk-taking before and during crisis. Table 7 shows that, before the 2008 financial crisis, banking profitability is pro-cycle and risk-taking is counter-cycle. Indeed, business cycle (GDPG) has a positive association with ROA and ROE. However, it exhibits a negative and significant relationship with LENDING. In addition, economic openness (ECF) has a positive effect on profitability (ROE) and a negative impact on risk-taking (ZSCORE and LENDING). This indicates that with more economic liberalization before the financial crisis, profitability increases and risk-taking by cooperative banks in the Eurozone decreases. It is observed that prior to the 2008 financial crisis, the economic growth and liberalization boost profitability and reduce insolvency and lending risks of cooperative banks.
However, after this crisis, the weak economic growth in the euro area weakens banking profitability and increases insolvency and lending risks. Indeed, economic growth (GDPG) is strongly negatively correlated with profitability (ROA and ROE), and strongly positively correlated with default risk (ZSCORE) at a 99% level of significance (see Table 8). Furthermore, economic openness (ECF) has a weakly positive effect on profitability (ROA and ROE) at a 95% level of significance, but a strongly positive impact on risk-taking (ZSCORE and LENDING) 99% level of significance (see Table 8). This means that after the financial crisis, economic growth and liberalization encourage risk-taking behavior by cooperative banks. The specification tests, Sargan tests and serial correlation tests do not reject the null hypothesis of correct specification, which means we have valid instruments and no serial correlation.

4.4. The case of cooperative banks in Germany and Italy

The selected sample includes 1670 cooperative banks in the Euro area based on the Bankscope database of 2015. A significant concentration of banks in Germany and Italy is observed. Indeed, in Germany, 971 cooperative banks are recorded, which represents roughly 60% of the sample (971/1670*100 = 58.14%). In Italy, 426 cooperative banks are recorded,

which represents 25.5% of the sample. Thus, a comparative study restricted to these two countries is interesting, especially because, with some exceptions, German banks were less affected by the crisis, while Italy was part of GIIPS. Indeed, five peripheral European countries are known as GIIPS (Greece, Ireland, Italy, Portugal and Spain). These five countries experienced banking industry troubles, credit crunches, government debt crises and significant recessions of varying degrees (Moro, 2014). Four of these European countries received financial assistance from the IMF and the European Union (Troïka institution). However, the Italian authorities had borrowed at commercial terms during the crisis period.
Consequently, this comparative study analyzing the performances of banks from different countries with country fixed effects is informative about the behaviors of European banks[6], especially over the period of a business cycle.
Tables 9 and 10 show that business cycle or economic growth GDPG increases banking profitability (ROA and ROE) in Germany and Italy at 1% level of significance. However, credit risk (LENDING) decreases (increases) during economic upturns (downturns). The major difference is that the default risk (ZSCORE) is significantly higher in Italian banks compared to German banks. Indeed, while economic growth increases the default risk observed among cooperative banks in Italy, it decreases this risk among cooperative banks in Germany.
As for the economic freedom index (ECF), it is shown that this promotes banking profitability in Europe. However, economic freedom (ECF) is positively associated with default risk (ZSCORE) in Germany and with credit risk (LENDING) in Italy. This indicates that economic liberalization affects risk-taking behavior in German and Italian banks differently. While, economic freedom increases default risk among German cooperative banks, it increases the credit risk related behaviors of Italian cooperative banks. This finding could be explained by the difference in the market structure and risk-taking culture in Germany and Italy, which confirms the heterogeneity of European Union state members.
In addition, inflation (INF) has different impacts on both banking structure performances. Estimates show that inflation increases the profitability and default risk of German cooperative banks. However, inflation decelerates Italian banking activities. As shown in Table 10, inflation (INF) negatively impacts profitability (ROA and ROE) and risk-taking (ZSCORE and LENDING).
Nevertheless, the size of cooperative banks in Germany and Italy seems to push them to act more responsibly. Indeed, the variable SIZE correlates with negative signs in the regressions (See Tables 9 and 10).
These interesting findings inspire future avenues of research to extend this study and analyze the performances of banks in each European country, in order to develop a deep and comprehensive mapping of banking behavior in Europe.

5. Conclusion

The relationship between economic performance and banking efficiency is a fundamental issue in finance. Indeed, the experiences derived from banking and economic crises have made governments, regulators, shareholders and banks themselves more aware of the importance of banking stability and harmony with the real economy. This paper sheds light on the effect the real economy has on banking profitability and risk-taking using a sample of 1670 cooperative banks in the euro area over the period between 1999-2015. Interesting

[6] We can estimate the effect of the business cycle and economic freedom on banking performance in Germany and Italy, using Ordinary Least Squares (OLS) and Within (FE) regressions - all results estimated by the OLS estimate and the FE estimate are available upon request - as discussed by Bond (2009). Overall findings and Hausmann tests confirm that the fixed effect (FE) regression is appropriate for all the models estimated from the present sample.

findings are reached. Firstly, cooperative banks have relatively higher financial stability, with relatively less risk-taking in the euro area. Secondly, cooperative banks perform differently, depending on their size. Indeed, the smallest cooperative banks are less efficient and more exposed to risk than the largest banks. Thirdly, financial crisis significantly affects the performance of cooperative banks. In fact, before financial crisis, economic growth boosts the banking profitability and reduces the insolvency and lending risks of cooperative banks. However, during and after such crisis, the difficulty of economic takeoff in the euro area weakens banking profitability and increases insolvency and lending risks.

Finally, the performance of German and Italian banks is quite different, as they are not facing the same risks related to the market structure and risk-taking culture. Thus, a comprehensive mapping of banking profitability and risk-taking in Europe is required.

In terms of policy implications, our results clearly suggest that banking efficiency (increasing banking profitability and reducing risk-taking) is a prerequisite to strengthen the financial and economic stability of the Euro area. From this perspective, there is a complementarity between the European banking stability project (through the Construction of European Banking Supervision[7]) and the implementation of mechanisms and policies to guarantee economic prosperity at national and international levels. More particularly, the present findings echo those studies highlighting the necessity to understand the strong connection between financial markets and real economy. In summary, a comprehensive overview of the different European market structures and banking governance structures are the key factors required for efficient regulation and supervision.

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APPENDIX

Table 1: Description of the relevant variables

Variable name	Description and source
Dependent variables: Banking profitability and risk-taking indicators	
ROA:	The ratio of return to total assets. Source: Bankscope (2015) and authors' calculation
ROE:	The ratio of return to total equities. Source: Bankscope (2015) and authors' calculation
ZSCORE:	The inverse of Z_Score for ROA = (ROA+ETA)/σROA.Source: Bankscope (2015) and authors' calculation. Here, ROA is the ratio of return to total assets, ETA is the equity percent of assets, and σROA is standard deviation of return on assets as a proxy for return volatility, using a 3-year moving average. We use the inverse Z-score to approximate a bank's probability of default.
LENDING:	Net loans/total assets. Source: Bank scope (2015) and authors' calculation.
VOL_ROA:	Three-year standard deviation of ROA. Source: Bankscope (2015) and authors' calculation
VOL_ROE:	The three-year standard deviation of ROE. Source: Bankscope (2015) and authors' calculation
Independent variables	
GDPG:	The annual GDP growth rate from the World Bank'WDI 2015
GDPPC:	The annual GDP per capita rate from the World Bank WDI 2015.
ECF:	The natural logarithm of economic freedom index which is based on 10 quantitative and qualitative factors, grouped into four broad categories of economic freedom. Source: Heritage Foundation – 2015 Index of Economic Freedom.
INF:	The natural logarithm of consumer price index from the World Bank's WDI 2015

Table 2: Summary statistics

VARIABLE	OBS	MEAN	STD. DEV.	MIN	MAX
ROA	26752	0.003	0.006	-0.200	0.250
ROE	26752	0.040	0.066	-2.122	2
ZSCORE	26752	3.964	0.703	1.897	6.741
LENDING	26752	0.607	0.136	0.121	0.963
GDPG	28420	1.108	2.225	-8.538	8.442
GDPPC	28420	0.991	2.262	-8.975	6.994
ECF	28420	4.209	0.061	4.014	4.383
INF	28420	4.539	0.082	4.054	4.682

Notes: This table reports summary statistics for the main analysis variables. Variable definitions are reported in the Appendix in Table 1.

Table 3: Correlation coefficients

	ROA	ROE	ZSCORE	LENDING	GDPG	GDPPC	ECF	INF
ROA	1.000							
ROE	0.676	1.000						
ZSCORE	0.025	0.060	1.000					
LENDING	0.026	-0.020	-0.019	1.000				
GDPG	0.015	0.036	-0.075	-0.051	1.000			
GDPPC	0.030	0.028	-0.116	-0.080	0.701	1.000		
ECF	-0.048	0.075	0.180	-0.250	0.290	0.388	1.000	
INF	-0.011	-0.120	0.027	-0.017	-0.232	-0.179	-0.112	1.000

Table 4: Economic growth, economic freedom, profitability and risk-taking

	(1) ROA	(2) ROE	(3) ZSCORE	(4) LENDING
LAG ROA	0.189***			
LAG ROE		0.004		
LAG ZSCORE			0.742***	
LAG LENDING				0.919***
GDPG	0.003***	0.005***	-0.092***	-0.069***
GDPPC	0.001**	0.002**	-0.007***	-0.005**
ECF	0.003***	0.024***	-0.048***	-0.002***
INF	-0.0241***	-0.0917***	-0.098**	-0.072***
CONS	0.071***	0.531***	1.496***	0.463***
N	26752	26752	20064	20064
AR(2)	0.83	1.45	-4.48	-3.23
p-value	(0.39)	(0.19)	(0.29)	(0.47)
Sargan	77.22	83.87	37.76	83.13
P-value	(0.59)	(0.48)	(0.42)	(0.64)
Instruments	109	109	95	109

Notes: The dynamic panel system and GMM technique are adopted. All regressions are estimated with annual data from 1999 to 2015. The dependent variables: Profitability (ROA is the return on assets and ROE is the return on equity) and risk-taking (ZSORE is an indicator of insolvency risk and LENDING is the net loans/total assets an indicator of credit risk). LAG ROA, LAG ROE, LAG ZSCORE and LAG LENDING indicate a lagged one period of bank profitability and risk patterns. The independent variables: GDPG is the annual GDP growth rate, GDPPC is the annual GDP per capita growth rate, ECF is the natural logarithm of economic freedom index and INF is the natural logarithm of the consumer price index. T-statistics are presented in brackets. *, **, and *** represent significance at the 90%, 95%, and 99% levels, respectively.

Table 5: Largest cooperative banks: T_ASSETS>480 (median)

	(1) ROA	(2) ROE	(3) ZSCORE	(4) LENDING
LAG ROA	0.269***			
LAG ROE		0.237***		
LAG ZSCORE			0.699***	
LAG LENDING				1.109***
GDPG	0.003***	0.007***	0.009***	0.002**
ECF	0.001*	0.002***	0.004*	0.005***
INF	-0.006***	-0.286***	-0.790***	-0.048***
CONS	0.029***	1.191***	-2.102**	-0.108*
N	9938	9338	9338	9338
AR(2)	2.67	0.71	-4.95	-2.96
p-value	(0.61)	(0.48)	(0.60)	(0.70)
Sargan	38.07	39.60	22.24	49.02
P-value	(0.50)	(0.30)	(0.41)	(0.24)
Instruments	108	108	94	108

Notes: Tables 5 and 6 present the same variables. Indeed, the dynamic panel system and GMM technique are adopted. All regressions are estimated with annual data from 1999 to 2015. The dependent variables: Profitability (ROA is the return on assets and ROE is the return on equity) and risk-taking (ZSORE is an indicator of insolvency risk and LENDING is the net loans/total assets an indicator of credit risk). LAG ROA, LAG ROE, LAG ZSCORE and LAG LENDING indicate a lagged one period of bank profitability and risk patterns. The independent variables: GDPG is the annual GDP growth rate, ECF is the natural logarithm of economic freedom index and INF is the natural logarithm of the consumer price index. T-statistics are presented in brackets. *, **, and *** represent significance at the 90%, 95%, and 99% levels, respectively.

Table 6: Smallest cooperative banks: T_ASSETS<480

	(1) ROA	(2) ROE	(3) ZSCORE	(4) LENDING
LAG ROA	0.245***			
LAG ROE		0.143***		
LAG ZSCORE			0.736***	
LAG LENDING				0.922**
GDPG	-0.002***	-0.001***	0.013***	0.004***
ECF	-0.001	-0.002***	0.004*	0.001*
INF	-0.011***	-0.126***	-0.024	-0.046***
CONS	0.054***	0.502***	0.688	0.294***
N	13602	13602	13602	13602
AR(2)	0.71	2.19	-0.54	-2.47
p-value	(0.47)	(0.33)	(0.59)	(0.21)
Sargan	43.32	28.71	25.21	59.25
P-value	(0.60)	(0.25)	(0.31)	(0.30)
Instruments	108	108	94	108

Table 7: Before the 2007-2008 financial crisis

	(1) ROA	(2) ROE	(3) ZSCORE	(4) LENDING
Lag ROA	0.128***			
LAG ROE		0.0189*		
LAG ZSCORE			0.741***	
LAG LENDING				1.148***
GDPG	0.004***	0.011***	-0.009*	-0.002**
ECF	0.002	0.006**	-0.029**	-0.005***
INF	-0.005***	-0.003*	-0.037**	-0.021***
CONS	0.027***	0.015**	0.714***	0.339***
N	13276	13276	13276	13276
AR(2)	0.18	0.49	-2.72	-1.45
p-value	(0.89)	(0.63)	(0.63)	(0.26)
Sargan	36.22	49.92	94.24	24.07
P-value	(0.40)	(0.55)	(0.42)	(0.35)
Instruments	39	39	39	39

Table 8: After the 2007-2008 financial crisis

	(1) ROA	(2) ROE	(3) ZSCORE	(4) LENDING
LAG ROA	0.318***			
LAG ROE		0.045***		
LAG ZSCORE			0.692***	
LAG LENDING				0.941***
GDPG	-0.002***	-0.001***	0.014***	-0.001
ECF	0.001**	0.003**	0.037***	0.007***
INF	-0.010***	-0.139***	-0.996***	-0.026*
CONS	0.045***	0.610***	-0.537***	-0.586***
N	12180	12180	10204	12180
AR(2)	0.65	1.46	-4.12	-1.99
p-value	(0.52)	(0.15)	(0.23)	(0.19)
Sargan	35.95	30.64	64.74	62.11
P-value	(0.39)	(0.32)	(0.38)	(0.25)
Instruments	64	64	59	64

Notes for Tables 7 and 8: The dynamic panel system and GMM technique are adopted. All regressions are estimated with annual data from 1999 to 2007 (Table 7) and from 2008 to 2015 (Table 8). The dependent variables: Profitability (ROA is the return on assets and ROE is the return on equity) and risk-taking (ZSORE is an indicator of insolvency risk and LENDING is the net loans/total assets indicator of credit risk). LAG ROA, LAG ROE, LAG ZSCORE and LAG LENDING indicate a lagged one period of bank profitability and risk patterns. The independent variables: GDPG is the annual GDP growth rate, ECF is the natural logarithm of economic freedom index and INF is the natural logarithm of the consumer price index. T-statistics are presented in brackets. *, **, and *** represent significance at the 90%, 95%, and 99% levels, respectively.

Table 9: Performance of German cooperative banks

	(1) ROA	(2) ROE	(3) ZSCORE	(4) LENDING
LAG ROA	0.754**			
LAG ROE		0.127***		
LAG ZSCORE			0.788***	
LAG LENDING				0.684**
GDPG	0.0135***	0.0578***	-0.0563**	-0.0171***
ECF	0.0109***	0.094***	0.093***	-0.130***
SIZE	-0.0046	-0.0040	-0.167***	-0.0164***
INF	0.0237**	0.0248***	0.262***	-0.166***
CONS	0.0539***	0.447***	-0.991***	-0.692***
N	12560	12560	8502	12560
R^2 overall	0.037	0.01	0.01	0.027

Note: The FE panel regression is used for a sample of 971 German cooperative banks. *, **, and *** represent significance at the 90%, 95%, and 99% levels, respectively.

Table 10: Performance of Italian cooperative banks

	(1) ROA	(2) ROE	(3) ZSCORE	(4) LENDING
LAG ROA	0.0548**			
LAG ROE		0.022**		
LAG ZSCORE			0.458**	
LAG LENDING				0.768***
GDPG	0.0785***	0.0592***	0.230***	-0.143***
ECF	0.0257***	0.423***	-0.053**	0.134***
SIZE	-0.0499***	-0.0394***	-0.0637*	-0.0240***
INF	-0.0204**	-0.133*	-0.296***	-0.832***
CONS	0.0756**	0.505***	-1.178***	-1.752***
N	3583	3581	3577	2539
R^2 overall	0.01	0.01.	0.004	0.006

Note: The FE panel regression is used for a sample of 426 Italian cooperative banks. *, **, and *** represent significance at the 90%, 95%, and 99% levels, respectively.