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$$\frac{n!}{(n-1)!} p^{m-1} (1-p)^{n-m} = p \sum_{\ell=0}^{n-1} \frac{\ell+1}{n} \frac{(n-1)!}{(n-1-\ell)! \ell!} p^{\ell} (1-p)^{n-1-\ell}$$
$$= p \frac{n-1}{n} \sum_{\ell=0}^{n-1} \left[\frac{\ell}{n-1} + \frac{1}{n-1} \right] \frac{(n-1)!}{(n-1-\ell)! \ell!} p^{\ell} (1-p)^{n-1-\ell} = p^2 \frac{n-1}{n} +$$

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Performance Comparison of European Cooperative and Commercial Banks in a Low Interest Rate Environment

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Abstract:

Our aim is to empirically assess differences in behaviour and performance of European cooperative and commercial banks in a low interest rate environment. We employ dynamic panel data methods to assess the relative performance of both ownership structures based on a data set of nearly 1,000 banks from 11 European countries for the 2009-2015 period. Our findings are threefold. First, we find that commercial banks are more profitable than cooperative banks in all three metrics used (return on average assets, return on average equity and net interest margin). Second, commercial banks decrease their loan loss provisioning to maintain their profitability. Interestingly, this trend is not present in the financial statements of cooperative banks. Third, cooperative banks are significantly more stable than commercial banks in terms of Z-score. In addition, the Z-score of cooperative banks increased during the observation period, whereas the Z-score of commercial banks remained stable. Therefore, our results show structural differences in the priorities and behaviour of both ownership types in a low interest rate environment: European commercial banks focus on maintaining their profitability, whereas cooperative banks seek to increase their stability by increasing their capital buffers.

JEL: C23, G21, L25

Keywords: Banks, cooperative banking, European Union, low interest rate environment, profitability, Z-score

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1 Introduction

Our aim is to empirically assess differences in behaviour and performance of European cooperative and commercial banks in a current environment of low interest rates. The outcome of the analysis reveals the priorities of both ownership types, i.e., whether there is a significant difference in profitability and stability measures in low interest rates markets. In addition, we focus on the interest rate drivers of the performance measures to establish the extent to which the banking profitability or stability measures can be explained by short-term or long-term yields, yield curve steepness or government bond yields. These findings have important implications for assessing banking performance in a low market rates environment.

Cooperative ownership is the second-most widespread banking ownership type in the European Union (Liikanen et al, 2012). Cooperative banks have an average market share of approximately 20% in Europe (EACB, 2019). Interestingly, the cooperative banking model differs significantly from country to country because of the different evolution of the model, as discussed by Ayadi et al. (2010). Either there is only one fully integrated cooperative banking institution in certain countries, or there are numerous more or less cooperating smaller cooperative banks. Cooperatives are controlled by their customers (referred to as members) according to the democratic principle of “one member – one vote”. Cooperative banks typically also pursue different objectives than only profit maximization, and therefore, they are occasionally termed dual bottom line institutions (Hillman and Keim, 2001). The only focus of traditional shareholder-owned commercial banks is profit. This difference has an important influence on the financial performance of both ownership types.

After the 2008 failure of Lehman Brothers, interest rates decreased sharply. Because of the loose monetary policy of the European Central Bank, there has been an unprecedentedly long period of low interest rates in Europe (Altavilla et al., 2017). The banks are rarely fully hedged to interest rates changes, as shown by Memmel (2008) and Ampudia and Van den Heuvel (2018). The threat of negative rates causes numerous practical problems for banks. On the one hand, it is politically difficult to charge negative interest rates on (retail) deposits, while on the other hand, it is legally difficult to apply rate floors on (existing) floating rate loan contracts. In addition, overliquidity is stored in the central bank for negligible or even negative interest rates. All these factors place pressure on profitability and thus on the stability of the European banking sector (Claessens et al., 2017). In this paper, we also focus on the effect of the low interest rate environment on loan loss provisioning. Non-performing loans

are a key interest of policymakers (European Commission, 2019) and regulators (EBA, 2018; ECB, 2019).

This paper analyses profitability and stability performance measures of cooperative and commercial banks in a low interest rate environment. To this end, we created a data set of 739 cooperative and 234 commercial banks from 11 European countries for the 2009-2015 period. We employ a dynamic panel data method (System GMM) as our primary analytical method.

The paper is structured as follows: Section 2 reviews the literature that compares the performance of different ownership structures in banking and that examines the effects of a low interest rate environment on financial institutions. Section 3 describes the paper's methodological approach. We describe the data used in the analysis in Section 4. Section 5 presents our empirical results and findings. Finally, we conclude the paper in Section 6.

2 Literature review

The empirical literature that examines differences in cooperative and commercial banking under low interest rates is limited. Therefore, we divide this literature review into two parts. The first addresses comparisons of cooperative and commercial banks' performance in terms of profitability and stability under the standard interest rates environment. The second focuses on the impact of low interest rates on the performance of financial institutions.

2.1 Cooperative and commercial bank performance under standard interest rates

Cooperative banks are created to maximize the utility of their stakeholders. Profit is often more a necessary prerequisite for survival and expansion than the ultimate objective. Cooperatives are therefore not compelled to pursue profit maximization to the same extent as commercial banks are (Fonteyne, 2007). Fama and Jensen (1983) claim that the lack of capital market discipline of mutually owned institutions causes lower efficiency compared to privately owned institutions. Altunbas et al. (2001) demonstrate that this theory does not hold for the profit inefficiency of different ownership types of German financial institutions between 1989 and 1996. They explain this fact by the harsh competition common to both ownership types. Goddard et al. (2004) use cross-sectional and panel data methods to analyse data on banks from six major European economies for the period 1992-1998 and find little evidence of a systematic relationship between ownership type and profitability. Iannotta et al. (2006) compare the performance of 181 large banks from 15 European countries over the 1999-2004 period. They find that mutual and government-owned banks have lower profitability than privately owned enterprises. Beckmann (2007) uses a long-term data set

(1979-2003) on banks from 16 Western European countries. He finds no difference in return on assets between cooperative and commercial banks. Ayadi et al. (2010) compare the profitability of the cooperative and commercial banks (ROAA and ROAE) from seven EU countries with the highest cooperative banking market share. The analysis is performed for the time period 2000-2008 and for two sub-periods: 2000-2003 and 2004-2008. The analysis is also run on sub-samples of individual countries. The study's results are mixed. In certain setups, the profitability of cooperative banks is higher, in others it is lower and in others there is no significant difference. Goddard et al. (2010) perform a dynamic panel data analysis (System GMM) on data from 7 Western European countries during the 1992-2007 period. They use excess return on equity (ROE - Capital Costs) as a profitability measure. They find no significant difference in the profitability of both ownership types in three countries, and the profitability of cooperatives is higher in four countries. The authors attribute this finding to the lower cost of capital of cooperative banks because the ROE of such banks is lower compared to commercial banks.

Groeneveld and de Vries (2009) claim that mutual banks, thanks to their cooperative structure, should be able to maintain long-term customer relationships that consequently reflect in more stable capitalization and in smaller credit risk. The authors demonstrate the higher stability of cooperative banks in several measures in 7 European countries. The risk of financial institutions is often measured by their earnings volatility. Hesse and Čihák (2007) employ the Z-score to evaluate bank soundness. They investigate a data set of more than 16,000 banks from 29 OECD countries over the 1994-2004 period and run an estimation using the OLS and fixed effects methods. The results reveal the higher stability of cooperative banks, which is driven by lower earnings volatility as opposed to higher capital buffers. Ayadi et al. (2010) also use the Z-score as a proxy for banking stability. They find a lower likelihood of cooperative banks becoming insolvent in 5 out of 7 European countries for the 2000-2008 period (there is no statistically significant difference for the other two countries). Köhler (2012) finds no significant difference in Z-score for cooperative and commercial banks in the EU-15 countries in the 2000-2009 period using dynamic panel data methods (System GMM). Iannotta et al. (2006) use three different risk measures in their study: share of loan loss provisions to total loans (asset quality), Z-score (insolvency risk) and return to volatility. An estimation is run on a set of 181 large banks from 15 European countries over 1999-2004. The results reveal that cooperative banks have higher asset quality and lower return to volatility and that there is no significant difference in Z-score between commercial and cooperative

banks. Godlewski, Skala and Weill (2018) study lending cyclicality in Polish cooperative banks over the period 2007-2013. Their results reveal that cooperative banks exhibit countercyclical lending behaviour (i.e., loan growth negatively linked to a business cycle). This finding supports the view that the cooperative banking sector mitigates the banking procyclicality typically observed in commercial banks.

2.2 Effect of low interest rates on banking performance

Unsurprisingly, the empirical literature on the influence of a long-term low interest rate environment on the behaviour of different ownership structures is scarce. The reason is that the low interest rate phenomenon is of very recent origin. Therefore, this literature review primarily focuses on the behaviour of commercial banks, which is more frequently the focus of researchers.

Borio and Gambacorta (2017) analysed the effectiveness of monetary policy on lending using a sample of 108 large banks. Their analysis suggests that reductions in short-term interest rates are less effective in stimulating lending growth when rates are already at a low level. Claessens et al. (2017) use a sample of more than 3,000 banks from 47 countries from 2005 to 2013 to examine the impact of decreasing rates on net interest margin. The authors demonstrate that the negative impact of decreasing market rates is more than two times stronger if rates are already low. Moreover, with each additional year of low rates, the net interest margin decreases further. Memmel (2008) evaluates 260 historical interest rate shocks and finds that the worst possible interest rate scenario for the income of German cooperative and savings banks is a sharp decrease in yield curve steepness. Bikker and Vervliet (2017) use static and dynamic panel data methods to investigate the impact of unusually low interest rates on the profitability and risk profile of US banks. The results indicate that bank interest margins are under pressure but that overall profit is maintained because of lower loan provisioning. They claim that unreasonably low provisioning may endanger financial stability. Altavilla et al. (2017) arrive at similar outcomes for a set of European banks: a decrease in short-term rates or yield curve flattening is not associated with lower banking profits. This outcome is again caused by lower loan provisioning, which offsets lower interest income. Bank profit is only affected when the low interest rate period is protracted. Brei et al. (2019) study the impact of a low interest rate environment on the intermediation activity of banks from 14 major advanced economies. They observe that banks react to lower interest income caused by lower interest rates by a decline in the risk-weighted asset ratio and by a reduction in loan loss provisions. This outcome may be a sign of so-called zombie lending

(i.e., less-capitalised banks delay credit losses by rolling over loans to risky borrowers; see Peek and Rosengren, 2005). There is a threat that low interest rates and loose monetary policy may impact the stability of banks by compelling them to take on excessive leverage and finance lower standard loans, thus weakening their lending portfolios (Dell’Ariccia and Marquez, 2013).

To summarize the findings of the papers presented in the review, the evidence for the relative profitability of European cooperative and commercial banks prior to the Great Recession of 2008 is mixed. The outcomes differ according to the analysed data and the method that is adopted. However, there is a quite strong consensus among the reviewed papers that the cooperative banks in Europe are less probable to become insolvent in a period of standard interest rates. In addition, the interest income of banks suffers in a low interest rate environment. Nevertheless, bank profitability remains unchanged thanks to lower loan loss provisioning. This phenomenon, together with risk of excessive leverage of banks in the environment of loose monetary conditions, creates pressure on banking stability.

3 Methodology

We examine the effects of a long-term low interest rate environment on a set of profitability and stability measures of cooperative and commercial banks. There is extensive evidence that banking profitability and stability measures are persistent because of intertemporal performance smoothing, long-term client relationships and regulation (Goddard et al., 2004; Shehzad et al., 2009; Delis and Kouretas, 2011 or Kuc and Teplý, 2018). We use System GMM to address inconsistency caused by the correlation of a lagged dependent variable with an error term (i.e., dynamic panel data bias). The System GMM method is described in Arellano and Bover (1995) and Blundell and Bond (1998). System GMM addresses endogeneity and generates more robust estimates when dealing with persistent variables. We cannot use the Difference GMM method (Arellano and Bond, 1991) in our analysis because it does not allow for time-invariant variables and therefore does not allow us to use a dummy for ownership type, which is crucial for our research. Arellano and Bond (1991) demonstrate that standard errors suffer from downward bias during a two-step estimation because of the inclusion of too many instruments. Therefore, we use Windmeijer’s (2005) correction. Moulton (1986) demonstrates that standard errors may overstate estimator precision when data are grouped in clusters, e.g., by country. Therefore, we use cluster-robust standard errors clustered on the country level, as in Cameron and Miller (2015). Roodman (2006) and Köhler (2012) suggest including year dummies in the regression equation to control for time-specific

effects, such as common shocks or a change in legislation. We estimate the model of the following form:

$$Y_{i,c,t} = \alpha + \beta Y_{i,c,t-1} + \gamma O_i + \delta B_{i,c,t} + \epsilon C_{c,t} + \theta T_t + \varepsilon_{i,c,t} \quad 3.1.1.1.1 \quad (1)$$

where

$Y_{i,c,t}$ is the bank performance measure for bank i in country c at time t ,

$Y_{i,c,t-1}$ is the first lag of the bank performance measure,

O_i is a dummy for ownership type,

B is a vector of bank-specific variables

$C_{c,t}$ is a vector of country-specific variables,

T_t is a vector of time-dummy variables for individual years,

$\varepsilon_{i,c,t}$ stands for error term.

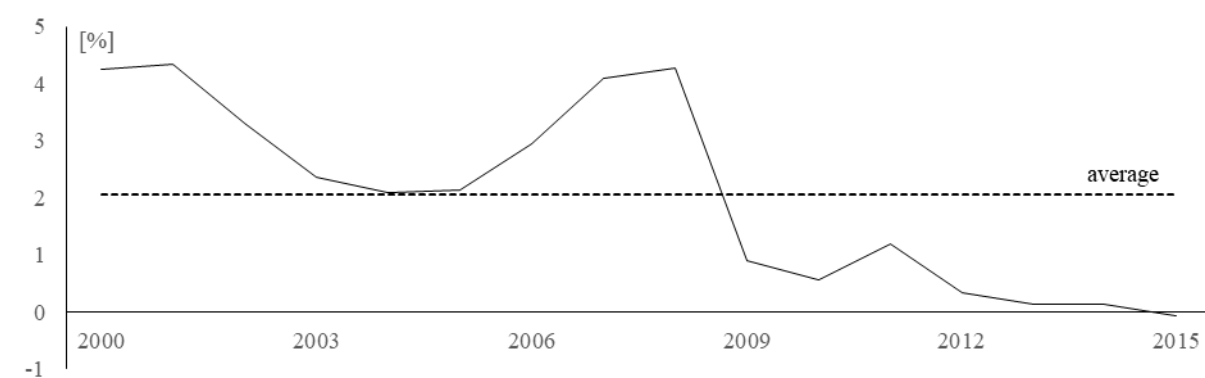
We use return on average assets (*ROAA* variable), return on average equity (*ROAE*) and net interest margin (*NIM*) as profitability performance measures. Loan loss provisions to total loans ratio (*Provisions*) is a proxy for asset quality. A suspiciously low share of loan loss provisions may indicate dangerous window dressing. The *Z*-score (*ZSCORE*) is another stability measure. It indicates the distance to the upper bound of insolvency, or how many standard deviations of net income the company has to lose (assuming a normal distribution of incomes) to deplete its equity. The dummy variable *COOP* helps distinguish cooperative from commercial banks in the data set. We use three bank-specific variables: natural logarithm of asset size (*Size*) (to control for company size), loan to deposit ratio (*LtD*) and share of non-interest income to total income as a proxy for income diversity (*IncDiv*). We use five country-specific variables to control for different characteristics in individual countries. We use GDP per capita in thousands EUR (*GDPI*) to control for the development level of a country, real GDP growth (*GDPg*) to control for the phase of the economic cycle, the one-month money market rate (*IBOR*) as a proxy for short-term market rates, the difference between the 10-year interest rate swap rate and the 1-month money market rate (*Steep*) as a proxy of yield curve steepness and, finally, the yield of a 10-year government bond (*Bond*) as a proxy of alternative investment opportunity and the risk level of a given government.

4 Data analysis

We created a data set of 973 banks, 739 of which have cooperative ownership and 234 of which are commercial banks. The banks are from eleven European countries. We include only countries in which both cooperative and commercial banks are present. The observations in our data set have annual frequency. We used the BankScope database as the main source of banking data. We include only banks whose figures are available for the entire observation period. Our data set is therefore balanced. We employ unconsolidated financial statements, only using consolidated financial statements when there are no unconsolidated statements available for a given entity. This approach helps to avoid double-counting of banks and is also used by Hesse and Čihák (2007). The Eurostat database is the source of the GDP measures, and, finally, information regarding interest rates was retrieved from the Eikon Reuters database.

This study focuses on a low interest rate environment. We include ten countries from the Eurozone and Denmark. We define *the low interest rate environment* with the help of short-term money market rates: 1M Euribor and 1M DKK Libor. The development of the yearly averages of the 1M Euribor rate is presented in Figure 1. For brevity, we do not describe the development of 1M DKK Libor – it provides a similar picture. One can clearly observe that the short-term market rates have been abnormally low since 2009. All the rates are substantially below the long-term average. Therefore, we define the 2009-2015 period as the low interest rate environment. Our data set covers exactly this 6-year period.

Figure 1: Development of the 1M Euribor rate in 2000-2015



Source: Authors based on Reuters

Table 1 presents a number of banks by country and ownership type. Cooperative banking institutions in certain countries merge into single entities, whereas in other countries, the organizational setup of multiple more or less interconnected cooperative banks remains. A

majority of the banks in the data set are from Western Europe. The reason is that cooperative banking structures in Eastern Europe were often dissolved by local communist regimes. Additionally, data availability in such countries is typically much lower.

Table 1: Banks in the data set by country

	Cooperative	Commercial	Total
Austria	61	20	81
Denmark	2	22	24
Finland	1	3	4
France	43	49	92
Germany	379	49	428
Italy	190	38	228
Luxembourg	1	9	10
Netherlands	1	5	6
Portugal	3	7	10
Slovenia	1	8	9
Spain	57	24	81
Total	739	234	973

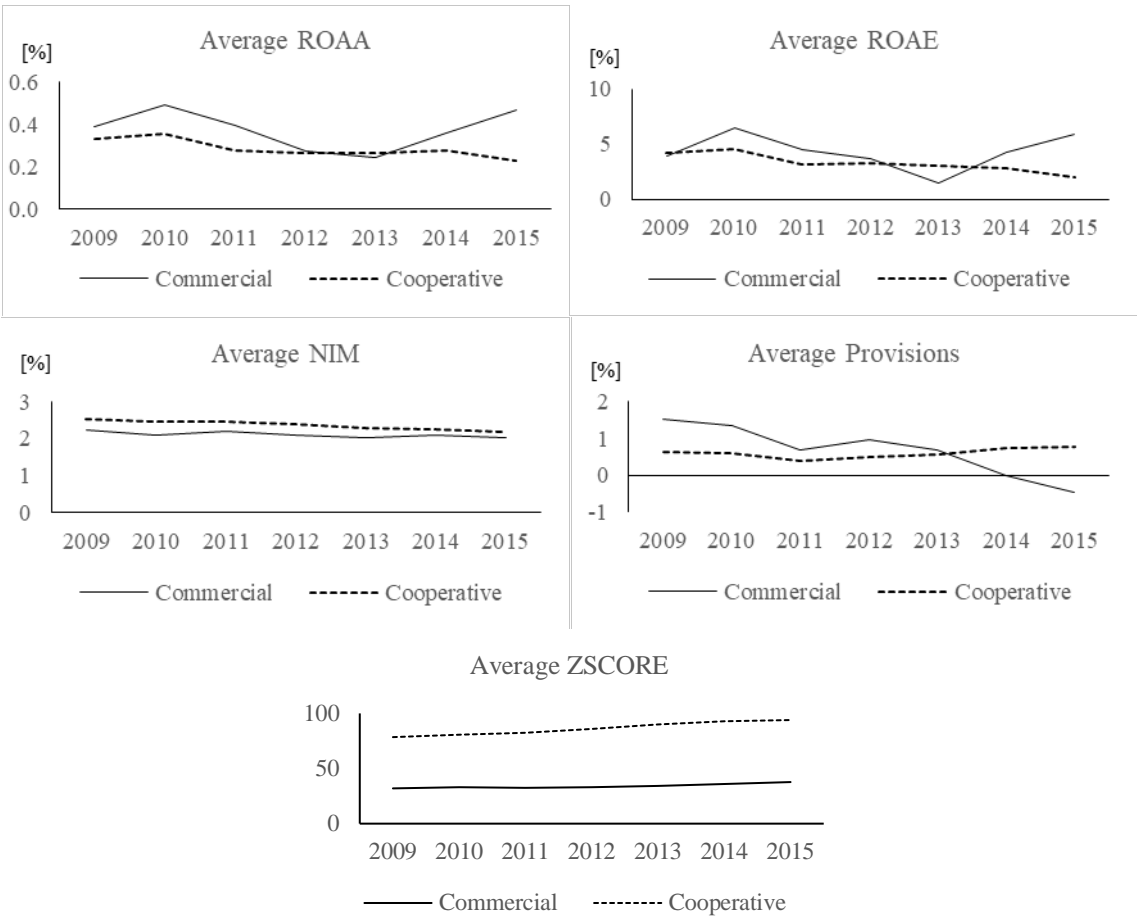
Source: Authors

Table A.1 in the Appendix provides descriptive statistics for the variables. We can observe significant differences in average values and standard deviations between both ownership types in certain measures. The Z-score of cooperative banks is more than twice as large as the commercial average. This difference is caused by the denominator of the Z-score measure. The income volatility of cooperative banks is on average significantly lower than that of commercial banks. The nominator of the Z-score (i.e., return on assets + equity to assets) of both ownership types is similar.

To ensure our results are not affected by outliers caused by extremely small income volatility in the Z-score denominator, we truncate the Z-score at the maximal value of 325. This truncation affects approximately 5% of the population. Similarly, we truncate the loan to deposit ratio at the level of 1,000% (10x more loans than deposits). This truncation affects approximately 1% of the data. To observe the difference, we run the regression analysis for both the truncated and non-truncated data. The loan to deposit ratio is another measure that exhibits a significant difference between cooperative and commercial banks. If we filter out the extreme values using the described truncation approach, we observe that commercial banks have on average by a 30% higher share of loans to deposits. This phenomenon is caused by the fact that commercial banks typically have access to much broader means of financing, whereas cooperative banks typically rely primarily on customer deposits.

The development of the dependent variables is presented in Figure 2. We observe a similar pattern for both average ROAA and average ROAE: commercial banks outperform cooperative banks in most years. The difference between the average NIM of both ownership types is decreasing, but the cooperatives retain their lead. The average share of provisions of commercial banks decreases significantly. Several papers presented in the literature review (Bikker and Vervliet, 2017; Altavilla et al., 2017; Brei et al., 2019) arrive at the same finding. Interestingly, this finding does not hold for cooperative banks in which the share of loan loss provisions is maintained nearly constant over time. Because both ownership types compete in the same market, the relative development of this measure should be similar. This development may indicate that commercial banks are under greater pressure by shareholders to maintain their profitability, and therefore, they seek to do so via lower loan provisioning. The average Z-Score of the cooperative banks increased much faster than the commercial banks' average thanks to an increased share of equity relative to total balance sheet size. This outcome indicates that cooperative banks are focused on increasing stability rather than maintaining profitability.

Figure 2: Development of dependent variables in 2009-2015



Source: Authors based on Reuters

Table A.2 in the Appendix provides a correlation matrix. A high positive correlation between ROAA and ROAE is not a surprise. Similarly, one can expect a high degree of correlation between market measures.

5 Results and Findings

Table 2 presents the results of the regression equation (1) with all five performance variables and with truncated data. Let us first focus on the series of tests that assure the correctness of the selected approach.

The Wald test results strongly reject the joint insignificance of all the variables used. Arellano-Bond AR(1) tests reject no serial correlation of the first order in all but the *Provisions* regression. However, in the *Provisions* regression, the lagged dependent variable is highly significant, and therefore, we continue to use System GMM with one lag. Arellano-Bond AR(2) tests do not reject that there is no second-order autocorrelation in residuals. Therefore, we do not include the second lag in our regressions. Hansen tests do not reject the hypothesis that all instruments are valid. Further, we perform a robustness check for GMM by Bond (2002). The test suggests using OLS and FE estimates, which should suffer from dynamic panel data bias, and thus, lagged dependent variables should be biased to opposite sides. The test results are provided in Table A.3 in the Appendix. The results are in line with expectations regarding GMM and OLS estimates. For the FE estimation, we must omit the cooperative dummy variable, and therefore, the results are not comparable. The lagged dependent variables in our estimations are either significantly positive or insignificant, which is in line with the dynamic panel data structure.

Table 2: Regression analysis results

	ROAA			ROAE			NIM			Provisions			ZSCORE		
	Coef.	St. er.	Sig.	Coef.	St. er.	Sig.	Coef.	St. er.	Sig.	Coef.	St. er.	Sig.	Coef.	St. er.	Sig.
lag	0.040	0.059		0.163	0.070	**	-0.110	0.082		0.534	0.202	***	0.273	0.072	***
Coop	-3.212	1.135	***	-22.25	9.738	**	-4.119	1.734	**	99.79	29.03	***	108.8	49.47	**
Size	-1.081	0.516	**	-5.603	3.014	*	-0.434	0.198	**	36.60	13.58	***	7.971	5.130	
LtD	0.000	0.005		-0.070	0.049		0.002	0.002		0.015	0.085		-0.028	0.058	
IncDiv	-0.099	0.017	***	-0.810	0.381	**	-0.109	0.009	***	2.546	1.155	**	-1.166	0.441	***
GDP1	0.003	0.018		0.007	0.128		0.006	0.027		5.517	2.691	**	2.758	1.627	*
GDPg	0.014	0.089		-0.818	0.928		0.068	0.031	**	6.509	9.045		2.012	1.758	
Ibor	10.99	7.509		63.87	64.36		7.261	11.72		-31.68	174.6		-9.912	260.8	
Steep	19.76	8.908	**	117.6	73.32		5.076	11.73		18.56	199.4		-14.77	292.5	
Bond	1.453	3.013		0.333	8.470		5.012	2.573	*	0.823	12.51		-3.709	61.19	
cons	-39.94	40.60		-209.8	282.8		-21.57	45.89		-1042	789.0		-135.6	962.5	
Year dummy	Yes			Yes			Yes			Yes			Yes		
Wald test	0.000 ***			0.000 ***			0.000 ***			0.000 ***			0.000 ***		
AR(1) test	0.021 **			0.004 ***			0.048 **			0.338			0.002 ***		
AR(2) test	0.677			0.247			0.084 *			0.434			0.262		
Hansen test	0.098 *			0.205			0.981			0.651			0.299		
observations	6811			6811			6811			6811			6811		

Note: * significant at 10% level, ** significant at 5% level, *** significant at 1% level

Source: Authors

The estimation results reveal that cooperative banks (*Coop*) are significantly less profitable in all three profitability measures (ROAA, ROAE and NIM). However, cooperatives have a higher share of loan loss provisions to total loans (*Provisions*), which probably cannot be attributed to the higher riskiness of their loan portfolios since both ownership structures compete in the same market. Rather, it is a sign of the effort by commercial banks to maintain their profitability under a low interest rate environment. Cooperative banks also enjoy much higher stability in terms of Z-score.

The logarithm of asset size (*Size*) has a negative effect on banking profitability and a positive effect on the level of *Provisions*. The loan to deposit ratio (*LtD*) is not significant in any regression equation. Income diversity (*IncDiv*) is significant in all regressions. It decreases profitability as well as stability (*ZSCORE*) and increases the share of loan loss provisions. Therefore, it seems optimal for the banks not to expand into less traditional fee-generating activities but rather to focus on traditional interest-generating business. Macroeconomic and market variables have a limited impact on bank performance measures in our study. The reason is probably the relative stability of the rates during the selected time frame because we ran our analysis on a time period when interest rates were already low.

We also ran all the regressions with non-truncated data. The estimation results are provided in Table A.4 in the Appendix. They are essentially similar to the truncated results. The cooperative dummy, our main variable of interest, is again significant in all the regressions, and the effect has the same direction it had when the truncated data were used.

6 Conclusion

This paper investigates the relative performance of European cooperative and commercial banks in a low interest rate environment. We perform the analysis using dynamic panel data methods (System GMM) on a data set of nearly 1,000 banks from 11 European countries for the 2009-2015 period. Our results are threefold. First, we show that European commercial banks are more profitable in a low interest rate environment in terms of ROAA, ROAE and NIM. Second, the higher profitability of commercial banks is achieved at the cost of stability. The loan loss provision creation of commercial banks decreased significantly during the observation period. Nothing similar occurred in the case of the cooperative banks. The decrease in provisioning of commercial banks is probably attributable to pressure by shareholders to maintain short-term profitability. Third, the stability of cooperative banks expressed in terms of Z-score is significantly higher compared to commercial banks. In addition, the difference in Z-score of both ownership structures is increasing. To sum up, in an environment of low interest rates, European commercial banks focus on maintaining their profitability, whereas cooperative banks focus on increasing their stability.

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Appendix

Table A.1: Descriptive statistics

	Cooperative		Commercial	
	Average	St. dev.	Average	St. dev.
ROAA	0.28	0.44	0.37	1.25
ROAE	3.29	6.67	4.31	15.65
NIM	2.37	0.63	2.12	1.33
ZSCORE (tr. 325)	86.3	90.4	34.0	44.7
ZSCORE	103	171	41.4	124
Provisions	0.60	1.20	0.67	9.03
Size	20.4	1.53	22.4	2.14
LtD (tr. 1000)	109	58.3	139	108
LtD	109	58.6	723	7297
IncDiv	23.2	8.26	32.6	20.3
GDP1	30.0	4.85	30.4	9.41
GDPg	0.30	2.78	0.23	2.54
Ibor	0.45	0.42	0.47	0.47
Steep	1.81	0.55	1.81	0.53
Bond	3.12	1.04	3.02	1.08

Source: Authors

Table A.2: Correlation matrix

	ROAA	ROAE	NIM	ZSCO.	Provi.	Coop	Size	LtD	IncDiv	GDP1	GDPg	Ibor	Steep	Bond
ROAA	1													
ROAE	0.81	1												
NIM	0.21	0.11	1											
ZSCO.	-0.01	0.00	0.08	1										
Provi.	-0.25	-0.15	0.01	-0.05	1									
Coop	-0.05	-0.05	0.12	0.16	-0.01	1								
Size	0.00	0.04	-0.37	-0.12	0.01	-0.45	1							
LtD	0.03	0.05	0.14	-0.02	0.00	-0.07	0.03	1						
IncDiv	0.00	0.00	-0.37	-0.07	0.04	-0.31	0.25	-0.13	1					
GDP1	0.04	0.05	0.00	0.16	-0.08	-0.03	0.04	0.02	0.02	1				
GDPg	0.04	0.05	-0.01	0.11	-0.05	0.01	0.00	0.01	0.02	0.34	1			
Ibor	0.02	0.03	0.12	-0.05	0.01	-0.02	-0.03	-0.01	-0.06	-0.19	-0.18	1		
Steep	0.05	0.06	0.11	-0.05	0.02	0.00	-0.04	-0.01	-0.05	-0.26	-0.39	0.68	1	
Bond	0.03	0.05	0.08	-0.03	0.00	0.04	-0.04	-0.01	-0.06	-0.22	-0.23	0.81	0.75	1

Source: Authors

Table A.3: Robustness check of GMM estimates

	ROAA			ROAE			NIM			ZSCORE			Provisions		
	FE	GMM	OLS	FE	GMM	OLS	FE	GMM	OLS	FE	GMM	OLS	FE	GMM	OLS
Coef.	0.089	0.040	0.406	0.119	0.163	0.443	0.018	-0.110	0.725	0.009	0.273	0.362	0.733	0.534	0.784
St. er.	0.036	0.059	0.059	0.084	0.070	0.065	0.088	0.082	0.068	0.003	0.072	0.067	0.19	0.202	0.235
Sig.	**		***		**	***				***	**	***	***	***	***

Source: Authors

Table A.4: Regression analysis results (non-truncated data)

	ROAA			ROAE			NIM			Provisions			ZSCORE		
	Coef.	St. er.	Sig.	Coef.	St. er.	Sig.	Coef.	St. er.	Sig.	Coef.	St. er.	Sig.	Coef.	St. er.	Sig.
lag	0.013	0.058		0.152	0.066	**	-0.130	0.115		0.562	0.175	***	0.335	0.088	***
Coop	-3.036	1.046	***	-22.01	9.479	**	-4.045	1.479	***	93.39	29.06	***	49.26	20.35	**
Size	-1.038	0.440	**	-7.709	3.797	**	-0.413	0.160	***	34.35	13.59	**	-1.388	10.78	
LtD	0.011	0.019		0.092	0.072		-0.003	0.002	**	0.104	0.057	*	0.115	0.511	
IncDiv	-0.097	0.018	***	-0.555	0.566		-0.104	0.011	***	2.427	0.992	**	-0.928	1.024	
GDP1	-0.004	0.019		0.117	0.146		0.009	0.016		4.592	2.687	*	3.284	1.549	**
GDPg	0.061	0.093		-0.469	0.667		0.049	0.028	*	6.088	7.125		3.203	1.191	***
Ibor	13.36	9.148		18.22	81.93		8.095	7.888		-52.13	124.1		110.2	208.2	
Steep	22.54	11.01	**	68.96	95.83		6.55	8.207		-7.915	126.8		148.9	236.9	
Bond	1.631	2.752		-4.095	8.053		5.108	2.805	*	3.640	18.22		-17.49	34.73	
cons	-50.76	43.52		4.905	374.3		-27.07	34.03		-885.5	524.8		-398.0	680.9	
Year dummy	Yes			Yes			Yes			Yes			Yes		
Wald test	0.000 ***			0.000 ***			0.000 ***			0.000 ***			0.000 ***		
AR(1) test	0.015 **			0.007 ***			0.054 *			0.291			0.000 ***		
AR(2) test	0.513			0.241			0.055 *			0.435			0.186		
Hansen test	0.111			0.355			0.993			0.761			0.331		
observations	6811			6811			6811			6811			6811		

Note: * significant at 10% level, ** significant at 5% level, *** significant at 1% level

Source: Authors

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