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DETERMINANTS OF LOANS GROWTH IN COOPERATIVE BANKS IN POLAND: DOES CAPITAL RATIO MATTER?

DETERMINANTY STOPY WZROSTU KREDYTÓW BANKÓW SPÓŁDZIELCZYCH W POLSCE: CZY WSPÓŁCZYNNIK KAPITAŁOWY MA ZNACZENIE?

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Summary: This article examines the impact of bank capital ratios on cooperative banks' lending by comparing differences in loan growth to differences in capital ratios at sets of banks that are clustered based on capital ratio size. Applying a fixed-effects estimator to a sample of cooperative banks operating in Poland and using a unique quarterly dataset covering the period of 2000:1-2012:4, we find that loans' growth is particularly capital-constrained in poorly-capitalized banks, but only in non-recessionary ones. Lending of poorly capitalized banks is strongly affected by the interest rate margin, which is also important in determining the loans' growth of medium and large cooperative banks. Generally the results add support to the view that small banks, such as cooperative banks, are not capital-constrained in recessionary periods, thus their customers do not suffer from

the capital crunch in unfavourable macroeconomic conditions. However, their lending activity is procyclical, because increases in the unemployment rate result in decreases in the loans' growth of cooperative banks in Poland.

Keywords: lending activity, capital adequacy ratio, procyclicality, cooperative banks.

Streszczenie: Artykuł analizuje wpływ współczynnika kapitałowego na aktywność kredytową banków spółdzielczych, biorąc pod uwagę stopień dokapitalizowania tych banków. W badaniu zastosowano estymator z ustalonymi efektami stałymi na próbie danych kwartalnych dotyczących banków spółdzielczych w Polsce w okresie 2000:1-2012:4 i zidentyfikowano, że stopa wzrostu kredytów jest szczególnie wrażliwa na współczynnik kapitałowy w przypadku słabo dokapitalizowanych banków, przede wszystkim w okresie ożywienia. Aktywność kredytowa banków słabo dokapitalizowanych jest również bardzo wrażliwa na wskaźnik marży odsetkowej netto. Efekt ten utrzymuje się również w przypadku pozostałych banków. Ogólnie wyniki badania dają podstawę do stwierdzenia, że aktywność kredytowa małych lokalnych banków, którymi zazwyczaj są banki spółdzielcze, nie jest ograniczona przez współczynniki adekwatności kapitałowej w okresie recesji. Zatem ich klienci nie odczuwają skutków kryzysu kapitałowego w niesprzyjających uwarunkowaniach makroekonomicznych. Jednakże aktywność kredytowa tych banków jest procykliczna, ponieważ przy wzroście stopy bezrobocia następuje spadek stopy wzrostu kredytów banków spółdzielczych w Polsce.

Słowa kluczowe: aktywność kredytowa, współczynnik adekwatności kapitałowej, procykliczność, banki spółdzielcze.

1. Introduction

Many empirical studies have examined the determinants of bank lending and the role of capital ratio on bank lending (see e.g. [Hancock, Wilcox 1994; Peek, Rosengren 1995; Beatty, Liao 2011; Carlson et al. 2013; Gambacorta, Marquez-Ibanez, 2011; Kim, Sohn 2017]). Most of these studies focus on commercial banks mainly operating in the United States. These studies find the mostly positive effect of capital ratio on lending. In this article we ask whether capital ratio is a significant determinant of lending in cooperative banks operating in Poland.

Consistent with the capital crunch theory (see [Van den Heuvel 2009; 2011]), we expect to find that lending depends on the level of capital ratio. However, it is not certain how cooperative bank lending reacts to capital shortages in recession. Thus, the article investigates whether both poorly-capitalized and well-capitalized banks are capital-constrained in recessionary periods.

The rest of the paper is organized as follows. Section 2 provides the regulatory background of the study and develops the hypotheses. The sample and research methodology are described in Section 3. The results and robustness checks are discussed in Section 4. Section 5 concludes the article.

2. Literature review and hypotheses development

As part of individual banking systems there are different types of institutions adopting various organizational forms, business models or ownership structures. In many banking sectors in Europe there exists cooperative banking, which, despite its sometimes small size can play an important role in the financial system. We have to bear in mind that cooperative banks are credit institutions whose members are simultaneously their customers. The rationale behind the existence of such institutions should be the care of local development and granting credit for small borrowers and depositors [Karafolas 2005].

The main clients of cooperative banks are individual persons as well as small and medium enterprises, and the business model of these banks is approaching the universal bank model [Gajowiak 2009]. Despite this, cooperative banks still retain certain specific features that distinguish them from commercial banks according to the basic values of the cooperative movement, which may be described as humanistic and universal [Gniewek 2016]. Co-operative banks play an important role in financing local communities [Zalcewicz 2009]. Regardless of the countries in which they operate, cooperative banks should have mechanisms of mutual support so that local communities are supported even in the event of temporary difficulties [Spulbar et al. 2015].

Previous research on the effect of capital ratio on bank lending suggests the diversity of this effect which can be attributed to bank size, capital ratio level and the business cycle or crisis events [Berrospide, Edge 2010; Mora, Logan 2012; Beatty, Liao 2011; Gambacorta, Marques-Ibanez 2011; Carlson et al. 2013; Kim, Sohn 2017]. However, the general conclusion of this research is that in commercial banks the effect of capital ratios on lending is positive. Due to the fact that cooperative banks also have to conform to the same capital adequacy rules as cooperative banks, we expect that in our sample the a*ssociation between bank lending and regulatory capital ratio is positive.*

Van den Heuvel [2009] shows that capital-constrained banks tend to reduce their lending. Previous empirical research also shows that poorly-capitalized commercial banks' lending tends to be definitely more sensitive to capital ratio [Carlson et al. 2013] than the lending of well-capitalized banks, we therefore expect that *the relative impact of capital ratio on lending in cooperative banks is stronger in poorly-capitalized banks than in well-capitalized banks.*

3. Methodology and data applied in the study

The baseline model reads as, and will be run in subsamples of banks:

$$\begin{gathered}\Delta\mathrm{Loan}_{i,t} = \alpha_o + \alpha_1 \cdot \Delta\mathrm{Loan}_{i,t-1} + \alpha_2 \cdot \mathrm{CAR}_{i,t-2} + \alpha_3 \cdot \mathrm{NIM}_{i,t-1} + \\ \alpha_4 \cdot \mathrm{FDEP}_{i,t-1} + \alpha_5 \cdot \mathrm{NFDEP}_{i,t-1} + \alpha_6 \cdot \mathrm{WIBOR3M}_t + \alpha_7 \cdot \mathrm{UNEMPL}_{j,t} + \\ \alpha_8 \cdot \mathrm{recession} + \alpha_9 \cdot \mathrm{recession} \cdot \mathrm{CAR}_{i,t-2} + \varepsilon_t + \vartheta_{i,t}\end{gathered} \quad (1)$$

where: *i* – the number of the bank, *j* – the number of voivodeship, *t* – the number of observation for the i-th bank,

- Δ***Loan*** – real annual loans growth rate calculated at a quarterly frequency; to deflate the nominal loans growth rate we apply the Fisherian formula, i.e. $\Delta\mathrm{Loan} = \frac{\mathrm{N\_Loan\ growth\ rate}_t - \mathrm{CPI}_t}{1+\mathrm{CPI}_t}$, where N_Loan growth rate is nominal annual loans growth rate (computed at a quarterly frequency), CPI is annual consumer price index in Poland (also computed at a quarterly frequency to correspond with the loans' growth rate); following the convention adopted in many studies (e.g. [Gambacorta, Mistrulli 2004; Berrospide, Edge 2010; Beatty, Liao 2011; Gambacorta, Marques-Ibanez 2011; Carlson et al. 2013; Kim, Sohn 2017]), we use the growth rate of the dependent variable instead of levels of the variable to mitigate spurious correlation problems. In contrast to previous research applying quarterly data, instead of using the quarterly loans' growth rate, we use annual loans' growth rate because macroeconomic variables are published at a quarterly frequency and presented as a yearly change in the variable (e.g. the unemployment rate). As in previous studies [Beatty, Liao 2011; Gambacorta, Marques-Ibanez 2011; Carlson et al. 2013; Kim, Sohn, 2017], we also apply one quarter lag of loans' growth rate as a dependent variable to capture adjustment costs that constrain complete adjustment to an equilibrium level;
- ***CAR*** – the lagged capital adequacy ratio, i.e. total bank capital divided by risk weighted assets, lagged by two quarters; in our study we apply basically a total risk-adjusted capital ratio. In the robustness checks we will also use Tier 1 capital adequacy ratio. According to the literature the coefficients on the capital ratio are expected to be positive, implying that well-capitalized banks extend more loans because they can more effectively absorb the negative effects of risk shocks on bank lending (see e.g. [Bernanke, Lown 1991; Hancock, Wilcox 1994; Peek, Rosengren 1995; Gambacorta, Mistrulli 2004; Berrospide, Edge 2010; Beatty, Liao 2011; Gambacorta, Marques-Ibanez 2011; Carlson et al. 2013; Kim and Sohn 2017]). The α2 coefficient measures sensitivity of bank lending to capital ratio during non-recessionary periods (see [Beatty, Liao 2011; Carlson et al. 2013]). In contrast to previous research (e.g. [Kim, Sohn

2017]) we apply two quarters lagged capital ratio due to the specific conditions related to bank reporting. Generally, banks in Poland are obliged to report capital adequacy data to the supervisory authority, as well as for internal reporting purposes at a quarterly frequency. So the information from the last quarter is reported to the management board of a bank with a lag, e.g. this may be one or two months lag (the data has to be collected, analyzed and included in the financial report, and then published in the case of stock-market traded banks);

- ***NIM*** – net interest margin on loans lagged by one quarter, i.e. net interest margin divided by average loans (this interest margin is annualized and computed at a quarterly frequency); it proxies the profitability of bank lending; banks with high profitability will be eager to extend more loans, thus the relationship between loans' growth rate and net interest margin is expected to be positive. However, a high profitability may also imply higher costs on bank loans, thus diminishing the loan demand; in effect, a negative coefficient on net interest margin may also be expected; as is suggested by Kim and Sohn [2017], higher profitability may imply a greater risk on assets; thus, from the perspective of a bank, it may be related to lower lending growth to improve the quality of loans; under this scenario, the association between profitability and lending can be negative;
- ***FDEP*** – one quarter lagged deposits from banks divided by total assets; a positive coefficient on this variable suggests that banks with better access to interbank market financing extend more loans; in contrast, a negative coefficient on this ratio may indicate that banks do not need wholesale financing for the development of their lending;
- ***NFDEP*** – one quarter lagged deposits from non-financial customers divided by total assets; a positive coefficient on this NIM; we generally expect a positive coefficient on this variable if banks need access to deposits to extend new lending; the association between loans growth and deposits may also be negative or statistically insignificant if banks do not suffer from the lack of stable funding;
- ***WIBOR3M*** – three month Warsaw Interbank Bid Rate; this rate proxies the cost of lending for bank customers (thus higher values may be related with decreased loans' growth rate, and the coefficient on WIBOR3M may be negative) or the earnings that banks get from the loan (thus the coefficient on WIBOR3M may be positive);
- ***UNEMPL*** – annual unemployment rate, calculated at quarterly frequency; this rate is included to account for the effects of macroeconomic conditions and loan demand; it proxies the demand for loans; we expect a negative coefficient on this variable because increases in the unemployment rate are associated with a decreased demand for bank lending (and vice-versa);

- ***recession*** – dummy variable equal to one during recessionary periods 0 otherwise; we identify four recessionary periods (in 2001q2-2002q2, 2005q1-q4, 2009q1-q3, 2012q2-q4). We predict a negative coefficient on recession if the loan supply declines during a crisis for reasons other than capital and liquidity constraints (as in [Beatty and Liao, 2011, p. 7]);
- ***recession * CAR*** – interaction between the crisis and capital ratio (CAR) was added to the model in order to investigate the effect of CAP depending on the recession (the presence or not, of the period of recession); banks which exhibit capital pressures during a recession will increase their lending if their capital ratio is sufficiently high; we expect the coefficient on this interaction to be positive and statistically significant for banks which suffer from capital shortages (or risk shocks), which affect capital absorption potential.

$\vartheta_{i,t}$ are unobservable bank-specific effects that are not constant over time but vary across banks; ε_t is a white-noise error term.

This study employs the fixed-effects panel method, following Judson and Owen [1999] who suggest that fixed-effects estimators perform well or better when the time dimension of panel data T is greater than 30. Because the time dimension of our datasets is 52 quarters, we adopt the bank fixed-effects panel model. The fixed-effects method has been extensively used in the literature (see e.g. [Berrospide, Edge 2010; Francis, Osborne 2012; Cornett et al. 2011; Kim, Sohn 2017]). As argued by Brei et al. [2013], non-randomly selecting a sample from the population of banks is also consistent with the choice of fixed-effects estimations, which is true of our sample. To make this choice formally supported we ran the Hausman test. Its results suggest that fixed effects method is more suitable to our sample.

We used pooled cross-section and time-series quarterly data of individual cooperative banks' balance sheet items and profit-and-loss accounts from Poland over a period from 1999 to 2012. The balance-sheet and profit-and-loss account data were taken directly from the prudential reporting of all banks operating in Poland in the period under analysis. This is a unique set of data gathered by the National Bank of Poland[1] and used in the Polish Financial Supervisory Authority, and covers the financial statements reporting information ("FINREP") and capital adequacy information (bank capital and own funds composition and capital requirements composition) ("COREP").

The macroeconomic data were accessed from the Central Statistical Office of Poland (GUS). We conducted our study for unconsolidated data, to include the effects of capital ratio on bank lending in traditional banking business (i.e. taking

[1] This data is collected because in accordance with Resolution No. 53/2011 of the Management Board of the National Bank of Poland of September 22, 2011 as amended (NBP Official Journal of 2011 No. 14, 2013 No. 6, No. 47, 2014 No. 40, 2015 No. 38, 2016, No. 2) and pursuant to Regulation of the European Parliament and Council (EU) No 575/2013 of June 26, 2013, (L 176, 06.27.2013 p.1), credit institutions are obliged to provide the NBP with prudential reporting on an individual and consolidated basis.

deposits and extending loans). We excluded outlier banks from our sample by eliminating the extreme bank-specific observations. Due to the fact that we are interested in the effect of capital ratio in different business cycle periods, in our study we included only those banks for which we have data covering five consecutive years (and 20 quarters). Based on this selection strategy, the number of banks included in our sample is 237 and the number of observations for the dependent variable is over 12000 observations.

In order to capture both economic upswings (non-recessionary periods) and downturns (recessionary periods) we needed to use bank data for a sufficiently long period. Thus, our period covers 1999:4-2012:4 and includes for most banks 52 quarters.

Table 1. Descriptive statistics of the data

	full sample						
	Mean	Std. Dev.	Min	Max	N obs	N banks	Median
ΔLoan	3.71	8.24	–38.92	402.34	12,087	237	3.04
CAR	16.9	7.51	–7.69	80.44	12,112	237	15.03
CAR1	16.37	7.09	0.03	73.11	12,112	237	14.64
NIM	11.16	5.1	0.92	78.84	12,087	237	9.94
NFDEP	74.61	10.25	15.25	95.06	12,056	237	76.06
FDEP	1.21	3.06	0	33.69	12,113	237	0
WIBOR3M	6.86	4.41	3.64	19.19	12,260	237	5.07
UNEMPL	14.39	4.25	5.8	30.6	12,260	237	14
	CAR above 12						
ΔLoan	3.5	7.39	–31.64	141.91	8,772	231	2.82
CAR	19.42	7.34	12	80.44	8,790	231	17.46
CAR1	18.76	6.88	7.92	73.11	8,790	231	17.07
NIM	11.94	5.41	3.67	78.84	8,772	231	9.51
NFDEP	73.42	10.48	15.25	91.54	8,743	231	75.07
FDEP	0.99	2.82	0	33.69	8,790	231	0
WIBOR3M	6.68	4.24	3.64	19.19	8,790	231	4.93
UNEMPL	14.23	4.1	5.8	30.6	8,790	231	13.9
	CAR below 12						
ΔLoan	4.29	10.1	–38.92	402.34	3,314	146	3.57
CAR	10.24	1.46	–7.69	12	3,322	146	10.53
CAR1	10.03	1.61	0.03	21.25	3,322	146	10.15
NIM	9.13	3.42	3.17	34.07	3,314	146	8.34
NFDEP	77.75	8.89	37.84	95.06	3,312	146	77.43
FDEP	1.82	3.54	0	31.79	3,322	146	0.07
WIBOR3M	7.46	4.85	3.64	19.19	3,322	146	5.33
UNEMPL	14.91	4.54	5.8	30.6	3,322	146	14.7

Notes: N obs – number of observations; N banks – number of banks.

Source: authors' estimations.

In Table 1 we present descriptive statistics of the key regression variables in the full sample as well as in well-capitalized and poorly-capitalized banks. We find that in well-capitalized banks, the mean total capital ratio (CAR) is 19.42%, with a median value of 17.46%. As for poorly-capitalized banks, the average CAR is 10.24% with a median value of 10.53%. Well-capitalized banks show lower median loans growth of 2.82% relative to poorly-capitalized banks with a median loans' growth of 3.57%. There is also visible discrepancy between well-capitalized and poorly-capitalized banks in terms of profitability (NIM). Generally, well-capitalized banks' average NIM is around 11.94% with a median value of 9.51%. In contrast, in poorly-capitalized banks these values are 9.13% and 8.34%, respectively.

4. Research results

Before discussing the main regression results, we present the baseline regressions which examine the relationship between bank lending and bank-specific variables without including the interaction terms of the capital ratio and measure of cyclicality of LLP as well as of income-smoothing. Table 3 reports these results.

Table 2. Determinants of cooperative banks' lending – full sample results

	full sample			full sample		
	1	prob.	*t*-stat	2	prob.	*t*-stat
ΔLoan	0.037	0.00	3.98	0.036	0.00	3.82
CAR(-2)	0.081	0.00	3.60	0.072	0.00	3.14
NIM(-1)	0.134	0.00	4.75	0.145	0.00	5.09
FDEP(-1)	–0.131	0.00	–4.06	–0.131	0.00	–4.07
NFDEP(-1)	–0.039	0.00	–3.10	–0.034	0.01	–2.75
WIBOR3M	0.135	0.00	5.37	0.131	0.00	5.20
UNEMPL	–0.056	0.04	–2.05	–0.048	0.08	–1.75
recession				–0.821	0.05	–2.00
CAR*recession				0.018	0.42	0.80
cons	3.585	0.01	2.71	3.352	0.01	2.52
N obs	11,789			11,789		
N groups	237			237		
R-sq within	0.022			0.022		
R-sq between	0.060			0.063		
R-sq overall	0.006			0.007		
F	36.36	0.00		29.45	0.00	
F that all u_i=0	1.42	0.00		1.43	0.00	

Notes: Prob. – statistical significance; *T*-stat – value of *t* -Student statistics ; N obs – number of observations; N banks – number of banks.

Source: authors' estimations.

First, looking at the full sample results estimated with FE we find that the coefficients of the capital ratio are positive and statistically significant at the 1% level. The effect of capital ratio on lending is 0.081 in non-recessionary periods (see column 1). The capital ratio in recessionary periods does not seem to induce procyclicality of lending in the full sample, because the coefficient on CAR*recession is positive but not statistically significant (see column 2).

In both regressions in Table 2, the coefficients of all the other control variables are generally significant, with the expected signs. Concerning the coefficients of the net interest margin on loans (NIM), the estimated coefficients are positive in the full sample and their effect is always significant. The stable funding effect (proxied by NFDEP) as well as non-stable funding (proxied by FDEP) is negative and significant, suggesting that cooperative banks' lending is not so much dependent on funding constraints (which contradicts the effects obtained by Kim and Sohn [2017] and Olszak et al. [2017], obtained for commercial banks).

Finally, the macroeconomic environment proxied with the market rate (WIBOR3M), unemployment rate (UNEMPL) and recession dummies also exert the expected effect. As for the interbank interest rate, we find that the estimated coefficients are positive in the full sample and their effect is always significant. Such effect suggest that cooperative banks increase their lending when the market rate is increasing. Looking at the full sample estimates of the effect of unemployment rate, we can infer that the increases in unemployment are associated with the decreases in bank's loan growth, thus confirming the notion that cooperative bank lending is procyclical.

The relative level of capital ratio of a bank matters for the effect of capital ratio on lending in non-recessionary, but not in recessionary periods (see Table 3). Poorly-capitalized banks' lending is definitely more affected by capital ratio in non-recessionary periods because the regression coefficients on CAR are positive and statistically significant (see columns 1 and 3 in Table 3). Based on regression 1, we infer that a 1% decrease (increase) in capital ratio causes a poorly-capitalized bank to decrease (increase) its lending by 0.723% in non-recessionary periods (see column 1 in Table 3). In contrast, well-capitalized banks' loans growth is definitely less sensitive to capital ratio in non-recessionary periods because the effect of CAR on loans' growth is 0.060 (see column 2 in Table 3).

Cooperative banks' loans' growth is not sensitive to capital ratio in recessionary periods, even if we take into account the size of capital ratio. As can be seen from Table 3 (see column 3) in poorly-capitalized cooperative banks the coefficient on CAR*recession is negative and statistically insignificant, suggesting that even banks with a relatively higher capital ratio are not able to increased their lending.

At this point, we present robustness checks to determine whether our results remain unchanged. To this end, we perform regressions with alternate measure for capital ratio, i.e. the tier 1 capital adequacy ratio and apply the alternate estimation

Table 3. Determinants of cooperative banks' lending – the role of capital ratio size

	CAR<12			CAR>12			CAR<12			CAR>12		
	1	prob.	*t*-stat	2	prob.	*t*-stat	3	prob.	*t*-stat	4	prob.	*t*-stat
ΔLoan(-1)	0.003	0.86	0.17	0.047	0.00	4.27	-0.002	0.90	-0.12	0.047	0.00	4.2
CAR(-2)	0.723	0.00	6.06	0.060	0.01	2.76	0.823	0.00	6.12	0.057	0.01	2.51
NIM(-1)	0.631	0.00	5.68	0.118	0.00	4.23	0.703	0.00	6.25	0.126	0.00	4.46
FDEP(-1)	-0.114	0.12	-1.54	-0.149	0.00	-4.08	-0.098	0.19	-1.33	-0.151	0.00	-4.12
NFDEP(-1)	-0.087	0.01	-2.55	-0.023	0.08	-1.77	-0.069	0.04	-2.02	-0.021	0.12	-1.57
WIBOR3M	0.058	0.34	0.95	0.116	0.00	4.09	0.039	0.52	0.64	0.112	0.00	3.94
UNEMPL	-0.155	0.02	-2.28	-0.028	0.34	-0.95	-0.13	0.06	-1.91	-0.024	0.42	-0.8
Recession							2.234	0.33	0.97	-0.339	0.49	-0.7
CAR*recession							-0.35	0.11	-1.6	0.00	0.99	0.02
Cons	-0.34	0.93	-0.09	2.188	0.11	1.58	-3.248	0.4	-0.85	2.046	0.14	1.47
N obs	3,220			8,568			3,220			8,568		
N groups	144			231			144			231		
R-sq within	0.039			0.022			0.043			0.022		
R-sq between	0.065			0.002			0.067			0.001		
R-sq overall	0.017			0.011			0.019			0.011		
F	17.63	0.00		26.5	0.00		15.33	0.00		21	0.00	
F that all u_i=0	1.16	0.10		1.17	0.04		1.21	0.05		1.18	0.04	

Notes: Prob. – statistical significance; *T*-stat – value of *t* -Student statistics ; N obs – number of observations; N banks – number of banks.

Source: authors' estimations.

technique, here the 2-step GMM estimator [Blundell, Bond, 1998], which ensures consistency and resolves potential endogeneity of our data. Tables 4 and 5 report the results for the change in capital ratio. Table 6 presents estimations using the 2-step GMM approach.

Looking at the full sample results we find that the coefficients on the capital ratio are positive and statistically significant at the 1% level. The effect of capital ratio on lending is stronger than in Table 2 and equals 0.102 in non-recessionary periods (see column 1 in Table 4). The capital ratio in recessionary periods does not seem to induce procyclicality of lending in the full sample, because the coefficient on CAR*recession is negative and statistically insignificant (see column 2).

Table 4. Robustness check of determinants of cooperative banks' lending – full sample results

XTREG FE	full sample			full sample		
	1	prob.	*t*-stat	2	prob.	*t*-stat
ΔLoan	0.037	0.00	3.94	0.036	0.00	3.81
CAR1(-2)	0.102	0.00	4.1	0.098	0.00	3.83
NIM(-1)	0.129	0.00	4.57	0.143	0.00	5.01
FDEP(-1)	-0.127	0.00	-3.95	-0.127	0.00	-3.96
NFDEP(-1)	-0.035	0.01	-2.79	-0.031	0.01	-2.46
WIBOR3M	0.142	0.00	5.59	0.136	0.00	5.33
UNEMPL	-0.06	0.03	-2.19	-0.052	0.06	-1.9
recession				-0.301	0.47	-0.72
CAR*recession				-0.012	0.60	-0.52
cons	3.07	0.02	2.28	2.763	0.04	2.04
N obs	11,789			11,789		
N groups	237			237		
R-sq within	0.022			0.023		
R-sq between	0.066			0.068		
R-sq overall	0.006			0.006		
F	36.93	0.00		29.75	0.00	
F that all u_i=0	1.43	0.00		1.43	0.00	

Notes: Prob. – statistical significance; T-stat – value of t-Student statistics ; N obs – number of observations; N banks – number of banks.

Source: authors' estimations.

The relative level of capital ratio of a bank matters for the effect of CAR1 on lending in non-recessionary, but not in recessionary periods (see Table 5), which further supports the main results presented in the previous section in Table 3. Poorly-capitalized banks' lending is definitely more affected by capital ratio in non-recessionary periods, because the regression coefficients on CAR are positive and statistically significant (see columns 1 and 4 in Table 5). Based on regression 1, we infer that a 1% decrease (increase) in capital ratio causes a poorly-capitalized bank to

Table 5. Robustness check of determinants of cooperative banks' lending – the role of capital ratio size

	CAR<12			CAR>12			CAR<12			CAR>12		
	1	prob.	t-stat	2	prob.	t-stat	3	prob.	t-stat	4	prob.	t-stat
ΔLoan	0.009	0.62	0.49	0.046	0.00	4.19	0.002	0.91	0.11	0.046	0.00	4.12
CAR1(-2)	0.487	0.00	4.1	0.087	0.00	3.6	0.712	0.00	4.94	0.092	0.00	3.68
NIM(-1)	0.559	0.00	5.01	0.11	0.00	3.97	0.644	0.00	5.69	0.121	0.00	4.28
FDEP(-1)	-0.119	0.11	-1.6	-0.146	0.00	-3.98	-0.096	0.2	-1.28	-0.146	0.00	-3.99
NFDEP(-1)	-0.074	0.03	-2.15	-0.019	0.15	-1.45	-0.053	0.12	-1.54	-0.016	0.21	-1.25
WIBOR3M	0.04	0.51	0.66	0.128	0.00	4.48	0.019	0.76	0.3	0.122	0.00	4.25
UNEMPL	-0.149	0.03	-2.18	-0.031	0.29	-1.06	-0.121	0.08	-1.78	-0.026	0.38	-0.89
recession							4.435	0.03	2.24	0.436	0.38	0.88
CAR*recession							-0.571	0.00	-2.97	-0.04	0.11	-1.59
cons	1.929	0.61	0.51	1.481	0.29	1.06	-2.65	0.50	-0.67	1.133	0.42	0.8
N obs	3,220			8,568			3,220			8,568		
N groups	144			231			144			231		
R-sq within	0.032			0.022			0.038			0.023		
R-sq between	0.048			0.00			0.05			0.00		
R-sq overall	0.013			0.01			0.014			0.01		
F	14.7	0.00		27.28	0.00		13.61	0.00		21.83	0.00	
F that all u_i=0	1.12	0.16		1.2	0.02		1.2	0.05		1.2	0.02	

Notes: Prob. – statistical significance; *T*-stat – value of *t* -Student statistics; N obs – number of observations; N banks – number of banks.
Source: authors' estimations.

Table 6. Robustness check – estimation with 2-step GMM

	CAR<12			CAR>12			CAR<12			CAR>12		
	1	prob.	t-stat	2	prob.	t-stat	3	prob.	t-stat	4	prob.	t-stat
ΔLoan(-1)	0.036	0.247	1.16	0.070	0.012	2.52	0.032	0.296	1.05	0.070	0.014	2.46
CAR(-2)	0.229	0.178	1.35	-0.009	0.818	-0.23	0.344	0.084	1.73	-0.010	0.811	-0.24
NIM(-1)	0.036	0.814	0.23	0.077	0.082	1.74	0.072	0.662	0.44	0.078	0.086	1.72
FDEP(-1)	-0.215	0.025	-2.25	-0.234	0.000	-3.51	-0.190	0.067	-1.83	-0.234	0.001	-3.36
NFDEP(-1)	-0.174	0.000	-3.61	-0.039	0.057	-1.90	-0.164	0.000	-3.66	-0.038	0.073	-1.79
WIBOR3M	0.151	0.156	1.42	0.082	0.055	1.9	0.143	0.182	1.33	0.078	0.075	1.78
UNEMPL	-0.184	0.002	-3.15	-0.022	0.592	-0.54	-0.170	0.004	-2.89	-0.024	0.554	-0.59
Recession							2.540	0.288	1.06	-0.018	0.980	-0.02
CAR*recession							-0.273	0.237	-1.18	-0.003	0.932	-0.09
Cons	16.914	0.000	3.81	5.273	0.026	2.23	14.470	0.001	3.45	5.270	0.030	2.17
N obs	3,220			8,568			3,220			8,568		
N groups	144			231			144			231		
AR(2)	-0.34	0.734		-2.19	0.028		-0.38	0.703		-2.21	0.027	
Hansen test	137.82	1.000		222	1.000		137.14	1.000		223.03	1.000	

Notes: Prob. – statistical significance; *T*-stat – value of *t* -Student statistics; N obs – number of observations; N banks – number of banks.

Source: authors' estimations.

decrease (increase) its lending by 0.487% (see column 1 in Table 3) or 0.712 (see column 3 in Table 3) in non-recessionary periods. In contrast, well-capitalized banks' loans' growth is definitely less sensitive to capital ratio in non-recessionary periods because the effect of CAR on loans' growth is 0.87 (see column 2 in Table 3).

We also find further empirical support for the view that cooperative banks' loans' growth is not sensitive to capital ratio in recessionary periods, even taking into account the size of capital ratio. As can be seen from Table 5 (see column 3) in poorly-capitalized cooperative banks the coefficient on CAR*recession is negative and (in contrast to the results obtained in the previous section) statistically significant, suggesting that even banks with a relatively higher capital ratio are not able to increase their lending.

The relative level of capital ratio of a bank matters for the effect of capital ratio on lending in non-recessionary, but not in recessionary periods even if we run our regressions with the Blundell-Bond [1998] 2-step GMM approach (see Table 6). Before going on with the interpretation, we would like to stress that the GMM estimations should be interpreted with some reserve. Generally, due to the fact that the dataset is of quarterly frequency, even a relatively small number of lags for endogenous bank-specific variables results in a huge number of instruments exceeding the number of banks. In effect the estimators may be biased (see [Roodman 2009]).

Looking now at the results, we find that poorly-capitalized banks' lending is definitely more affected by capital ratio in non-recessionary periods because the regression coefficients on CAR are positive (see columns 1 and 3 in Table 6) and statistically significant (see column 3). Based on regression 3, we infer that a 1% decrease (increase) in capital ratio causes a poorly-capitalized bank to decrease (increase) its lending by 0.344% in non-recessionary periods (see column 1 in Table 3). In contrast, well-capitalized banks' loans growth is definitely less sensitive to capital ratio in non-recessionary periods because the effect of CAR on loans' growth is 0.01 (see columns 2 and 4 in Table 6).

4. Conclusions

Using the 2000:1-2012:4 unbalanced quarterly observations of Polish cooperative banks, this study examines whether the effect of bank capital on lending differs depending upon the bank capital ratio level. There are two novel contributions of our study relative to the literature.

First, we show that the effect of capital ratio on loans growth in cooperative banks is significant only in non-recessionary periods. Thus, in contrast to commercial banks, in cooperative banks the capital ratio does not exert procyclical effects on loans' growth.

Second, we provide evidence that the impact of the capital ratio on lending of cooperative banks depends on the banks' capital ratio size. Poorly-capitalized banks'

lending is definitely more sensitive to the capital ratio in non-recessionary periods. In contrast, well-capitalized banks' loans' growth does not suffer from capital constraints in non-recessionary periods. Our research also finds evidence that lending by poorly-capitalized cooperative banks is not immune to the recessionary capital crunch.

The implication of this research is that decision-makers implementing new capital adequacy standards, such as Basel III capital buffers or increases in the capital ratios, should consider the fact that lending by cooperative banks does not respond to changes in the capital ratios as occurs in commercial banks. Therefore, any attempts to reduce cooperative banks loans' growth through capital ratios may not be effective.

Bibliography

Beatty A., Liao S., 2011, *Do delays in expected loss recognition affect banks' willingness to lend*?, Journal of Accounting and Economics, 52, pp. 1-20.

Bernanke B.S., Lown C.S., 1991, *The credit crunch*, Brookings Papers on Economic Activity, 2.

Berrospide J.M., Edge R.M., 2010, *The effects of bank capital on lending: What do we know? And what does it mean*?, International Journal of Central Banking, 6(4), December 2010, pp. 5-54.

Blundell R., Bond S., 1998, *Initial conditions and moment restrictions in dynamic panel data model*, Journal of Econometrics, 87, pp. 115-143. http://dx.doi.org/10.1016/S0304-4076(98)00009-8.

Brei M., Gambacorta L., von Peter G., 2013, *Rescue packages and bank lending*, Journal of Banking Finance, 37, pp. 490-505 .

Carlson, M., Shan, H., Warusawitharana, M., 2013, *Capital ratios and bank lending: A matched bank approach*, Journal of Financial Intermediation, 22.

Cornett M.M., McNutt J.J., Strahan P.E., Tehranian H., 2011, *Liquidity risk management and credit supply in the financial crisis*, Journal of Financial Economics, 101, pp. 297-312 .

Francis W.B., Osborne M., 2012, *Capital requirements and bank behavior in the UK: Are there lessons for international capital standards*?, Journal of Banking & Finance, 36, pp. 803-816.

Gajowiak D.K., 2009, *Spółdzielczość bankowa w Polsce na tle wybranych spółdzielczych grup i systemów bankowych w Unii Europejskiej*, Problemy Rolnictwa Światowego, t. 8, no. XXIII, pp. 52-62.

Gambacorta L., Marques-Ibanez D., 2011, *The bank lending channel: Lessons from the crisis,* Economic Policy, vol. 26, issue 66, pp. 135-182.

Gambacorta L., Mistrulli P.E., 2004, *Does bank capital affect lending behavior*?, Journal of Financial Intermediation, vol. 13, issue 4, pp. 436-457.

Gniewek J., 2016, *Misja i zasady spółdzielcze jako istotne czynniki rozwoju spółdzielczego sektora bankowego w Polsce*, Annales Universitatis Mariae Curie-Skłodowska Lublin – Polonia, vol. 50, no. 3, pp. 39-48.

Hancock D., Wilcox J.A., 1994, *Bank capital and the credit crunch: The roles of risk-weighted and unweighted capital regulation*, Journal of the American Real Estate and Urban Economics Association, 22, DOI: 10.1111/1540-6229.00626

Judson, Owen [1999),

Karafolas S., 2005, *Development and prospects of the Greek cooperative credit system*, Journal of Rural Cooperation, vol. 33, no. 1, pp. 3-20.

Kim D., Sohn W., 2017, *The effect of bank capital on lending: Does liquidity matter*?, Journal of Banking and Finance., 77, pp. 95-107.

Mora N., Logan A., 2012, *Shocks to bank capital: Evidence from UK banks at home and away*, Applied Economics, 44(9), pp. 1103-1119.

Olszak M., Pipień M., Kowalska I., Roszkowska S., 2017, *What drives heterogeneity of cyclicality of loan-loss provisions in the EU*?, Journal of Financial Services Research, 1.

Peek J., Rosengren E., 1995, *The capital crunch: Neither a borrower nor a lender be*, Journal of Money, Credit, and Banking, 27, pp. 625-638.

Peek, J., Rosengren E.S., Tootell M.B., 2003, *Identifying the macroeconomic effect of loan supply shocks,* Journal of Money, Credit and Banking, vol. 35, no. 6, Part 1, pp. 931-946.

Roodman D., 2009, *Practitioners corner: A note on the theme of too many instruments*, Oxford Bulletin of Economics and Statistics, 71, pp. 135-156, DOI: 10.1111/j.1468-0084.2008.00542.x.

Spulbar C., Nitoi M., Anghel L., 2015, *Efficiency in cooperative banks and savings banks: A stochastic frontier approach*, Romanian Journal of Economic Forecasting, XVIII (1), pp. 5-21.

Van den Heuvel S., 2009, *The bank capital channel of monetary policy*, Working Paper, The Wharton School, University of Pennsylvania.

Van den Heuvel S., 2011, *Banking conditions and the effects of monetary policy: Evidence from the United States*, Working Paper, Federal Reserve Board.

Zalcewicz A., 2009, *Bank spółdzielczy. Aspekty prawne tworzenia i funkcjonowania*, Oficyna Wolters Kluwer, Warszawa.

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