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Is Lending by Polish Cooperative Banks Procyclical?*

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Abstract

We investigate the lending cyclicality of Polish cooperative banks. Cooperative banks have an important role in the financing of the local economy and as such their sensitivity of their lending behavior to business cycles can influence the financing of small firms. We use a rich dataset of 367 Polish cooperative banks over the period 2007-2013. We find that cooperative banks have a countercyclical lending behavior on the country level, with loan growth negatively linked to national business cycles. We observe that greater bank size contributes to reduce the countercyclical lending behaviour. The lending behavior of cooperative banks is also sensitive to local economic conditions, with some evidence for procyclicality versus the regional economy. Finally, we point out differences in cyclicality of lending across types of borrowers. These findings support the view that the cooperative banking sector should be preserved to mitigate bank lending procyclicality.

1. Introduction

Cyclicality of bank lending is a major issue as it can generate undesirable feedback effects, including credit rationing, which can amplify recessions. Therefore, policymakers worldwide have implemented tools to mitigate bank cyclicality, such as countercyclical capital buffers and dynamic loan loss provisions. A strand of literature has analysed the cyclicality of bank lending to investigate its nature and its differences across types of banks (e.g., Bertay et al. 2015; Behr et al. 2017). However, there is scarce empirical work on the cyclicality of bank lending in less developed banking markets, especially for smaller, regional banks. The bulk of existing empirical literature for developing markets focuses on the cyclicality of commercial bank lending, frequently relating to differences between foreign, domestic and state-owned banks (Cull and Martinez Peria 2013, De Haas and van Lelyveld 2014). Meanwhile, many authors find significant shock transmission to less developed markets, which distorts analyses of local credit cyclicality.

To fill this gap, we study cyclicality of lending in the cooperative banking sector using the case of Poland, which is among the largest economies in Central Europe. Cooperative banks play a major role in the financing of the economy at the

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local level and build confidence towards the Polish banking sector among the general public, especially outside larger cities. In addition, cooperative banks have a distinctive ownership structure from their commercial counterparts. Commercial banks in Central Europe are strongly dependent on their foreign shareholders and thus suffer from contagion effects of macroeconomic downturns also outside the region (De Haas and van Lelyveld, 2014; Temesvary and Banai, 2017). Cooperative banks are isolated from such outside pressure and may soften foreign crisis propagation, thus contributing to financial stability. It is therefore crucial to analyse their sensitivity to country-wide economic deteriorations and to precisely determine what factors affect the cyclicality of their lending.

The aim of this study is to examine the cyclicality of lending of small, regional banks that are active primarily in the loan and deposit business. We consider both countrywide and regional economic cycles, which allows to separate cyclicality into macro- and regionally driven. We use a rich dataset of 367 Polish cooperative banks over the period 2007-2013. We have detailed, quarterly data for banks and economic variables, which makes it possible to study loan cyclicality from a very precise perspective.

We first investigate whether Polish cooperative banks have a procyclical lending behaviour towards country-wide economic cycles. Our key hypothesis is that lending is not procyclical for these banks, so that they may have a stabilizing effect on the credit supply. This hypothesis is based on two reasons related to cooperative banks. First, it is related to the fact that cooperative banking has expanded in Europe to enhance access to credit by reducing problems associated with information asymmetries. These banks have greater knowledge of their clients than commercial banks because of their specific ownership. Second, besides profit maximization, these banks possess an additional objective of sustaining credit supply to the local economy, which makes them less sensitive to the business cycle. As a result, we are able to contribute to the literature on cooperative banks.

We extend our analysis by including the sensitivity of cooperative banks to local conditions and thus contribute to the literature on cyclicality of bank lending. Many banks have local activities related to their size or their business model. Cooperative banks, which have a large market share in many European countries, are typically banks with local activities. It is therefore important to know whether the lending of cooperative banks has a different sensitivity to country conditions and local conditions.

Finally, we complete the study with two additional analyses. First, we check whether bank size exerts an influence on cyclicality of bank lending. Even if Polish cooperative banks are small, they differ in size, allowing such investigation. The observation of any relation between bank size and cyclicality of bank lending provides information on the consequences of the consolidation process within the cooperative banking sector. In addition, observing larger banks may provide information on whether larger size makes cooperative banks more similar to commercial banks, despite a different ownership structure. Second, we investigate whether cyclicality differs among types of loans. Cyclicality can be influenced by the characteristics of borrowers and of loan types, which cannot be observed when loans are considered at an aggregate level.

It has to be stressed that our work does not investigate whether the cyclicality of lending behavior of cooperative banks contributes to amplify or moderate business cycles in Poland. The small market share of cooperative banks does not suggest such role. However, we consider the effects of the cyclicality of lending behavior of cooperative banks on the financing behavior of firms. Given the key role of cooperative banks in the local economy, the cyclicality of lending behavior of cooperative banks informs about the sensitivity of cooperative banks to macroeconomic volatility and as such provides evidence about the fact that firms can have continued access to loans over the business cycles.

This work has therefore major implications for policymakers on the role of smaller, regional banks in smoothing adverse effects of macroeconomic fluctuations on the real economy, in particular in less developed banking markets. The absence of procyclicality of Polish cooperative banks would mean that such banks can have a beneficial effect on the real economy in crisis times. They could sustain local economies through stable loan supply. Reversely, procyclicality of cooperative banks could make them vulnerable to macroeconomic deteriorations and generate default risk that may affect both the banking system and the real economy, through a decreased loan supply.

This paper is divided into six sections. Section 2 reviews the existing literature. Section 3 describes the data. Section 4 presents the methodology and main hypotheses. Section 5 displays the results. Section 6 provides concluding remarks.

2. Literature Review

Our study lies at the crossroads of two strands of literature: lending cyclicality and cooperative banking. The first area is cyclicality. Numerous works have investigated the cyclicality of bank lending for various countries and various types of banks. In particular, cyclicality of lending is demonstrated to depend on shareholder structure of banks, with a general conclusion on lower procyclicality of loans found at state-owned banks. Among recent works, Bertay et al. (2015) find consistent evidence for lower procyclicality of loans by state-owned banks in comparison to private banks, using a wide, international sample of banks from 111 countries. In addition, they indicate that lending of state banks in high income (developed) countries is countercyclical.[1] In line with these results, Brei and Schclarek (2013) provide a cross-country study where they conclude to a countercyclical role for state-owned banks. They observe that state-owned banks' lending increases during crises relative to normal times, while lending by private banks declines.

Andries and Brown (2017) analyse the credit boom and bust cycle in Central and Eastern Europe, using commercial bank data. They find that pre-crisis credit growth is mitigated by differences in corporate governance elements, such as the existence of risk committees and the position of Chief Risk Officer, as well as a share of foreign members in bank supervisory boards. Choi et al. (2016) use a wide sample of developing country banks in Central and Eastern Europe, East Asia and Latin America and demonstrate that during the financial crisis foreign-owned banks diminished loan growth more than domestic private banks. When controls for the

[1] Although they also include cooperative banks, the cyclicality of their lending is not separately analyzed.

financial situation of the parent bank are introduced, the effect of the foreign ownership is sustained. Importantly, Choi et al. (2016) also provide evidence for a counter-cyclical behaviour of state-owned, domestic banks. On the other hand, although Cull and Martinez Peria (2013) also find that foreign-owned banks cut loan growth during the crisis more than domestic private banks in Eastern Europe, they do not confirm a counter-cyclical behaviour of state-owned banks. Anginer et al. (2017) show a positive correlation between the default risk of foreign bank subsidiaries in developing countries and their parents during the financial crisis.

For pre-crisis data, De Haas and van Lelyveld (2010) find that subsidiaries operating within strong, multinational holding groups can maintain loan growth, while domestic banks limit their expansion rates. Using later data, De Haas and van Lelyveld (2014) show that foreign ownership had a strong effect on loan growth cuts during the financial crisis, with subsidiaries of multinational banking groups diminishing loans three times as fast as domestic banks. Using pre-crisis data, Jeon et al. (2013) document that both negative and positive financial shocks are transmitted from foreign parent banks to subsidiaries and this is especially visible in Central and Eastern Europe. Utilizing data over the period 2002-2013, Temesvary and Banai (2017) show that the parent banking group traits influence lending patterns of foreign banks in Central and Eastern Europe.

The issue of cyclicality is also strongly related to bank capital, in particular supervisory constraints (Estrella 2004; Heid 2007). As capital standards tighten during downturns, banks are forced to limit their lending, which exacerbates recessions. Credit constraints have detrimental effects on short-term volatility and long-term GDP growth (Aghion et al., 2010). Thus, much attention has been paid to countercyclical capital buffers (Drehman et al., 2010; Repullo and Saurina-Salas, 2011) and dynamic loan loss provisioning (Laeven and Majnoni, 2003) that alleviate capital cyclicality. Countercyclical ratios included in Basel III regulation have been developed to reduce cyclicality of bank lending (Behn, Haselmann and Wachtel, 2015). In addition, Olszak et al. (2017) provide evidence that loan loss provisions (LLP) created by banks may also be procyclical. This procyclicality is mostly visible for large, publicly traded and commercial banks. Cooperative banks have the least procyclical loan loss provisions, in relation to both commercial- and savings banks. This result of Olszak et al. (2017) may indicate that lending at cooperative banks may also be less cyclical.

The second area of relevant literature relates to cooperative banking and relationship banking. Cooperative banks have a very important market share in many European countries. They have an average market share of 20% in Europe with levels that can climb up to 60% in some countries (e.g., France). As such, there is an increasing strand of literature analysing the implications of their presence. Altunbas et al. (2001) examine differences in efficiency between commercial and cooperative banks in Germany. They provide evidence of slight advantages in cost and profit efficiency for cooperative banks. Hesse and Cihak (2007) compare financial stability of cooperative versus commercial banks in Europe. They find that cooperative banks have a higher Z-score, i.e. higher financial stability, than commercial banks. Fiordelisi and Mare (2014) find a positive link between competition and stability of cooperative banks in five countries of the European Union with the largest

cooperative banking sectors. The positive relation is confirmed in both the short- and the long run, also including the financial crisis period.

Groeneveld (2014) demonstrates that cooperative banks in Europe do exhibit a diverse performance when compared to all other banks throughout various stages in recent business cycles. Their specific corporate governance and decision-making mechanisms lead to a lower risk appetite, higher capitalization, and higher degree of stability. Egarius and Weill (2014) provide evidence for differences in competition levels between cooperative and commercial banks for five European countries. They point out that cooperative banks have a lower market power than commercial banks.

Polish cooperative banks are strongly present in their core regions and base their business on relationship lending. Relationship banking allows solving agency and asymmetric information problems (Boot, 2000). Although relationship banking can generate higher operating costs than transaction banking, such lenders are demonstrated to offer more favourable terms for loans to profitable firms during a crisis (Bolton et al., 2013). After the financial crisis, long-term, closer lending relations result in lower credit costs for firms (Sette and Gobbi, 2015). Beck et al. (2014) demonstrate that banks engaged in relationship lending have fewer credit constraints towards SMEs than other banks and that this is particularly visible during economic downturns. Moreover, Beck et al. (2014) find that relationship banking institutions help alleviate credit constraints to SMEs in regions particularly affected by economic downturns within one country.

Using the same bank sample as in our paper, Hasan et al. (2017) find that regions ("poviats") with a strong presence of cooperative banks are linked with better financing conditions for SMEs. SMEs located in poviats with a higher proportion of cooperative bank branches are shown to display higher investment and sales growth, as well as lower financing costs. In addition, new firm creation is also higher in cooperative bank dominated poviats. Some indirect evidence for potential procyclicality of cooperative banks towards country-wide economic cycles is provided by Hasan et al. (2017) in the estimations accounting for regional- and country wide crises. Better access to long-term financing and lower financing costs of SMEs in cooperative bank dominated poviats are reversed during country-wide deteriorations. No effects are seen for regional downturns. This could indicate that cooperative banks react to macroeconomic, rather than regional, deteriorations.[2]

There are few studies linking cyclicality of lending and cooperative (or regional) banks. Two studies are the closest to our analysis. Ferri et al. (2014) examine procyclicality of loan growth as a function of bank ownership structure in the Euro zone, including stakeholder banks such as savings and cooperative banks. Procyclicality is defined here as the link between loan growth and interest rate changes. The authors find that cooperative and savings banks are less procyclical than shareholder banks, but only cooperative banks remained less procyclical during the crisis. Ferri et al. (2014) suggest that this is due to the willingness of such banks to maintain longer-term relations with their clients, irrespective of their own financial standing or their economic environment. Behr et al. (2017) investigate the cyclicality of SME lending for German savings banks and cooperative banks. They question

[2] As no bank control variables are used in the estimations of Hasan et al. (2017), this result provides an indirect proof for procyclicality of cooperative banks and it is not the main scope of their analysis.

whether banks with government involvement – German savings banks – have a different behavior over the business cycle than other local banks without government involvement –German cooperative banks. They observe that savings banks are less procyclical than cooperative banks and motivate this result by their different business objectives. Lending of German cooperative banks is found to be positively related to German GDP growth, but no cyclicality is found for regional GDP growth.

Our literature review shows that there is consistent empirical evidence that procyclicality of lending exists in many banking sectors across the world. Foreign ownership may exacerbate it, while state ownership or some form of government involvement may minimise it. Cooperative banks that are independent from foreign shareholders and not vulnerable to shock transmission from abroad are likely to behave differently than their commercial bank counterparts, especially on Central European markets where the penetration of foreign shareholders is high. In addition, cooperative banks constitute a perfect sample to study loan cyclicality, as they focus on loan-and-deposit activities and on relationship lending, which is likely to be related to their own operating environment and not to their shareholders objectives.

3. Data

We base our analysis on financial statements data of 367 Polish cooperative banks. All the banks belong to the same associating bank, Bank Polskiej Spółdzielczości (BPS).[3] As a result, they all have similar funding possibilities within the group and potential competition between banks is also largely limited. BPS covers about two thirds of all cooperative banks in Poland and is mostly present in the south-eastern part of the country. Our data has a quarterly frequency and covers the period between 2Q2007 and 3Q2013, which amounts to 26 quarters and 8,653 bank-quarter observations.

This period is rather short to investigate the cyclicality of lending behavior of cooperative banks in Poland. But we are restricted by the unique data provided by BPS. We do however believe it is sufficient given the fact that we have quarterly data leading to 26 points in time. We have therefore a much greater number of periods than most studies on cyclicality of bank lending.

The data is strongly balanced, with very few missing observations. All bank financial data is in Polish zloty (PLN), which excludes the potential distortion problem of exchange rate fluctuations. In addition to bank data, we use quarterly macroeconomic- and regional economic data from the Polish Statistical Office (GUS) and its Local Data Bank (BDL). Table 1 provides summary statistics for the main variables used in our analysis.

The primary variable in our empirical analysis is loan growth. We use the quarterly rate of growth in gross loans extended by cooperative banks, calculated as the difference in gross loans in quarters *t* and *t-1*, divided by gross loans from *t-1*.

[3] We are very grateful to the BPS for providing the database.

Table 1 Descriptive Statistics for Main Variables

Variable	*Obs. No.*	*Mean*	*Std. Dev.*	*Min.*	*Max.*
Dependent variables					
Loan growth	8652	0.034	0.085	-0.137	0.499
Loan growth (banks)	8015	0.066	0.303	-0.950	1.548
Loan growth (clients)	8645	0.025	0.056	-0.695	0.187
Loan growth (subnationals)	8275	0.193	1.018	-1	8.020
Economic variables					
GDP growth	8652	0.017	0.094	-0.151	0.163
Unemployment	8652	0.119	0.013	0.089	0.143
Unemployment growth	8652	0.007	0.076	-0.138	0.168
Inflation	8652	0.033	0.010	0.005	0.047
Regional unemployment	8652	0.139	0.050	0.018	0.338
Regional unemployment growth	8652	0.009	0.091	-0.321	0.455
Bank control variables					
Equity	8652	0.136	0.051	0.009	0.440
Loans to assets	8652	0.872	0.125	0.141	0.980
Deposits to liabilities	8652	0.960	0.036	0	0.998
Bank size (ln)	8652	18.144	0.852	16.123	21.773
Bank size (PLN mln)	8652	115.915	159.176	10.049	2856.830

Notes: GDP growth is the change in the level of GDP on the country level (in %) between quarter of *t* and *t-1*; *Inflation* is the rate of inflation at the country level at quarter-end; *Unemployment* is the rate of registered unemployment at the country level at quarter-end; *Bank size (ln)* is the natural logarithm of total assets*; Bank size (mln)* are total assets given in millions of Polish zloty (PLN)*; Equity* is the relation of total equity to total assets lagged by one quarter; *Loans to assets* is the relation of total loans to total assets lagged by one quarter; *Deposits to liabilities* is the relation of total deposits to total liabilities lagged by one quarter.

4. Hypotheses and Methodology

We examine the cyclicality of lending for cooperative banks. Our key hypothesis posits that their lending is not procyclical versus the macroeconomic cycle. This hypothesis is based on two premises. First, cooperative banks have been developing in European countries because of problems arising from information asymmetries, which made it difficult for small companies and households to access commercial bank loans. With their specific ownership and governance, cooperative banks have a better knowledge of their clients than larger commercial banks frequently headquartered in the capital city. Cooperative banks frequently have long-standing relations with their clients and are thus less affected by asymmetric information problems. Therefore, the business cycle does not exacerbate asymmetry information problems the same way for these banks as for other banks.

Second, cooperative banks do not strictly follow profit maximization but also have supply-related objectives and welfare-maximising objectives for their shareholders, which are also bank clients. They are closely linked to their local environment, partly through their ownership structure, as well as through their stable and local client base. In consequence they also consider the goal of sustaining credit granting in the local economy. As a result, we pose our first hypothesis as follows:
Hypothesis 1: Cooperative bank lending is not procyclical towards economic cycles on the country level.

In order to verify this hypothesis, we estimate the following baseline equation:

$$LGR_{i,j,t} = \alpha + \beta_1 GDP\ growth_t + \beta_2 Bank\ control\ variables_{i,j,t-1} + \beta_3 Macroeconomic\ control\ variables_{t-1} + \gamma_{i,t} + \varepsilon_{i,j,t} \quad (1)$$

Equation (1) is estimated using a panel data fixed effects approach, with $\gamma_{i,t}$ accounting for bank fixed effects. The primary dependent variable is *Loan growth* (*LGR*) of total gross loans for bank *i*, located in "poviat" *j*, in quarter *t*. The growth rate is calculated as the difference between loans in quarters *t* and *t-1*, divided by loans in quarter *t*. The main explanatory variable, *GDP growth*, is also calculated based on quarters *t* and *t-1*. Our main goal is to study if banks modify their loan growth in accordance with trends in economic growth observed on the country level. We concentrate on short-term reactions in loan growth, from the current quarter to the next, to analyse the reaction of banks to contemporary changes in their economic environment. Hypothesis 1 suggests that there is no positive link between GDP growth and loan growth. If the coefficient for GDP growth is not significant, it will imply that cooperative banks do not make their loans a function of country-wide economic developments. If it is negative, it will indicate that cooperative banks behave anticyclically towards the general economic cycle.

Bank control variables include the ratios of equity to assets, loans to assets and deposits to liabilities, all lagged by one period to avoid endogeneity concerns. We account for bank size through the natural logarithm of total assets. *Macroeconomic control variables* consist of the rate of inflation and unemployment on the country level, also lagged by one period. Additionally, we include quarterly binary variables, to account for seasonality effects. Although the main estimations are performed using the fixed effects panel data approach, we check for potential endogeneity problems in a robustness check with a dynamic setting. We include a lagged dependent variable and perform a dynamic two-step system GMM estimation, which yields very similar results.

In the second step, we check if cyclicality of cooperative bank lending is driven by regional, rather than country-wide cycles. Historically, Polish cooperative banks were forced by regulations to limit their credit-granting activities to the "poviats" where they were headquartered, to maintain their regional character and discourage competition between neighbouring banks. In addition, cooperative banks did not possess advanced credit risk management tools that would allow them to adequately manage risk of a large and diversified client base outside their historical regions. As a result, they were basing on long-term relations with their clients from

their core regions. Although the restrictions on undertaking lending outside core regions have been largely lifted, Polish cooperative banks remain focused regionally. At the same time, as the data in Table 1 indicates, the economic situation in some "poviats" is very different from the national average. In consequence, it is quite likely that cooperative banks accommodate their loan growth to regional, rather than country-wide, conditions. We verify this through the second hypothesis, which posits that loan growth of cooperative banks is linked to local economic conditions:
Hypothesis 2: Cyclicality of cooperative bank lending is linked to regional economic cycles, with procyclicality visible on the "poviat" level.

To verify Hypothesis 2, we introduce regional economic data on "poviats", where cooperative banks are headquartered. The modified regression equation takes the following form:

$$\begin{aligned} LGR_{i,j,t} = \alpha &+ \beta_1 GDP\ growth_t + \beta_2 Poviat\ unemployment\ growth_{j,t} \\ &+ \beta_3 Bank\ control\ variables_{i,j,t-1} \\ &+ \beta_4 Macroeconomic\ control\ variables_{t-1} + \gamma_{i,t} \\ &+ \varepsilon_{i,j,t} \end{aligned} \tag{2}$$

The primary economic variable relating to the economic situation of "poviats" is their unemployment rate. The Polish Statistical Office does not provide GDP in regional splits, apart from the voivodship level, which is at a much higher level of aggregation. Unemployment is the next possible proxy and is measured quarterly at the "poviat" level. It accurately reflects the economic situation in the region and is likely to translate into different financial conditions of cooperative bank clients. In order to analyse loan cyclicality, we use *Poviat unemployment growth*, which is the growth rate of unemployment between quarters *t* and *t-1*, divided by unemployment in *t-1*. The construction of this ratio is similar to the GDP growth variable, as again we want to assess the changes in bank lending as a function of contemporary shifts in regional economic environment. All the remaining variables are the same as in Equation (1).

The third hypothesis deals with the influence of bank size. It assumes that the cyclicality of larger cooperative banks is different than that of smaller banks. On one hand, larger cooperative banks may have better access to funds, which can relax their financing constraints in troubled times. In addition, they may be more skilled at managing credit risk of a more diversified client group that is not necessarily part of relationship banking. Hence, they may be more willing to expand loans to unknown clients. Evidence in favour of this hypothesis would provide support for the consolidation of Polish cooperative banks through mergers to enhance the size of these institutions. On the other hand, however, very large cooperative banks may be more prone to extend loans to clients from larger regions with a more diversified economic cycle and thus be more vulnerable to changes in the country-wide economic indicators. At the same time, large cooperative banks are more competitive and more alike to commercial banks, the cyclicality of which has been proven in the literature. We pose the next hypothesis as follows:

Hypothesis 3: Cyclicality of bank lending versus macroeconomic cycles varies with bank size, with larger banks displaying a higher immunity to changes in macroeconomic conditions.

We check Hypothesis 3 through the introduction of an interactive term, representing large banks. The modified regression equation takes the following form:

$$\begin{aligned} LGR_{i,j,t} = \alpha &+ \beta_1 GDP\ growth_t + \beta_2 Large\ banks_{i,j,t} \\ &+ \beta_3 Large\ banks_{i,j,t} * GDP\ growth_t \\ &+ \beta_4 Bank\ control\ variables_{i,j,t-1} \\ &+ \beta_5 Macroeconomic\ control\ variables_{t-1} + \gamma_{i,t} \\ &+ \varepsilon_{i,j,t} \end{aligned} \tag{3}$$

We introduce two alternative variables for *Large banks*. First, we consider banks that are above the median of total assets for our sample. Second, we consider banks that are above the 90th centile of total assets and represent institutions likely to be able to compete with commercial banks at a local level. The remaining variables are the same as in Equation (1). As an additional test, we verify Hypothesis 3 also for regional economic cycles, through interacting the binary variables of *Large banks* with *Poviat unemployment growth* from Equation (2).

The fourth hypothesis concerns the type of borrowers. Our dataset allows us to divide the portfolio of loans for each bank into loans granted to banks, non-financial clients, and subnationals which are clients connected with the local government. The type of borrower plays a role in the degree of information asymmetries. Therefore, we can expect that loans associated with greater information asymmetries would be more procyclical. We predict that loans to clients should be more procyclical than loans to the two other types of borrowers, also due to more stable risk of default in the two remaining groups. The ability to distinguish loans to subnationals from other loans is of particular interest to investigate the influence of the political links at the local level. Several papers have shown the influence of the political authorities at the local level on the lending behaviour of local banks. For instance, Englmaier and Stowasser (2017) provide evidence that German savings banks, where local politicians are involved in their management, adjust lending policies in response to local electoral cycles.

We assume that loans to subnationals are more countercyclical – in line with the view that local authorities would put pressure on local banks to increase lending in troubled times – than other types of loans.

Hypothesis 4: Cyclicality of bank lending depends on the type of borrower, with higher procyclicality for loans granted to non-financial clients and lower procyclicality of loans granted to clients connected with the local governments or public institutions.

Hypothesis 4 is tested for both the country-wide and regional economic cycles. We use Equations (1) and (2) to empirically verify Hypothesis 4, where the dependent variable *Loan growth* is replaced by quarterly loan growth of bank loans, client loans and subnational loans respectively. All control variables remain unchanged.

5. Results

This section presents the results of the estimations. We first comment on the main estimations (Hypotheses 1 & 2). We continue with results on the influence of size (Hypothesis 3) and complete the analysis with the impact of the type of borrowers (Hypothesis 4).

5.1 Main Estimations

We present the main results in Table 2. We provide alternative specifications of the set of country-level variables to test the sensitivity of our results. We respectively include *Inflation* or *Unemployment* in Specifications (1) and (2). We then include both variables in Specification (3) and exclude both variables in Specification (4).

Table 2 Loan Growth and Macroeconomic Cycles

Dependent variable:				
Loan growth	*Specification 1*	*Specification 2*	*Specification 3*	*Specification 4*
GDP growth	-0.4325***	-0.3907***	-0.3860***	-0.3360***
	[0.0732]	[0.0709]	[0.0729]	[0.0714]
Inflation rate	-0.4802***		0.027	
	[0.0839]		[0.0966]	
Unemployment		1.1033***	1.1186***	
		[0.0930]	[0.1079]	
Bank size	-0.0294***	-0.0681***	-0.0684***	-0.0233***
	[0.0051]	[0.0062]	[0.0063]	[0.0050]
Equity	0.9847***	0.9089***	0.9080***	0.9874***
	[0.0641]	[0.0640]	[0.0641]	[0.0642]
Loans to assets	-0.2580***	-0.2651***	-0.2652***	-0.2583***
	[0.0101]	[0.0101]	[0.0101]	[0.0101]
Deposits to liabilities	-0.0368	-0.0192	-0.0188	-0.0324
	[0.0325]	[0.0323]	[0.0324]	[0.0326]
Intercept	0.6750***	1.2329***	1.2356***	0.5561***
	[0.0948]	[0.1082]	[0.1086]	[0.0927]
Quarter dum.	Yes	Yes	Yes	Yes
No. of observations	8652	8652	8652	8652
No. of banks	367	367	367	367
Adj.R-squared	0.15	0.16	0.16	0.15

Notes: Loan growth is the change in the level of gross loans (in %) between quarter of *t* and *t-1*; *GDP growth* is the change in the level of GDP on the country level (in %) between quarter of *t* and *t-1*; *Inflation* is the rate of inflation at the country level at quarter-end; *Unemployment* is the rate of registered unemployment at the country level at quarter-end; *Bank size* is the natural logarithm of total assets;

Equity is the relation of total equity to total assets lagged by one quarter; *Loans to assets* is the relation of total loans to total assets lagged by one quarter; *Deposits to liabilities* is the relation of total deposits to total liabilities lagged by one quarter. Estimations are performed including bank- and time fixed effects. Standard errors are given in parentheses; ***, ** and * denote significance levels at 1%, 5% and 10% respectively.

Our main finding is the countercyclicality of cooperative banks. In all estimations, we find a significantly negative coefficient for *GDP growth*, showing that loan growth evolves in opposition with the business cycle. As a result, we validate Hypothesis 1 as we do not find procyclicality of cooperative bank lending. On the opposite, lending is countercyclical. We explain this result by the fact that cooperative banks have specific characteristics. Their better knowledge of clients prevents them from amplifying information asymmetry problems during busts and from overreacting through excessive loan growth during booms. Their links to the local economy give them incentives to sustain credit in troubled times.

This finding has major implications, since it supports the view that the cooperative banking sector may provide a countercyclical tool to stabilize the economy, especially for households and SMEs on the regional level that are the cooperative banks' main client groups.

The analysis of control variables shows a significantly negative coefficient for bank size in all estimations, supporting the view that smaller banks have higher credit growth. This finding is in line with those obtained by Bertay et al. (2015), Brei and Schclarek (2013) and Ibrahim (2016) for other geographic samples. We observe a significantly positive coefficient for the ratio of equity to total assets. A greater share of loans in total assets is negatively related to loan growth. We do not observe any link between the share of deposits in liabilities and loan growth. Finally, we observe that the inclusion of country-level variables does not change the results.

We now compare the sensitivity of cooperative banks to country conditions and local conditions. Since we do not have information for GDP growth at the regional level, we use regional unemployment growth to take into account the local conditions. We perform six estimations by testing several specifications for the macroeconomic control variables at the country level (*Inflation*, *Unemployment*, *Unemployment Growth*). Table 3 reports the estimations.

We observe that *Regional unemployment growth* is significantly negative in the first two specifications but not significant in the other ones. We therefore find limited evidence for procyclicality of the lending behaviour of cooperative banks at the local level.

Two conclusions can then emerge from the analysis of the regional cyclicality. On the one hand, cooperative banks tend to react differently to country conditions and local conditions: they are countercyclical relative to national business cycles but to some extent procyclical to local business cycles. On the other hand, the lending behaviour of cooperative banks is more sensitive to country conditions than to local conditions: we observe that variables taking into account country conditions are all significant in all specifications.

We therefore find limited support for the Hypothesis 2 since there is procyclicality at the poviat level but no greater sensitivity to local conditions than to country conditions.

Table 3 Loan Growth and Regional Economic Cycles

Dependent variable						
Loan growth	*Specification 1*	*Specification 2*	*Specification 3*	*Specification 4*	*Specification 5*	*Specification 6*
GDP growth	-0.4319*** [0.0732]	-0.3386*** [0.0714]	-0.4263*** [0.0732]	-0.3403*** [0.0713]	-0.3858*** [0.0729]	-0.3907*** [0.0709]
Regional unemployment growth	-0.0345** [0.0143]	-0.0399*** [0.0143]	-0.0081 [0.0175]	-0.005 [0.0175]	0.0034 [0.0147]	0.0031 [0.0146]
Unemployment growth			-0.0741*** [0.0282]	-0.0964*** [0.0279]		
Unemployment					1.1253*** [0.1116]	1.1085*** [0.0962]
Inflation	-0.4663*** [0.0841]		-0.4315*** [0.0851]		0.0287 [0.0969]	
Bank size	-0.0271*** [0.0052]	-0.0209*** [0.0051]	-0.0232*** [0.0054]	-0.0164*** [0.0052]	-0.0688*** [0.0066]	-0.0685*** [0.0065]
Equity	1.0005*** [0.0644]	1.0056*** [0.0645]	1.0309*** [0.0654]	1.0446*** [0.0655]	0.9059*** [0.0647]	0.9071*** [0.0646]
Loans to assets	-0.2569*** [0.0101]	-0.2571*** [0.0101]	-0.2560*** [0.0101]	-0.2559*** [0.0101]	-0.2654*** [0.0101]	-0.2652*** [0.0101]
Deposits to liabilities	-0.0358 [0.0325]	-0.0315 [0.0326]	-0.0368 [0.0325]	-0.0331 [0.0326]	-0.0188 [0.0324]	-0.0192 [0.0323]
Intercept	0.6323*** [0.0964]	0.5106*** [0.0941]	0.5598*** [0.1003]	0.4282*** [0.0970]	1.2432*** [0.1134]	1.2397*** [0.1128]
Quarter dum.	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	8,652	8,652	8,652	8,652	8,652	8,652
Banks	367	367	367	367	367	367
Adj.R2	0.151	0.148	0.520	0.149	0.161	0.161

Notes: Loan growth is the change in the level of gross loans (in %) between quarter of *t* and *t-1*; *GDP growth* is the change in the level of GDP on the country level (in %) between quarter of *t* and *t-1*; *Regional unemployment growth* is the change in the level of unemployment rate on the regional ("poviat") level (in %) between quarter of *t* and *t-1*; *Inflation* is the rate of inflation at the country level at quarter-end; *Unemployment* is the rate of registered unemployment at the country level at quarter-end; *Bank size* is the natural logarithm of total assets*; Equity* is the relation of total equity to total assets lagged by one quarter; *Loans to assets* is the relation of total loans to total assets lagged by one quarter; *Deposits to liabilities* is the relation of total deposits to total liabilities lagged by one quarter. Estimations are performed including bank- and time fixed effects. Standard errors are given in parentheses; ***, ** and * denote significance levels at 1%, 5% and 10% respectively.

5.2 The Influence of Size

We can question if the cyclicality of Polish cooperative banks is influenced by their size. Namely, larger cooperative banks can have better access to funds, which can relax their financing constraints in crisis times. In line with this prediction, former works have shown lower procyclicality for larger banks (e.g. Bertay et al., 2015).

We investigate this question by testing two definitions of large banks. We first create the dummy variable *Large banks* which is equal to one if the bank has higher total assets than the median of total assets for the full sample and zero otherwise. The median of total assets is a natural threshold separating the population of banks into large and small banks. However, banks above the median are still relatively small given the dispersion of size across cooperative banks and much larger commercial banks that are active in Poland. It is with these latter banks that the largest cooperative banks are likely to compete with. We therefore adopt the 90 centile as a second threshold for large banks. This results in a more restrictive definition of large cooperative banks. The dummy variable *Top 10%* equals one if a bank has total assets above the 90 centile of total assets for the full sample and zero otherwise. We alternatively include two binary variables for large banks variables with their interaction term with *GDP growth*. The interaction variables provide information about the difference in cyclicality of bank lending between large and small cooperative banks.

The first four specifications of Table 4 provide estimations with *Large banks* while the last four specifications present estimations with *Top 10%*. We observe that the interaction variables *Large banks*×*GDP growth* and *Top 10%* ×*GDP growth* are significantly positive in all estimations. For the rest, we still observe that *GDP growth* is significantly negative. It consequently means that countercylicality of the lending behaviour of cooperative banks is lower for the largest banks. This finding supports Hypothesis 3 according to which larger banks would be less sensitive to changes in macroeconomic conditions, remembering however that this lower sensitivity takes place when small banks are behaving in a countercyclical way.

Therefore, the analysis of the influence of bank size shows that greater bank size contributes to reduce the countercyclical lending behaviour of cooperative banks. This countercyclical behaviour generates some macroeconomic benefits by contributing to smooth economic fluctuations. Smaller countercyclicality of large banks visible in our results implies that the consolidation of Polish cooperative banks through mergers may diminish the smoothing effects of the cooperative sector on credit supply.

We can however question if this finding also stands when it comes to changes in local economic conditions. Namely the sensitivity to local conditions can differ between large and small banks with small banks more sensitive to what is going on at the local level. To this end, we redo our estimations on the cyclicality of bank lending versus local business cycles by including simultaneously *Regional unemployment growth*, dummies for large banks, and the interaction terms between dummies for large banks and *Regional unemployment growth* in the estimations. Table 5 displays these estimations.

Table 4 Loan Growth and Macroeconomic Cycles as a Function of Bank Size

Dependent variable								
Loan growth	*Specification 1*	*Specification 2*	*Specification 3*	*Specification 4*	*Specification 5*	*Specification 6*	*Specification 7*	*Specification 8*
GDP growth	-0.4646***	-0.4219***	-0.4185***	-0.3654***	-0.4496***	-0.4087***	-0.4031***	-0.3529***
	[0.0741]	[0.0718]	[0.0738]	[0.0723]	[0.0733]	[0.0711]	[0.0730]	[0.0715]
Bank size	-0.0267***	-0.0655***	-0.0657***	-0.0208***	-0.0327***	-0.0724***	-0.0727***	-0.0268***
	[0.0054]	[0.0064]	[0.0065]	[0.0053]	[0.0053]	[0.0064]	[0.0065]	[0.0052]
Large banks	-0.0074*	-0.0075*	-0.0075*	-0.0067				
	[0.0042]	[0.0041]	[0.0041]	[0.0042]				
Large banks×GDP growth	0.0485***	0.0493***	0.0492***	0.0466***				
	[0.0177]	[0.0176]	[0.0176]	[0.0177]				
Top 10%					0.0150**	0.0177***	0.0178***	0.0155**
					[0.0067]	[0.0066]	[0.0066]	[0.0067]
Top 10% ×GDP growth					0.0805***	0.0794***	0.0793***	0.0785***
					[0.0288]	[0.0286]	[0.0286]	[0.0289]
Equity	0.9894***	0.9133***	0.9126***	0.9916***	0.9798***	0.9022***	0.9011***	0.9822***
	[0.0641]	[0.0640]	[0.0641]	[0.0642]	[0.0641]	[0.0640]	[0.0641]	[0.0642]
Loans to assets	-0.2577***	-0.2649***	-0.2650***	-0.2581***	-0.2577***	-0.2649***	-0.2650***	-0.2580***
	[0.0101]	[0.0101]	[0.0101]	[0.0101]	[0.0101]	[0.0101]	[0.0101]	[0.0101]
Deposits to liabilities	-0.0384	-0.0207	-0.0204	-0.0339	-0.0413	-0.0239	-0.0234	-0.037
	[0.0325]	[0.0323]	[0.0324]	[0.0326]	[0.0325]	[0.0323]	[0.0324]	[0.0326]
Inflation	-0.4882***	0.0196			-0.4804***	0.0325		
	[0.0839]		[0.0966]		[0.0838]		[0.0966]	
Unemployment		1.1090***	1.1201***			1.1115***	1.1299***	
		[0.0930]	[0.1078]			[0.0930]	[0.1079]	
Intercept	0.6306***	1.1893***	1.1914***	0.5147***	0.7380***	1.3114***	1.3148***	0.6209***
	[0.0993]	[0.1120]	[0.1125]	[0.0975]	[0.0980]	[0.1114]	[0.1118]	[0.0960]
Quarter dum.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	8,652	8,652	8,652	8,652	8,652	8,652	8,652	8,652
Banks	367	367	367	367	367	367	367	367
Adj.R2	0.151	0.162	0.162	0.148	0.152	0.163	0.163	0.148

Notes: Loan growth is the change in the level of gross loans (in %) between quarter of *t* and *t-1*; *GDP growth* is the change in the level of GDP on the country level (in %) between quarter of *t* and *t-1*; *GDP growth* is the change in the level of GDP on the country level (in %) between quarter of *t* and *t-1*; *Bank size* is the natural logarithm of total assets*; Large banks* are banks with total assets above median assets; *Top 10%* are banks with total assets above 90th centile of assets; *Equity* is the relation of total equity to total assets lagged by one quarter; *Loans to assets* is the relation of total loans to total assets lagged by one quarter; *Deposits to liabilities* is the relation of total deposits to total liabilities lagged by one quarter; *Inflation* is the rate of inflation at the country level at quarter-end; *Unemployment* is the rate of registered unemployment at the country level at quarter-end. Estimations are performed including bank- and time fixed effects. Standard errors are given in parentheses; ***, ** and * denote significance levels at 1%, 5% and 10% respectively.

Table 5 Loan Growth and Regional Cycles as a Function of Bank Size

Dependent variable:				
Loan growth	*Specification 1*	*Specification 2*	*Specification 3*	*Specification 4*
GDP growth	-0.4482***	-0.4015***	-0.4408***	-0.3947***
	[0.0733]	[0.0731]	[0.0733]	[0.0729]
Regional unemployment growth	-0.0075	0.0290*	-0.0289**	0.0095
	[0.0167]	[0.0170]	[0.0146]	[0.0150]
Large banks	-0.0064	-0.0064		
	[0.0042]	[0.0041]		
Large banks×Regional unemployment growth	-0.0571***	-0.0544***		
	[0.0185]	[0.0184]		
Top 10%			0.0159**	0.0190***
			[0.0067]	[0.0066]
Top 10% ×Regional unemployment growth			-0.0491	-0.0485
			[0.0306]	[0.0304]
Bank size	-0.0250***	-0.0665***	-0.0307***	-0.0735***
	[0.0055]	[0.0068]	[0.0054]	[0.0068]
Equity	0.9892***	0.8958***	0.9905***	0.8935***
	[0.0646]	[0.0649]	[0.0645]	[0.0648]
Loans to assets	-0.2564***	-0.2648***	-0.2565***	-0.2650***
	[0.0101]	[0.0101]	[0.0101]	[0.0101]
Deposits to liabilities	-0.0325	-0.0157	-0.0368	-0.0198
	[0.0325]	[0.0324]	[0.0325]	[0.0324]
Inflation	-0.4673***	0.0257	-0.4631***	0.0384
	[0.0841]	[0.0969]	[0.0840]	[0.0969]
Unemployment		1.1209***		1.1391***
		[0.1115]		[0.1116]
Intercept	0.5927***	1.2003***	0.6952***	1.3251***
	[0.1009]	[0.1171]	[0.0997]	[0.1167]
Quarter dum.	Yes	Yes	Yes	Yes
Obs.	8,652	8,652	8,652	8,652
Banks	367	367	367	367
Adj.R2	0.152	0.162	0.152	0.162

Notes: Loan growth is the change in the level of gross loans (in %) between quarter of *t* and *t-1*; *GDP growth* is the change in the level of GDP on the country level (in %) between quarter of *t* and *t-1*; *Regional unemployment growth* is the change in the level of unemployment rate on the regional ("poviat") level (in %) between quarter of *t* and *t-1*; *Bank size* is the natural logarithm of total assets*; Large banks* are banks with total assets above median assets; *Top 10%* are banks with total assets above 90th centile of assets; *Equity* is the relation of total equity to total assets lagged by one quarter; *Loans to assets* is the relation of total loans to total assets lagged by one quarter; *Deposits to liabilities* is the relation of total deposits to total liabilities lagged by one quarter; *Inflation* is the rate of inflation at the country level at quarter-end; *Unemployment* is the rate of registered unemployment at the country level at quarter-end. Estimations are performed including bank- and time fixed effects. Standard errors are given in parentheses; ***, ** and * denote significance levels at 1%, 5% and 10% respectively.

We observe that *Large banks×Regional unemployment growth* is significantly negative, suggesting that large banks are more procyclical to what occurs at the local level. However, *Top 10%×Regional unemployment growth* is not significant, which accords with the view that the very largest banks do not influence the link between lending behaviour and regional economic conditions. So we find limited evidence that the relation between local business cycles and lending behaviour is influenced by bank size.

5.3 The Influence of the Type of Borrowers

Until now we have investigated cyclicality of lending at the aggregate level for each bank. We considered only total lending for each bank without disentangling the portfolio of loans. However, banks grant loans to different types of borrowers and consequently the sensitivity of the different types of loans can be influenced in a different way by the business cycle.

The last part of our study focuses on estimations by types of loans. We have detailed information on the loan portfolio of each bank for three types of borrowers: banks, clients (i.e., non-financial clients), subnationals. This latter category gathers all clients that are connected with the local government, including public entities and public utilities owned by the local government.

We re-estimate our regressions by considering separately the three types of borrowers. For each type, we perform three regressions by including alternatively or jointly *Inflation* and *Unemployment*. The estimation results are presented in Table 6.

We find a striking conclusion: loans to banks and loans to clients are countercyclical while subnational loans are procyclical. *GDP growth* is indeed significantly negative in estimations explaining loans to banks and to loans to clients, while it is significantly positive in estimations with subnational loans as the dependent variable.

We extend this analysis by investigating if these findings are still observed when considering local economic conditions. Again, the sensitivity to local conditions can differ from the one to country conditions. We therefore redo the estimations by adding *Regional unemployment growth* in all specifications in Table 7.

While *GDP growth* has the same sign as before throughout all specifications, we interestingly find some evidence of the influence of local conditions on the cyclicality of loans to different types of borrowers. For bank loans, the sign of *Regional unemployment growth* is not significant in two estimations and significantly negative once, tending to show no influence of loans to banks to local business cycles. However, we observe that *Regional unemployment growth* is significantly negative in all regressions explaining growth of loans to clients. It therefore supports the view that loans to clients are procyclical relative to local economic conditions. In addition, we find that *Regional unemployment growth* is positive, being significant twice, when explaining growth of subnational loans. This result suggests that subnational loans would be countercyclical relative to local business cycles.

Therefore, we find very interesting results regarding the cyclicality of loans by type of borrowers. We observe that loans to clients are countercyclical to national business cycles but procyclical to regional business cycles. It accords with Hypothesis 4 that loans to clients would be more procyclical because of greater information asymmetries but only at the regional level. It shows the importance of regional economic conditions for the lending behaviour of cooperative banks.

In opposition to this, we demonstrate that subnational loans are procyclical to national business cycles but countercyclical to regional business cycles. This latter finding accords with the fact that political connections between authorities and banks at the local level would contribute to favour loans to local government entities in troubled times. It is in line with Hypothesis 4 that loans connected to the local government would be less procyclical but again only at the regional level.

To sum it up, these findings show additional support to Hypothesis 2 according to which lending behaviour of cooperative banks would be sensitive to regional economic conditions. The analysis by type of borrowers allows stressing the differences in sensitivity for the loans to national and regional economic conditions.

Table 6 Loan Growth of Various Borrower Segments – Macroeconomic Cyclicality

	Bank loans	***Bank loans***	***Bank loans***	***Client loans***	***Client loans***	***Client loans***	***Subnational loans***	***Subnational loans***	***Subnational loans***
	Specification 1	Specification 2	Specification 3	Specification 4	Specification 5	Specification 6	Specification 7	Specification 8	Specification 9
GDP growth	-1.3932***	-1.1772***	-1.2489***	-0.0839*	-0.0950**	-0.0882*	2.4874**	1.9945**	2.5623***
	[0.2751]	[0.2675]	[0.2743]	[0.0478]	[0.0466]	[0.0479]	[0.9855]	[0.9623]	[0.9869]
Bank size	-0.0779***	-0.2178***	-0.2134***	-0.0318***	-0.0276***	-0.0280***	-0.0881	-0.1286	-0.1640*
	[0.0192]	[0.0243]	[0.0246]	[0.0033]	[0.0041]	[0.0042]	[0.0695]	[0.0872]	[0.0883]
Equity	3.4499***	3.1558***	3.1716***	-0.1585***	-0.1498***	-0.1511***	0.3957	0.3633	0.2424
	[0.2489]	[0.2494]	[0.2497]	[0.0419]	[0.0421]	[0.0421]	[0.8861]	[0.8920]	[0.8929]
Loans to assets	-1.0311***	-1.0438***	-1.0425***	-0.0252***	-0.0244***	-0.0245***	0.1576	0.1609	0.1485
	[0.0600]	[0.0597]	[0.0597]	[0.0066]	[0.0066]	[0.0066]	[0.1484]	[0.1485]	[0.1486]
Deposits to liabilities	-0.7020***	-0.6099***	-0.6193***	0.1036***	0.1013***	0.1019***	-0.1778	-0.1997	-0.1494
	[0.1447]	[0.1441]	[0.1443]	[0.0212]	[0.0213]	[0.0213]	[0.4411]	[0.4412]	[0.4415]
Inflation	-1.9156***		-0.4164	0.0876		0.0394	2.4354**		3.3301**
	[0.3103]		[0.3531]	[0.0548]		[0.0635]	[1.1235]		[1.2939]
Unemployment		3.8917***	3.6529***		-0.1288**	-0.1066		0.1742	2.0774
		[0.3650]	[0.4174]		[0.0612]	[0.0710]		[2.1947]	[1.4906]
Intercept	2.5919***	4.5861***	4.5463***	0.5254***	0.4678***	0.4717***	1.8692	2.6286*	2.9786*
	[0.3635]	[0.4238]	[0.4251]	[0.0620]	[0.0713]	[0.0715]	[1.2961]	[1.5154]	[1.5209]
Quarter dum.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	8015	8015	8015	8645	8645	8645	8275	8275	8275
Banks	363	363	363	367	367	367	363	363	363
Adj.R2	0.148	0.156	0.156	0.127	0.127	0.127	-0.032	-0.033	-0.032

Notes: Loan growth is the change in the level of gross loans (in %) between quarter of *t* and *t-1*; *Bank loans* denote loans to financial institutions; *Client loans* denote loans granted to non-financial, non-public institutions; *Subnational loans* denote loans granted to public and local government linked entities; *GDP growth* is the change in the level of GDP on the country level (in %) between quarter of *t* and *t-1*; *Inflation* is the rate of inflation at the country level at quarter-end; *Unemployment* is the rate of registered unemployment at the country level at quarter-end; *Bank size* is the natural logarithm of total assets*; Equity* is the relation of total equity to total assets lagged by one quarter; *Loans to assets* is the relation of total loans to total assets lagged by one quarter; *Deposits to liabilities* is the relation of total deposits to total liabilities lagged by one quarter. Estimations are performed including bank- and time fixed effects. Standard errors are given in parentheses; ***, ** and * denote significance levels at 1%, 5% and 10% respectively.

Table 7 Loan Growth of Various Borrower Segments – Regional Cyclicality

	Bank loans	***Bank loans***	***Bank loans***	***Client loans***	***Client loans***	***Client loans***	***Subnational loans***	***Subnational loans***	***Subnational loans***
	Specification 1	*Specification 2*	*Specification 3*	*Specification 4*	*Specification 5*	*Specification 6*	*Specification 7*	*Specification 8*	*Specification 9*
GDP growth	-1.3848***	-1.1801***	-1.2492***	-0.0833*	-0.0943**	-0.0902*	2.4751**	1.9752**	2.5734***
	[0.2751]	[0.2675]	[0.2743]	[0.0478]	[0.0466]	[0.0479]	[0.9855]	[0.9623]	[0.9868]
Regional unempl. growth	-0.0933*	0.0309	0.0262	-0.0274***	-0.0334***	-0.0332***	0.2846	0.3391*	0.3817*
	[0.0541]	[0.0555]	[0.0556]	[0.0093]	[0.0096]	[0.0096]	[0.1937]	[0.2002]	[0.2007]
Bank size	-0.0719***	-0.2218***	-0.2169***	-0.0300***	-0.0233***	-0.0236***	-0.1063	-0.1734*	-0.2165**
	[0.0195]	[0.0254]	[0.0257]	[0.0034]	[0.0043]	[0.0043]	[0.0706]	[0.0912]	[0.0925]
Equity	3.4997***	3.1352***	3.1537***	-0.1459***	-0.1304***	-0.1314***	0.2706	0.1699	0.0178
	[0.2506]	[0.2521]	[0.2526]	[0.0421]	[0.0424]	[0.0425]	[0.8901]	[0.8991]	[0.9005]
Loans to assets	-1.0300***	-1.0443***	-1.0430***	-0.0244***	-0.0230***	-0.0232***	0.1495	0.1487	0.1341
	[0.0600]	[0.0597]	[0.0597]	[0.0066]	[0.0066]	[0.0066]	[0.1485]	[0.1487]	[0.1487]
Deposits to liabilities	-0.7042***	-0.6081***	-0.6175***	0.1044***	0.1014***	0.1018***	-0.1865	-0.2033	-0.1506
	[0.1447]	[0.1441]	[0.1443]	[0.0212]	[0.0212]	[0.0213]	[0.4411]	[0.4412]	[0.4414]
Inflation	-1.8860***		-0.404	0.0985*		0.0234	2.3318**		3.5228***
	[0.3108]		[0.3541]	[0.0549]		[0.0636]	[1.1256]		[1.2977]
Unemployment		3.9431***	3.7036***		-0.1849***	-0.1712**		0.7607	2.8477*
		[0.3765]	[0.4311]		[0.0633]	[0.0734]		[1.3400]	[1.5444]
Intercept	2.4848***	4.6523***	4.6035***	0.4914***	0.3951***	0.3980***	2.2122*	3.3848**	3.8498**
	[0.3687]	[0.4401]	[0.4421]	[0.0630]	[0.0742]	[0.0746]	[1.3168]	[1.5796]	[1.5882]
Quarter dum.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	8,015	8,015	8,015	8,645	8,645	8,645	8,275	8,275	8,275
Banks	363	363	363	367	367	367	363	363	363
Adj.R2	0.148	0.156	0.156	0.128	0.128	0.128	-0.032	-0.033	-0.032

Notes: Loan growth is the change in the level of gross loans (in %) between quarter of *t* and *t-1*; *Bank loans* denote loans to financial institutions; *Client loans* denote loans granted to non-financial, non-public institutions; *Subnational loans* denote loans granted to public and local government linked entities; *GDP growth* is the change in the level of GDP on the country level (in %) between quarter of *t* and *t-1*; *Regional unemployment growth* is the change in the level of unemployment rate on the regional ("poviat") level (in %) between quarter of *t* and *t-1*; *Inflation* is the rate of inflation at the country level at quarter-end; *Unemployment* is the rate of registered unemployment at the country level at quarter-end; *Bank size* is the natural logarithm of total assets*; Equity* is the relation of total equity to total assets lagged by one quarter; *Loans to assets* is the relation of total loans to total assets lagged by one quarter; *Deposits to liabilities* is the relation of total deposits to total liabilities lagged by one quarter. Estimations are performed including bank- and time fixed effects. Standard errors are given in parentheses; ***, ** and * denote significance levels at 1%, 5% and 10% respectively.

5.4 Robustness Checks

We check the robustness of our results in different ways. All the tables of the robustness checks are available in the *Appendix* (on the website of this journal). First, we use an alternative measure for loan growth in our estimations. Until now we have measured loan growth as the change in loans from quarter *t-1* to the quarter *t*. We motivate this specification by the fact that we want to focus on the most recent period and study contemporary changes in lending in the context of contemporary fluctuations in the economic environment. However, we use quarterly data and they may suffer from seasonal fluctuations. Although we control for this by including seasonal binary variables in all estimations, we perform additional robustness tests to rule out seasonality concerns. We re-calculate loan growth, using the difference between gross loans in quarter *t* and *t-4* divided by loans in *t-4*. This way we account for usually lower growth in first quarters of the year and higher growth in the last quarters. We re-calculate GDP growth accordingly. We observe the same findings as before: *GDP growth* is significantly negative in all estimations, supporting the view of countercyclicality of lending behavior of Polish cooperative banks (Table A.1 in the *Appendix* (on the website of this journal)).

Second, we consider the endogeneity problem. Our baseline regression model is potentially a subject to this problem since we can have reverse causality from loan growth to GDP growth. To tackle this problem, we include a lagged dependent variable to the right-hand-side of the equation and apply a dynamic two-step system GMM estimator (Arellano and Bover, 1995; Blundell and Bond, 1998), in line with Bertay et al. (2015). We assume that all bank control variables are endogenous and instrumented with lags, while economic variables and period binary variables are exogenous and included as iv-type regressors.

In the results of the dynamic specification, we still observe that the estimated coefficient of *GDP growth* is negative and significant in all estimations. At the same time, we observe that lending is procyclical towards regional unemployment growth, confirming the partial results of verifying Hypothesis 2. Our GMM results strengthen the potential procyclicality of lending on the regional level, as the statistical significance of the coefficient is sustained even when country indicators of unemployment are included in the regression (Specification 4). (Table A.2 in the *Appendix* (on the website of this journal)).

Third, we take into account asset quality in the estimations. The cooperative sector may have pockets of vulnerability due to weak asset quality. During the period of our study, average credit risk of cooperative banks in Poland was lower than that for commercial banks. At end-2012, cooperative banks made lower loan loss provisions (0.31% of total assets) than commercial banks (0.66%) and their non-performing loans were also much less elevated (6.3% of total loans) than for commercial banks (9%), as indicated in the regulatory reports from the National Bank of Poland.

At the same time, lower profitability of cooperative banks (ROA of 0.91% at end-2012) versus commercial banks (1.19%) was mainly due to higher operational costs of the cooperative sector. Similarly, to other countries, Polish cooperative banks are focused on relationship banking, which entails higher personnel costs and less automatized and hence more costly credit granting procedures. Despite relatively

healthy overall asset quality, several cooperative banks in Poland experienced problems with credit risk, which negatively affected their financial stability and contributed to their failure.

We account for potential distorting effects of credit risk on cyclicality of cooperative bank lending by including alternatively two control variables for asset quality: NPL defined as the ratio of non-performing loans to total loans, LLPROV measured by the ratio of loan loss provisions to total assets. We re-estimate our main regressions by adding alternatively each asset quality measure. In each case, we perform two regressions by including or excluding both variables *Inflation* and *Unemployment*. We observe the same findings as before: *GDP growth* is significantly negative in all estimations, suggesting that the inclusion of asset quality does not influence the conclusion. (Table A.3 in the *Appendix* (on the website of this journal)).

Additionally, we test if the findings remain the same when considering local economic conditions. We therefore redo the estimations by adding *Regional unemployment growth* in all specifications. With each indicator for asset quality, we perform two estimations with and without the inclusion of *Inflation*. We find the same results than in the main estimations. We see that *Regional unemployment growth* is significantly negative while *GDP growth* remains significantly negative. Thus the inclusion of asset quality in the estimations does not change the results. (Table A.4 in the *Appendix* (on the website of this journal)).

6. Conclusion

In this paper, we analyzed the cyclicality of lending for Polish cooperative banks. Cooperative banks have an important role in the financing of the local economy and as such can contribute to amplify or moderate business cycles through their lending behavior. Their local nature in terms of activities and of ownership also contributes to isolate these banks from the transmission of international shocks. Therefore, Polish cooperative banks can serve as a buffer against loan supply constraints during macroeconomic downturns. We obtain several findings.

First, cooperative banks have a countercyclical lending behavior. We find that their loan growth is negatively linked to GDP growth. This result comes from the local nature of these banks. Their better knowledge of clients allows them not to amplify business cycles through their lending behavior. Their links to the local economy make them sustain credit in troubled times.

Second, the lending behavior of cooperative banks is also sensitive to local economic conditions. On the regional level, cooperative banks are procyclical and shown to increase loans when economic conditions improve. However, the effect is not always stable and disappears when country conditions are controlled for.

Third, greater bank size contributes to reduce the countercyclical lending behaviour of cooperative banks. This conclusion stands for the influence of the country economic environment but not for the one of the local economic environment for which there is no change in the sensitivity of lending behaviour based on bank size.

Fourth, we observe differences in cyclicality of lending across types of borrowers. While loans to non-financial clients and loans to banks are

countercyclical to the macroeconomic cycles, we find evidence of procyclicality for loans to local government entities. On the regional level, we document stable and consistent procyclicality of non-financial client loans.

These findings have several policy implications. Cooperative banks can contribute to reduce business cycle fluctuations by smoothing adverse effects of macroeconomic fluctuations on the real economy. They serve as a buffer against loan supply constraints in troubled times by increasing their lending. Therefore, authorities have incentives to preserve the cooperative banking sector in the perspective of reducing procyclicality of bank lending. The conclusion of greater countercyclicality for small cooperative banks provides motives against the consolidation of the cooperative banking industry. In a nutshell, the take-away lesson for policymakers here is that preserving a cooperative banking industry with small institutions can be beneficial by reducing cyclicality of bank lending.

From a research perspective, we only provide a first analysis of the cyclicality of loan behaviour of Polish cooperative banks. These findings however offer tantalizing new avenues for further research.

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