The bank lending channel and monetary transmission in Central, Eastern and South-Eastern European countries

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THE BANK LENDING CHANNEL AND MONETARY TRANSMISSION IN CENTRAL, EASTERN AND SOUTH-EASTERN EUROPEAN COUNTRIES

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ABSTRACT

Using disaggregated data for 266 individual banks from Bankscope database and other supplementary sources, this article investigates the functioning of the bank lending channel and monetary transmission in 10 Central, Eastern and South-Eastern European (CESEE) countries over the period 2010-2018. It also takes into account the banks' characteristics such as: size and capitalisation, classifying the countries in three groups according to the development level of their banking sector, captured by the EBRD banking reform criteria. Results confirm the theory of bank lending channel, with smaller banks being more sensitive to monetary contractions in less developed financial systems. Capitalisation has a positive effect on loan growth, and changes in funding costs have the most significant impact on small and less capitalised banks. GDP growth and inflation have a positive impact on loan growth in all country groups.

Key words: bank lending channel; size and capitalisation; monetary transmission

1. INTRODUCTION

Determining the nature of the monetary transmission mechanism in a market economy is quite difficult, but this task becomes even more difficult for transition economies (Wróbel and Pawlowska, 2002; Golinelli and Rovelli, 2005). During the planned-economy era and the early-transition period, there was no market type economy monetary transmission mechanism in these economies due to the underdevelopment of financial institutions and markets. Furthermore, this mechanism couldn't be evaluated, since there was no data generation and collection process. By the mid-90s, institutions and financial markets developed sufficiently for policymakers to start utilizing traditional monetary transmission mechanisms, monetary policy tools, resulting in consistent and purposeful monetary policy. Data availability still limits policy experts to perform quantitative analyses (Gavin and Kemme, 2004).

The analysis of the monetary policy transmission mechanism in transition economies is crucial for a comprehensive understanding of the way in which a change in a central bank's interest rate instrument affects inflation. The latter is at

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the focus of an inflation targeting regime, which is adopted by a large number of transition countries as a monetary policy framework. This article investigates the functioning of the bank lending channel of the monetary policy transmission in ten Central, Eastern and South Eastern European (CESEE) countries over the period 2010-2018, using micro bank-level data mainly from Bankscope database, but also other supplementary sources, and controlling for cross-country heterogeneities. It aims at examining: (i) whether monetary conditions affect bank lending in selected CESEE countries; (ii) whether there is any linear relationship between certain bank characteristics (size and capitalisation) and the loan growth rate; (iii) the effectiveness of the bank lending channel, by looking whether there are distributional effects due to the bank's characteristics in the impact of monetary policy on bank lending. Most of existing literature on this topic consists of country-specific studies, whereas in this article the analysis is performed for a pool of selected CESEE countries controlling for cross-country heterogeneities.

The empirical studies on monetary transmission mechanism in Central and Eastern Europe that use micro data-based evidence, apply mainly the generally used approach of Kashyap and Stein (1995, 2000), which relies on discovering asymmetric movements of loans quantities, with respect to certain bank characteristics. De Bondt (1998, 1999) was among the first to provide empirical evidence on bank lending channel in Europe using individual bank data. However, these two studies did not conclude on a clear-cut conclusion since the results were dependent on the monetary policy indicator, as well as on the econometric methodology used. Favero et al. (1999) investigated the response of bank loans to a monetary tightening in 1992 in France, Germany, Italy and Spain. They found no evidence on the bank lending channel in any country they considered.

Wróbel and Pawlowska (2002) analyse the bank lending channel for Poland for 48 commercial banks, from 1995 to 2002. They find that the long-run effect of an increase in the interest rate on bank lending is smaller for a bigger bank; for capitalisation, the long-run effect of an increase in the interest rate on bank lending is smaller for more capitalised banks. Credit channel appears to operate mainly through small, poorly capitalised banks. A more recent study by Havrylchyk and Jurzyk (2005) is conducted on the existence of the bank lending channel in Poland for the period 1997-2002 and 67 banks (commercial banks and a few biggest cooperative banks). When the usual bank specific characteristics (size, liquidity and capitalisation) are considered, there is no evidence on bank lending channel of the monetary policy transmission. The inclusion of a variable which accounts for the ownership structure changes the results. In the latter case, small, less liquid banks expand their loan portfolios faster, while capitalisation becomes less important (as foreign banks are much better capitalised).

Juks (2004) studies the bank-lending channel in Estonia, using quarterly data from 1996 to 2004. The empirical results provide evidence in favour of the bank-lending channel. First, well-capitalised banks seem to experience a smaller outflow of deposits after a monetary contraction. As a consequence, a monetary policy shock that leads to a drain of deposits from the banking sector has the highest effect on deposits of less capitalised and more risky banks. Second, the liquidity position of banks seems to be an important determinant of loan supply, suggesting that more liquid banks are able to maintain their loan portfolios; yet, less liquid banks must reduce their loan supply after a monetary policy contraction.

Using quarterly data for the period 1996 to 2001, Pruteanu (2004) analyses the overall effect of the monetary policy changes on the growth rate of loans and the characteristics of the supply of loans in Czech Republic. Monetary policy changes alter the growth rate of loans with stronger magnitude in the period 1999-2001 than during 1996-1998. For the period 1996-1998, the cross-sectional differences in the lending reactions to monetary policy shocks are due to the degree of capitalisation and liquidity. For the subsequent period of 1999 to 2001, the distributive effects of the monetary policy depend on the bank size as well as the bank's proportion of classified loans.

The existence of the bank lending channel in Hungary is examined by Horváth, Krekó and Naszódi (2006) using quarterly data, from 1995 to 2004. Besides the usual bank specific variables (size, liquidity and capitalisation), the authors consider the foreign ownership as well. The novelty of this study is that it tests whether demand of loans can be considered homogenous across banks with respect to some bank-characteristics. The empirical evidence shows that the demand for loans can be considered reasonably homogenous across banks with respect to the share of foreign ownership and the size of banks. The main findings in terms of bank lending channel are that an increase in the policy rate induces a larger increase in the average cost of funding for smaller, less capitalised banks and for banks with a higher domestic share.

The following section describes the model applied, as well as the data used for the empirical analysis of this study.

2. METHODOLOGY

2.1 EMPIRICAL MODEL

Kashyap and Stein (1995) develop a theoretical model and use disaggregated bank balance sheet data to assess whether a lending channel exists in the US. They argue that the loan portfolios of banks of different sizes are expected to respond differently to a monetary policy contraction. In line with their model and other more recent empirical studies (see, e.g., Gambacorta, 2005; Gambacorta and Mistrulli, 2004; Bertay et al., 2012), this article uses an autoregressive model, in which the presence of a lending channel is tested by considering two bank characteristics: bank size (log of total assets) and capitalisation (equity to asset ratio), Kashyap and Stein (1995a, 1995b, 2000) and Kishan and Opiela (2000) claim that small banks are more prone to the problem of information asymmetry than large banks, which should be reflected in the higher sensitiveness of small banks to monetary policy shocks unlike large banks that can issue market instruments such as certificate of deposits. Evidence provided by Kishan and Opiela (2000, 2006) show that poorly capitalised banks reduce their loan supply more than well capitalised banks after a monetary contraction, due to their limited ability to utilize uninsured sources of funds.

In this article, we examine how changes in the short-term interest rate affect the total loans supplied by banks and whether banks with varying characteristics react differently to monetary policy shocks, using the following model specification, as proposed by Kashyap and Stein (1995):

$$\Delta lnL_{i,t} = \sum_{j=1}^{p} \alpha_j \Delta lnL_{i,t-1} + \sum_{j=0}^{p} \beta_j \Delta MP_{t-j} + \gamma z_{i,t-i} + \sum_{j=o}^{p} \delta_j \Delta MP_{t-j} z_{i,t-1} + \sum_{j=0}^{p} \varphi_j \pi_{t-j} + \sum_{j=0}^{p} \eta_j \Delta lny_{t-j} + \mu_i + \varepsilon_{it} \quad (1)$$

Individual banks are denoted *i (i =1, ..., N), and t (t=1, ..., T)* indicates the time observation for each variable; T is the number of time periods available for each bank i, and p is the number of lags. L is the dependent variable, namely (the natural logarithm of) the volume of loans supplied by bank i in year t; the parameter MP is the monetary policy stance indicator for each of the countries, captured by the short-term interest rate, and computed as the annual average of the monthly interest rate values. According to lending channel theory, the coefficient β should be negative: as interest rates increase, banks decrease the amount of loans supplied.

Since the main objective of this article is to investigate whether the monetary authorities can affect loans supply, it becomes necessary to account also for loan demand movements, which are captured by real GDP growth and inflation, that are denoted as y and π, respectively. Variables such as real GDP or inflation rate have traditionally been added to the model. The introduction of these two variables allows us to capture the cyclical movements and serves to isolate the monetary policy component of the interest rate changes (Gambacorta, 2005). To control for the existence of distributional effects of monetary policy among banks, the following indicators are utilized for the bank characteristics, incorporated in the variable (z): bank size and capitalisation, in line with the empirical studies mentioned earlier in this article. Size is computed as the natural log of total assets and capitalisation as the share of equity to total assets.

The banks' individual characteristics are normalized with respect to their mean across all banks in the sample, in order to make the average measure of a characteristic to add up to zero over all the observations. This means that for the regression (1), the mean of the interaction terms $\Delta MP_{t-j}\, z_{i,t-1}$ is also zero, and the parameters β_j are directly interpretable as the average effect of the monetary policy on loans.

$$Size_{it} = logA_{it} - \frac{\sum_{i=1}^{N} logA_{it}}{N_t}$$

(2)

$$Capitalization_{it} = \frac{E_{it}}{A_{it}} - \frac{\sum_{t=1}^{T}\left(\frac{\sum_{i=1}^{N}\left(E_{it}/A_{it}\right)}{N_t}\right)}{T}$$

The categorization of a large bank may change with varying market conditions, since banks which are considered to be small on a market with a deeper financial sector, might be regarded as medium-sized or large in a smaller market. Therefore, size is a variable that captures the possible bank-specific asymmetries as deviations from each period's mean. This removes the upward trend which can be observed in banks assets. Contrary to size, capitalisation is a less relative measure. For capitalisation, the overall sample mean (across banks and over time) is removed from each observation, allowing the interpretability of parameters β_j, without removing the trend from a possibly changing financial market (Ehrmann et al., 2003).

The model allows for bank-specific effects (μ_i). The parameters of interest are those in front of the monetary policy indicator (β_j), which capture the direct overall impact of monetary policy changes on bank lending growth, and the coefficients before the first order interaction terms (δ_j). The latter capture the distributional effects of monetary policy stance which is expected to be weaker among larger or better capitalised banks. Here the fundamental assumption is that size is a proxy for information friction or problems (adverse selection, moral hazard) so that smaller banks being more opaque have bigger difficulties in restructuring their portfolio of loans and other assets. Large banks on the other hand, may find it easy to raise funds to compensate for the effects of a contractionary monetary policy. They can use these funds to grant loans. But, as rates increase, they can lose loans to substitute source of financing. The effect of capital on the response of loans to monetary policy changes is expected to be positive. As banks become better capitalised, the amount of loans it provides becomes less sensitive to the policy. A positive and significant parameter (δ_j) implies that smaller and less capitalised banks react more strongly to monetary policy changes. Furthermore, if the coefficients on these cross terms are positive and statistically significant while the coefficient associated to ΔMP is negative, then the lending channel is at work. Conversely, if the coefficients on the interaction terms do not differ significantly from zero, then there are no loan supply effects from monetary policy at least based on this methodology. The coefficient in front of the bank characteristics has an illustrative role; it describes whether there is a linear relationship between the growth rate of loans and the bank characteristics. In other words, the situation when the coefficient β_j is statistically significant and negative, and the coefficient δ_j statistically positive represents the existence of the bank lending channel in these countries.

Specifically, in this article we will focus on the following hypotheses:

$$\text{Hypothesis 1: } \frac{\delta\, ^2L_{i,t}}{\delta size_{i,t}\delta MP_t} > 0$$

$$\text{Hypothesis 2: } \frac{\delta\, ^2L_{i,t}}{\delta cap_{i,t}\delta MP_t} > 0 \qquad (3)$$

where $L_{i,t}$, $size_{i,t}$, and $cap_{i,t}$ represent bank i's loans, size and capitalisation in year t, respectively, while MP denotes the proper interest rate measuring the monetary policy stance, where higher values of MP correspond to tighter monetary policy. It should be emphasized that the rationale behind accounting for the first order interaction terms is that the effect of monetary policy on bank loans should depend to a large extent on the balance sheet strength of the bank. It is worth noticing that bank characteristics variables, either in their linear forms or in the first order interaction terms, have been included in their lagged forms, as it can be understood from equation (1) specification. The reasoning behind this is that since bank characteristics are items of bank balance sheet, they might be highly correlated with the loan variable $L_{i,t}$.

The dynamic structure provided in the model specification (1) leads to more efficient and consistent estimates through the one-step difference Generalized Method of Moments (GMM) as proposed by Arellano-Bond (1991). This technique tackles the possible endogeneity issue present in the model and ensures consistent parameter estimates by choosing instruments for the lagged dependent variable so that the sample correlations between the instruments and the model's error term are as close to zero as possible (see Hamilton, 1994). This estimator instruments a first-differenced endogenous regressor in equation (1) with its lagged levels. The main idea behind this estimator is that past (lagged) levels are often predictive of current changes (Δx_{it}). Further, second or even deeper lagged levels of an endogenous regressor ($x_{i,t-p}$ for $p \geq 2$) are available as instruments for its first-differenced endogenous regressor (Δx_{it}) because, unlike the mean-deviations transform in standard fixed-effect estimations, second or deeper lagged levels of the endogenous regressor ($x_{i,t-p}$ for p ≥ 2) remain orthogonal to the error term ($\Delta v_{it} = v_{it} - v_{it-1}$) (Roodman, 2009).

Consistency of the GMM estimator depends on the validity of the instruments, which is verified by two specification tests suggested by Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998). The first is the Sargan (1988) (or Hansen) test of over-identifying restrictions, which examines the overall validity of the instruments. Under the null hypothesis of the validity of the instruments, the statistic associated with this test has a chi-squared distribution with (J-K) degrees of freedom where J is the number of instruments and K the number of the independent variables in the regression. The second test, the so-called Arellano-Bond test, is applied to control for the presence of autocorrelation in the first-differenced residuals, and to determine the number of lags available for instruments. Under the null hypothesis of no second-order correlation, the statistic associated with this test has a standard-normal distribution. Failure to reject the null hypotheses of both tests confirms the validity of our specifications.

2.2 DATA DESCRIPTION

This study employs disaggregated data based on financial statements derived mainly from Bankscope, provided by Bureau van Dijk (BvD), but also supplemented with the data and information from annual reports of the banks, from the respective central banks of the countries and from the International Monetary Fund, International Financial Statistics. The dataset (at an unconsolidated level) consists of annual observations from 10 CESEE countries[2] over the period 2010-2018 covering 266 individual banks, characterized by different types of ownership: commercial banks, savings banks, cooperative banks and investment banks, but it is an unbalanced panel, since there are some missing values at some time observations for some of the countries. Ashcraft (2006) and Gambacorta (2005) provide a discussion and evidence indicating that annual observations are appropriate for lending equations, thus affirming the utilization of this database for our study. Moreover, disaggregated data on banks can effectively capture the distributional effects of monetary policy through a lending channel (Bernanke and Blinder, 1992).

Two worries about the quality of the data arise from the wide variation in practices regarding the writing off of non-performing loans and the absence of consistent information on the amount of non-performing loans across banks. First, the degree to which estimated loan growth is distorted by this consideration depends on how the misreporting of total loans net of write-offs changes over time for each bank. Second, any under-provisioning against non-performing loans results in an overstatement of both bank equity and total assets. These potential data problems must be considered when interpreting the regression results (Fries, Taci, 2002).

Due to the short time span and sample heterogeneity, the banks are clustered in groups according to the progress in banking reform captured by the EBRD (2020) transition indicators as published in the Transition Reports and ATC scores database. A simple mean of this indicator is computed for the period 1989-2016, in order to take into account both the initial conditions and the entire evolution of banking reform for each of the considered countries. The countries are divided in three groups: the first one comprises the least developed ones, such as: Albania, Bosnia and Hercegovina and Serbia (economies where the average index of banking reform is situated between 2.14 and 2.67); the second group consist of Bulgaria, Romania and North Macedonia (an average banking reform index between 2.74 and 2.86), and the third group includes: Croatia, Poland, Hungary and Czech Republic (with an average index of the banking reform between 3,14 and 3.55).

[2] *Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Hungary, North Macedonia, Poland, Romania and Serbia.*

3 EMPIRICAL RESULTS

3.1. EVIDENCE ON THE AGGREGATE LEVEL FOR EACH GROUP OF COUNTRIES

First, a 'benchmark model' is estimated for all country groups, which does not include the bank characteristic (z) and the interaction between the bank characteristics and the monetary policy indicator $\Delta MP_{t-j}\, z_{i,t-1}$. This will give us a preliminary insight into whether the loan growth responds to monetary policy changes and to macroeconomic conditions. The full model, given by the equation (1) will be referred to as the 'extended model'. The estimations are done separately for each group of countries.

The tables below summarise the results of the estimation of the 'benchmark' and the 'extended' models for total loan growth, first for the whole sample, and then separately, for each group of countries. The reported figures represent the long-run elasticities of the models.

The long-term coefficient of a variable is computed as the sum of its coefficients (of its lags and current values, where applicable) divided by one minus the sum of the coefficients of the lags of the dependent variable. For instance, the long-run elasticity of the dependent variable with respect to monetary policy for the average bank is given by $\sum \beta_j \big/ (1-\sum \alpha_i)$.

Table 1. 'Benchmark model' (equation (1)) (long-term coefficients).

Dependent variable	Growth rate of total loans		
Specifications	(1st group)	2nd group)	3rd group)
Monetary policy	-0.048*** (0.002)	-0.069* (0.069)	-0.028* (0.064)
GDP growth	0.067*** (0.000)	0.004 (0.661)	0.024** (0.037)
Inflation	0.097*** (0.000)	0.073*** (0.000)	0.023* (0.809)
p-value Hansen	0.293	0.247	0.166
p-value AR1/AR2	0.0035/0.248	0.006/0.534	0.144/0.603
No. obs./ No. banks	261/56	244/51	470/124

Note: p-values in parentheses.
, **, * denotes significance at 10%, 5%, and 1% level, respectively.*
Source: Author's computation.

Several diagnostic tests are performed to verify that the individual models satisfy all of the necessary assumptions. Throughout all tables we report the outcomes of the Arellano-Bond (1991) test for first and second order autocorrelation of the residuals, which constantly show that we cannot reject the null hypothesis of no second-order autocorrelation. Since the estimator is in first differences, first-order autocorrelation does not imply inconsistent estimates. Robust estimators are used to correct for heteroscedasticity. The Hansen test does not reject the overidentification conditions. If the null cannot be rejected, the model is supported (Roodman, 2009) and this is the case throughout the paper (see the p-values at the bottom of the tables).

Regarding the monetary policy effects on the growth rate of total loans, changes in the policy-induced interest rate have a negative and significant impact in the three groups of countries; thus, the theory of bank lending channel holds for the all the groups based on this version of the model: loans tighten after a monetary policy contraction. With regards to the impact of macroeconomic conditions, the influence of GDP growth is positive for all the groups, but statistically significant only for the first and third one, while inflation affects positively and significantly the loan growth in all the country groups.

In the extended version of the model, we add consecutively banks' characteristics and their interaction with monetary policy rate and we concentrate on the significance of the linear relationship between the growth rate of total loans and the banks' characteristics - the coefficient γ in equation (1) - and of the distributive effects of monetary policy on the growth rate of loans due to these bank characteristics, i.e. the interaction coefficients δ_1 in the same equation. As in the case of the benchmark model, we estimate the extended version for all the three country groups. The estimated results are presented in Table 2.

Table 2. 'Extended model' (equation (1)) (long-term coefficients).

Dependent variable	Growth rate of total loans					
Specification		1st group		2nd group		3rd group
MP	-0.055* (0.052)	-0.033* (0.069)	-0.086** (0.016)	-0.079** (0.042)	-0.045 (0.380)	-0.048** (0.0362)
Size	-0.372*** (0.000)		-0.0159 (0.478)		0.229*** (0.000)	
Size*MP	0.025*** (0.003)		0.001 (0.923)		0.006 (0.612)	
Cap		0.025** (0.016)		0.036*** (0.000)		0.020*** (0.000)
Cap*MP		0.001 (0.648)		0.004 (0.591)		0.002 (0.235)
GDP growth	0.049 (0.191)	0.042*** (0.001)	0.034*** (0.009)	0.011 (0.329)	0.034*** (0.004)	0.011** (0.030))
Inflation	0.015** (0.041)	0.014 (0.251)	0.091*** (0.000)	0.05*** (0.001)	0.043*** (0.0003)	0.032*** (0.000)
p-value Hansen	0.346	0.279	0.141	0.295	0.403	0.209
p-value AR1/AR2	0.0269/0.1833	0.0361/0.164	0.037/0.521	0.013/0.38	0.05/0.747	0.217/0.554
No. obs./ No. banks	261/56	249/56	194/39	243/51	359/106	467/123

Note: p-values in parentheses.
*, **, *** *denotes significance at 10%, 5%, and 1% level, respectively.*
Source: Author's computation.

The theory of bank lending channel still holds for all the groups, but the size of the effects of monetary policy on banks' lending varies across the different specifications. The results reveal a linear negative relationship between bank size and the loans growth rate for the countries with the least developed financial system and those with a moderate level of financial development (i.e. the first and second group, respectively), even though for the latter the effect is statistically insignificant. This indicates that on average, for these countries, small banks enjoy higher loan growth rates; while the opposite holds for the most advanced countries, where the coefficient before the bank size is positive and statistically significant. The interaction term between monetary policy and bank size presents a significant positive coefficient only for the first group of countries, supporting the previous findings that small banks are more sensitive to monetary contractions compared to bigger ones; whereas for the two other group of countries, bank size does not affect the loans growth in the aftermath of a monetary policy tightening for none of the banks.

Capitalisation seems to be an important variable in explaining bank loan supply behaviour for all the groups: better capitalised banks are less likely to decrease their lending (ceteris paribus). This means that well-capitalised banks enjoy higher loan growth rates. The overall analysis demonstrates a positive coefficient for the interaction term between capitalisation and the monetary policy for all the groups, but none of these coefficients result to be significant, implying that capitalisation does not influence the growth rate of total loans to clients in the aftermath of a monetary policy change based on this specification of the model and on country group level analysis.

The effects of the macroeconomic indicators that account for demand movements are robust across the different models. The long-run elasticity of credit to GDP is always positive and significant in most of the cases. The response of credit to prices is always significant and positive as well. It is worth noting that the coefficient on inflation picks up both the positive effect of inflation on nominal loan growth and the potential negative effects of higher inflation via higher nominal interest rates. It seems that the first effect has dominated for all groups in our case.

The analysis at the aggregate level for each group of countries does not show significant results in terms of bank characteristics for all the cases, which could come from the existing heterogeneity among banks, inside each group. Consequently, it would be more appropriate to examine the impact of bank characteristics on the growth rate of loans through an analysis on single countries in a pooled regression for each group.

3.2 EVIDENCE ON SINGLE COUNTRIES

In this section, we extend our model with some dummy[3] variables, in order to account for cross-country differences within each group, by allowing the parameters of interest, i.e. those of the monetary policy indicator and the interaction between banks' characteristics and the monetary policy indicator to vary across countries. The loan demand elasticities with respect to GDP and inflation are supposed to be homogeneous across banks inside each group. This extended version of the model can be written as below:

[3] *These variables are binary and take value 1 for a certain country and 0 for all the others.*

$$\Delta lnL_{i,t} = \sum_{j=1}^{p} \alpha_1 \Delta lnL_{i,t-1} + \sum_{j=0}^{p} \beta_j \, \Delta MP_{t-j} * dcountry + \gamma z_{i,t-i} + \sum_{j=o}^{p} \delta_j \, \Delta MP_{t-j} z_{i,t-1} * dcountry + \sum_{j=0}^{p} \varphi_j \pi_{t-j} + \sum_{j=0}^{p} \eta_j \, \Delta lny_{t-j} + \mu_i + \varepsilon_{it} \quad (4)$$

Table 3 summarizes the estimation results, which reveal differences between the three groups of countries, both in terms of magnitude and significance.

Table 3. 'Extended model' for bank size (equation (4)) (long-term coefficients).

Dep. variable	Growth rate of total loans					
	1st group		2nd group		3rd group	
Control variables						
MP	Albania	-0.14* (0.09)	Bulgaria	-0.082** (0.038)	Croatia	-0.02** (0.04)
	Bosnia-Hercegovina	-0.01* (0.084)	Romania	-0.031** (0.019)	Poland	-0.02** (0.028)
	Serbia	-0.01* (0.08)	North Macedonia	-0.09** (0.016)	Hungary	-0.036** (0.028)
					Czech Republic	-0.057* (0.092)
Size		-0.71*** (0.000)		-0.001 (0.971)		0.060*** (0.003)
MP*size						
	Albania	0.206*** (0.000)	Bulgaria	0.007 (0.680)	Croatia	0.016** (0.049)
	Bosnia-Hercegovina	0.171*** (0.002)	Romania	0.005 (0.652)	Poland	0.024*** (0.001)
	Serbia	0.005 (0.354)	North Macedonia	0.035* (0.06)	Hungary	-0.006 (0.269)
					Czech Republic	0.005 (0.934)
GDP growth		0.018* (0.05)		0.029** (0.011)		0.022** (0.028)
Inflation		0.01 (0.627)		0.046*** (0.000)		0.024** (0.043)
p-value Hansen		0.626		0.251		0.508
p-value AR1/AR2		0.015/0.280		0.029/0.678		0.01/0.692
No. obs./ No. banks		261/56		194/39		359/106

Note: p-values in parentheses.
, **, * denotes significance at 10%, 5%, and 1% level, respectively.*
Source: Author's computation.

As regards the effects of monetary policy on the growth rate of total loans, changes in the policy-induced interest rate have a negative and significant impact in all the considered countries, which complies with the results of the analysis performed earlier in this article. This reconfirms the bank lending channel theory: loans fall after a monetary policy tightening. These results represent the average impact of the monetary policy across all banks, which are considered to have the same weight, regardless of their market share or other characteristics.

Next we focus on the significance of the linear relationship between the growth rate of total loans and the bank characteristics and the distributive effects of monetary policy on the loans growth rate due to these bank characteristics for the three groups of countries. The test for the bank lending channel consists in checking whether the coefficients of interaction terms are statistically significant or not. If the coefficients on these cross terms are positive and statistically significant while the coefficient associated to ΔMP is negative, then the lending channel is at work. Conversely, if the coefficients on the interaction terms do not differ significantly from zero, then there are no loan supply effects from monetary policy at least based on this methodology.

The estimations reveal a significant linear negative relationship between bank size and the loans growth rate in the case of the 1st group of banks, implying that small banks from this group enjoy higher loan growth rates; while for the second group of countries this coefficient is insignificant. The most advanced countries are characterized by a significantly positive coefficient of size, indicating that large banks in these countries are the ones that take advantage of higher rates of loan growth. The interaction term between the monetary policy and bank size that represent the distributive effect of monetary policy changes due to bank size, results significant for some of the countries: Albania, North Macedonia, Croatia and Poland, meaning that size, as a bank characteristic, influences the loans growth in the aftermath of a monetary policy change for the banks of these countries, but not for the rest of the countries.

Table 4. 'Extended model' for bank capitalisation (equation (4)) (long-term coefficients).

Dep. variable	Growth rate of total loans					
	1st group		2nd group		3rd group	
Control variables						
MP	Albania	-0.16* (0.08)	Bulgaria	-0.103*** (0.000)	Croatia	-0.033*** (0.002)
	Bosnia-Hercegovina	-0.011* (0.087)	Romania	-0.038*** (0.001)	Poland	-0.025** (0.001)
	Serbia	-0.08** (0.010)	North Macedonia	-0.05* (0.054)	Hungary	-0.009** (0.000)
					Czech Republic	-0.051* (0.020)
Capitalisation		0.033*** (0.000)		0.038*** (0.000)		-0.005 (0.226)
MP*cap						
	Albania	0.008 (0.645)	Bulgaria	0.009*** (0.003)	Croatia	0.004*** (0.000)
	Bosnia-Hercegovina	0.007 (0.865)	Romania	0.008** (0.048)	Poland	0.005*** (0.000)
	Serbia	0.002 (0.787)	North Macedonia	0.002 (0.831)	Hungary	0.001 (0.142)
					Czech Republic	0.003 (0.182)
GDP growth		0.055*** (0.000)		0.012* (0.066)		0.013*** (0.000)
Inflation		0.007 (0.627)		0.041*** (0.000)		0.027*** (0.000)
p-value Hansen		0.389		0.263		0.172
p-value AR1/AR2		0.002/0.691		0.01/0.174		0.22/0.586
No. obs./ No. banks		249/56		243/51		467/123

Note: p-values in parentheses.
, **, * denotes significance at 10%, 5%, and 1% level, respectively.*
Source: Author's computation.

Based on our results, capitalisation presents an overall significant linear and positive effect on the growth rate of total loans for the first two groups, but negative and insignificant for the third one. For the distributive effects of the monetary policy, the overall analysis reveals, in the case of the least advanced banks (first group), a positive coefficient for the interaction term between capitalisation and the monetary policy in all the countries, but the interaction coefficient is statistically significant only for Bulgaria, Romania, Croatia and Poland, confirming the theory: less capitalised banks are more affected by the monetary policy conditions in these countries. For the group of least advanced banks (first group), the coefficient of the interaction term is not significant, meaning that capitalisation, as a bank characteristic, does not influence the growth rate of total loans in the aftermath of a monetary policy change.

As regards the macroeconomic conditions' impact, the influence of GDP growth is positive and significant for all the groups; inflation which is also meant to account for demand factors, impacts positively the loan growth in all the groups, but not significantly in all the cases. These results are robust across the different model specifications comprising the ones in the former estimation results for country groups.

Other empirical studies have found similar results on the bank lending channel and the monetary transmission in these CESEE countries (see for instance Skufi (2020); Vika, Suljoti (2015); Vika (2007) for Albania; Kovacevic, D. (2015) for Bosnia Herzegovina; Kujundžić and Otašević (2012) for Serbia; Eliskovski (2018) for North Macedonia; Nenova et al. (2019) for Bulgaria; Wróbel and Pawlowska (2002) for Poland; Pruteanu (2004) for Czech Republic; Horváth, Kréko and Naszódi (2006) for Hungary; Vizek (2006) for Croatia, Jimborean (2007) for Romania and other selected CEEC countries etc.).

4. CONCLUSIONS AND POLICY IMPLICATIONS

This article investigates the functioning of the bank lending channel in 10 CESEE countries over the period 2010-2018, classifying the commercial banks of these countries in three groups according to the development level of their banking sector, captured by the EBRD banking reform criteria. Using disaggregated data mainly from Bankscope database, but also other supplementary sources, this article analyses: (i) whether monetary conditions affect bank lending; (ii) whether there are linear relationships between some particular bank characteristics (size and capitalisation) and the loan growth rate; and (iii) we examine the effectiveness of the bank lending channel, by looking whether there are distributional effects due to the bank's characteristics in the impact of monetary policy on bank lending.

The results reveal that bank lending contracts significantly after a monetary tightening both on group and country level. We find some significant linear effects of bank size on the growth rate of loans for the countries with the least developed financial system and the most advanced ones (i.e. the first and third group of countries, respectively), but with reverse signs (positive in the first case and negative in the second one), indicating that on average, for the least developed countries, small banks enjoy higher loan growth rates, whereas the opposite holds for the most advanced countries. Capitalisation presents an overall significant linear and positive effect on the growth rate of total loans for all the country groups, meaning that better capitalised banks are less likely to decrease their lending (ceteris paribus).

As regards the distributive effects of monetary policy on the loans growth rate due to these bank characteristics, our findings suggest that changes in the cost of funding engineered by monetary policy actions exert their maximum impact on small banks in Albania, North Macedonia, Croatia and Poland, and on less capitalised banks in Bulgaria, Romania, Croatia and Poland, confirming the theory that small and less capitalised banks are more affected by the monetary policy conditions in these countries, correspondingly. Furthermore, these banks are best placed to refinance the real economy, in particular small- and medium-sized firms, which are the biggest generator of employment in the economy. Large and more capitalised commercial banks, on the other hand, appear to be more competent to isolate their lending activities from changes in monetary policy conditions.

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