Expansionary monetary policy and bank lending: the case of new Euro Area member states

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Abstract: We study the effectiveness of the bank lending channel in the transmission of the unconventional monetary policies of the European Central Bank (ECB). We use the bias-corrected LSDV estimator to study the effect of ECB's unconventional policies on bank lending to private sector on a sample of 54 banks from the 5 new Euro Area (EA) member states over the years 2008-2018. We distinguish two groups of unconventional monetary policies – the Quantitative Easing (QE) and central bank lending to commercial banks. We find that the two groups of unconventional policies did not have a statistically significant effect on bank lending in all the sampled countries. However, for Slovakia, with its comparatively healthy banking system, we find evidence that the QE did boost credit provision to private sector. Indeed, we find that both the ECB's lending to commercial banks and the QE had stronger effect on healthier banks in Slovakia.

Keywords: unconventional monetary policies; ECB; European Central Bank; QE; quantitative easing; bank lending channel; LSDVC estimator; new EA member states; monetary policy transmission.

Reference to this paper should be made as follows: Fisera, B. and Kotlebova, J. (2020) 'Expansionary monetary policy and bank lending: the case of new Euro Area member states', *Int. J. Monetary Economics and Finance*, Vol. 13, No. 4, pp.383–416.

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This paper is a revised and expanded version of a paper entitled 'Expansionary monetary policy and bank lending: the case of new euro area member states' presented at *17th International Conference on Finance and Banking*, Karvina, Czech Republic, 16–17 October, 2019.

1 Introduction

The economic downturn caused by the global financial crisis (GFC) of 2008–2009 and the subsequent subdued economic recovery has led to introduction of ultra-loose monetary policies by several of the world's most important central banks. These prominently included the European Central Bank (ECB), which after cutting its main policy rate to zero (and reaching the zero lower bound) started with the policy of Quantitative Easing (QE) in 2015 in order to prevent deflation threat and lay foundations for the economic recovery. Furthermore, the ECB introduced numerous other non-standard liquidity proving policies – with the aim of easing the monetary conditions even further. These expansionary policies[1] aimed to influence inflation, as the main target of ECB's policy, through number of transmission channels. In this paper, we aim to study the effectiveness of one of these transmission channels – the bank lending channel. That is, we intend to study the effect of expansionary or unconventional monetary policies of the ECB on bank lending. The standard view of the bank lending channel assumes that by leading to higher bank deposits, expansionary monetary policy may encourage banks to increase their lending to the real economy. Then, the higher lending could lead to higher investments, employment and by extension to higher economic growth and inflation. So far, many studies have investigated the overall effectiveness of unconventional policies, but not much attention has been given to the role of the bank lending channel in the transmission of these policies. Even though, many of these policies could be expected to operate through the bank lending channel.

For example, the QE, as by far the most important programme introduced by the ECB in the post-GFC era, may be expected to affect the bank lending in three ways – the higher bank reserves may motivate the commercial banks to provide more credit, furthermore, higher asset prices might also lead to higher bank equity and thus stimulate higher bank lending. Finally, higher bond prices caused by the QE may lead to changes in relative prices of assets – thus requiring a new optimal portfolio allocation – with higher proportion of relatively longer-term and higher-yielding assets, which may include loans (Tischer, 2018). Through these three channels, the QE might be expected to lead to higher bank lending, higher investments and economic growth and eventually to higher inflation, as well. The first of the three channels described above represents the traditional bank lending channel. Furthermore, apart from QE, the ECB also introduced other programmes to enable further policy loosening. These notably included targeted long-term refinancing operations (TLTROs), which represented direct loans of the Eurosystem to the commercial banks. These loans were provided at favourable conditions and banks could only use these funds to provide loans to firms or non-housing related loans to households. Thus, these policies may also be expected to operate through the

bank lending channel – by providing additional funding to the commercial banks, these policies may lead to higher bank lending.

Now, with regards to the standard monetary policies,[2] there is a general consensus in the literature that these policies are more likely to operate through weaker banks (for example less capitalised or liquid) – that is, looser standard monetary policy is likely to increase bank lending of more constrained banks more significantly. It is assumed that these weaker banks, which are constrained by lack of resources, will be able to use the additional sources of funding provided by the monetary policy and increase their lending (Jayaratne and Morgan, 2000). However, Albertazzi et al. (2016) argue that for unconventional monetary policies, this relationship could be reversed. They argue that since the unconventional policies are generally introduced in the times of stress on the financial markets, they are more likely to benefit the stronger banks – as weaker banks are unable to increase their credit provision (even with additional funds offered by the central bank) because they, for example, need to deleverage or they have to meet the regulatory requirements imposed on them by the regulators.

In this paper, we use the bank-level data on 54 banks from the five new Euro Area (EA) member states to study the effects of ECB's unconventional monetary policies on the credit supply in these countries. We distinguish two groups of unconventional monetary policies – the QE policies and the central bank lending to commercial banks.[3] We cover the period over the years 2008–2009 in this analysis. We contribute to the existing literature on the effectiveness of bank lending channel in different aspects. First, to the best of our knowledge, ours is the first paper that uses the national central bank (NCB) balance sheet data to study the effects of these two groups of monetary policies on bank-level credit supply in the case of the Eurozone. The second contribution of this paper is the study of the effectiveness of the bank lending channel in the case of the five new EA member states (Estonia, Latvia, Lithuania, Slovakia and Slovenia) – all of which are the former transmission economies. We concentrate on this group of former transition economies, as they form a rather homogenous bloc within the Eurozone. And while the role of heterogeneity in the transmission of the monetary policies and the heterogeneity of the Eurozone had already been discussed, this was done primarily in the case of the 'North-South' divide in the EA. However, the new EA member states can not be neatly attributed to either the northern or southern bloc within the EA. Instead, these countries have many common and specific characteristics within the Eurozone – above-average growth rates, relatively low per capita income, low private and public debts and their financial systems are primarily bank-based with underdeveloped capital markets and dominated by foreign-owned banks (Jimborean, 2009). Thus, if the ECB's unconventional policies were to attain their goal in this group of countries, they would have to operate through the bank lending channel. Additionally, we concentrate on this group of countries because we hypothesise that these countries, which are on average poorer than old EA members and which generally experienced higher growth rates over the past two decades, could be more affected by ECB's ultra-loose policies – as there are more investment opportunities available that the banks can fund. The under-average credit-to-GDP ratios could also enable such an expansion in the bank lending. On the other hand, these faster growing states may then be more prone to formation of asset price bubbles – especially on the real estate market, which could be fuelled by expansionary monetary policies. Besides, these ultra-loose policies could also fuel an unsustainable growth of private sector debt. Indeed, for example the National Bank of Slovakia (NBS) has recently been voicing concerns about the rapid growth of private

sector debt in Slovakia (NBS, 2018) – consequently, we aim to investigate, to what extent did ECB's unconventional policies such as QE contribute to this development. The third contribution of this paper is our analysis of the role of bank-level characteristics in the transmission of unconventional monetary policies. Fourth, we contribute to the literature by investigating the relationship between the unconventional monetary policies and the macroprudential policies, which are increasingly being used by many central banks alongside their monetary policy toolkits.

Our findings can be summarised as follows. We do not find evidence that either of the two studied policies seems to have affected the bank lending in the case of the banks from all five new EA member states. As the Baltic countries were hit hard by the financial crisis and the burst of the asset prices bubbles in 2008–2009 – in the post-crisis era the banks from these countries were thus under pressure to deleverage (especially banks in Latvia) – which was also the case of the banks from Slovenia. Therefore, in the next step of our analysis we study the effectiveness of the bank lending channel on only a sub-sample of banks from Slovakia. Slovak banks have weathered the financial crisis relatively unscathed, the banking sector is relatively healthy – and in the post-crisis era, the country experienced the most significant growth of the private sector debt from all the studied countries. Our findings do confirm that the QE policies of the ECB did contribute to this development, as they had a positive effect on bank lending in Slovakia. We furthermore find some evidence that in Slovakia, the QE policies had more positive effect on healthier banks, and that the central bank lending also had a more positive effect on healthier and more capitalised banks. Thus, we do confirm that the theoretical assumptions that the healthier banks benefit more from the unconventional policies seem to hold in the context of former transition economies (especially in the context of Slovak banks, but we did find some weak evidence also for the full sample of banks from all five new EA member states). Finally, we do not find evidence that the macroprudential policies have hindered or reinforced transmission of either of the studied groups of unconventional policies. However, we do find that the macroprudential policies reinforce the standard monetary policies.

The rest of the paper is structured as follows: next section presents some stylised facts about the banking sectors of the new EA member states and the ECB monetary policy in the post-crisis era. Afterwards, Section 3 is dedicated to the literature review. Section 4 outlines our dataset and empirical methodology, while the Section 5 reports the results and sixth section concludes the paper.

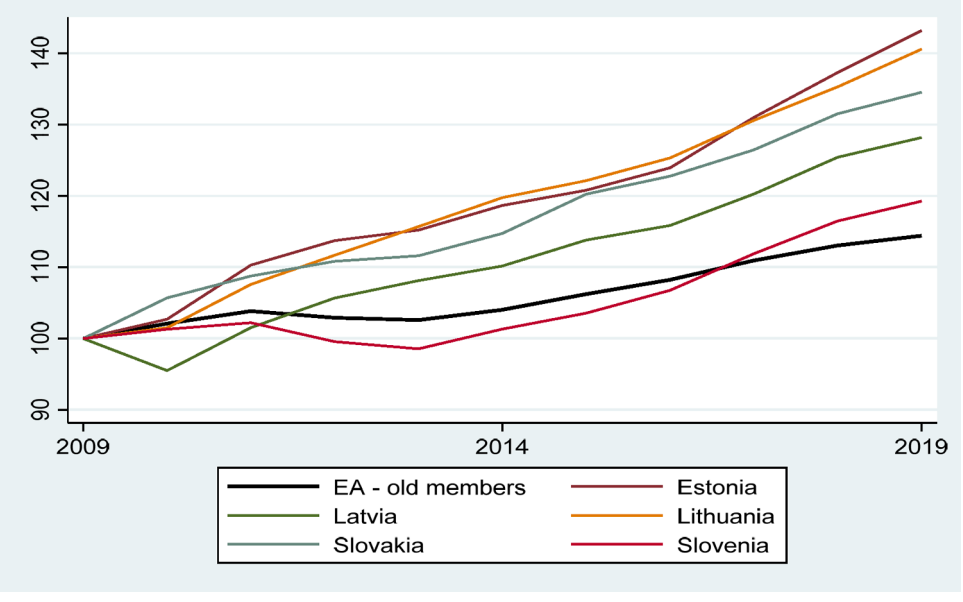
2 Stylised facts

2.1 Banking sector in the new EA member states

The new EA member states, as former transition economies, have undergone a difficult process of transition towards the market economy in the 1990s. For this group of five countries, the transition process was concluded rather successfully and was followed by a period of rapid economic growth. As a result, these countries, which initially lagged substantially behind the old members, have gradually been closing the gap with the old members. Figure 1 clearly demonstrates that every new EA member state outperformed the average old members' economic growth in the post-GFC era. With regards to total outstanding loans of banks to non-financial corporations and households, the

development has been more heterogeneous for the five former transition economies – as is shown on the Figure 2. Only in Estonia, Lithuania and especially in Slovakia did the total outstanding loans grow faster than in the old EA member states. This was the case especially after 2014 – that is, after the ECB greatly loosened its monetary policy. On the other hand, Latvia and Slovenia both experienced unstainable lending growth prior to the GFC era – consequently, the post-crisis era in both these countries was dominated by restructuring of the banking sector, which led to a significant reduction in the total amount of outstanding loans. Despite significant increases in overall bank lending in the pre-crisis era, the overall share of outstanding loans to GDP (i.e., credit-to-GDP ratio) in the new EA member states had already been lower than the average value for old members in the pre-crisis era (Figure 3). During the post-crisis era, the credit-to-GDP ratio in all new EA member states except Slovakia decreased more significantly than in the old member states. Slovakia, which started with lowest credit-to-GDP ratio from all the countries in our sample, saw a rapid growth of bank lending, which resulted in Slovakia having the highest credit-to-GDP ratio by 2019.

Figure 1 Real GDP of old and new EA member states (see online version for colours)

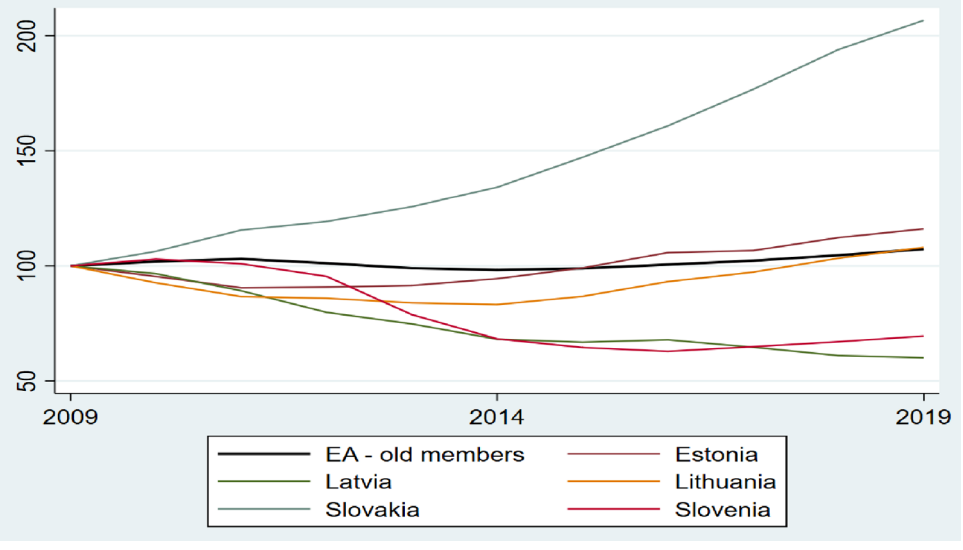


Chain linked real GDP (2009=100) of 12 old EA member states and the five new EA member states that are included in our sample. The source of the data is Eurostat.

In spite of the restructuring of the banking sectors, the financial systems of the new EA member states remain overwhelmingly bank-based – with capital markets being rather underdeveloped.[4] Consequently, any positive effects of ECB's expansionary policies are likely to operate primarily through the banking sector. The restructuring of banking sector, which occurred in different time periods in the respective new EA member states, have resulted in these countries' banking sectors being healthier than the banking sectors in the old EA. While the ratio of capital to total assets for the banks in old EA was equal to 7% in 2018, in new EA the figure averaged almost 13%. With the return on assets (ROA) in excess of 1%, the banks in the new EA were also more profitable in 2018 than

the banks in the old EA – which had a ROA of only about 0.5%.These figures do provide some rationale for an assumption that banks in the new EA could be more likely to extend more credit than their counterparts in old EA – since these banks seem to be on average healthier and they operate in economies with faster economic growth, hence they could be expected to use the additional liquidity to increase lending. Nonetheless, the banks in new EA also have riskier loan portfolios – as their non-performing loans (NPLs) represented some 5% of total loans in 2019, while for old EA the corresponding figure was 3.5%.

Figure 2 Outstanding loans[1] in old and new EA member states (see online version for colours)



Chain linked outstanding loans (2009=100) of 12 old EA member states and the five new EA member states that are included in our sample. The source of the data is European Central Bank.

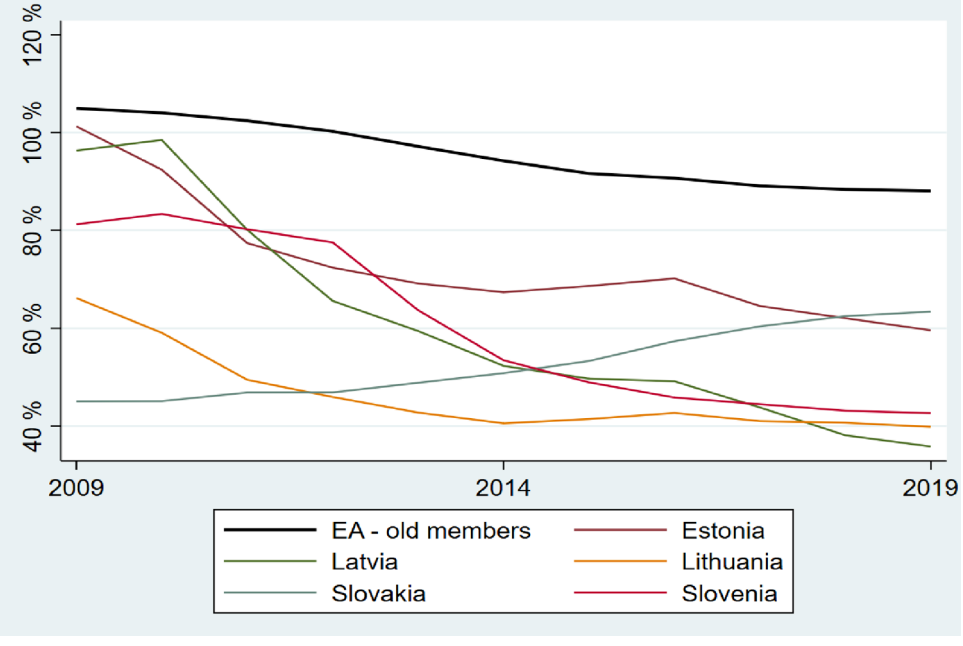
[1]Loans to households and non-financial corporations

2.2 The monetary policy of the ECB in the crisis and post-crisis era

Initially, the ECB responded to the GFC in a conventional manner – it reduced the policy rates. During the GFC, the ECB additionally started or expanded some liquidity providing operations – for example, the long-term refinancing operations (LTRO) were extended to six, later to 12 and even 36 months. After reaching the ZLB in 2014, the ECB announced the targeted long-term refinancing operations (TLTROs), which were aimed at increasing bank lending to the private sector by providing financing to banks for the periods of up to four years. The TLTRO I was operated quarterly until March 2016. TLTRO II followed since June 2016 on a quarterly basis until summer 2017. As all the applied measures failed to prevent the acute threat of deflation, the ECB responded by introducing its Quantitative Easing (QE) programme – called Asset Purchase Programme (APP). The APP consisted of several programmes, as a part of which, the ECB purchased mostly government bonds in the secondary market (PSPP), but also smaller quantities of covered bonds (CBPP III), asset-backed securities (ABSPP) and since 2016 commercial

bonds (CSPP). The monthly asset purchases under APP amounted to 60 billion EUR until March 2016, when this figure expanded into 80 billion EUR. Economic recovery coupled with higher inflation (albeit still below ECB's target) led to the reduction of these purchases back to 60 billion EUR in March 2017, then to 30 billion EUR in January 2018, to 15 billion EUR monthly starting September 2018. The APP was discontinued in December 2018, however, the principals continued to be reinvested. Considering worsening economic outlook for the Euro Area, as well as still meagre inflation, the ECB announced third round of TLTROs, which commenced in September 2019.

Figure 3 Ratio of outstanding loans to GDP in old and new EA member states (see online version for colours)



Source: European Central Bank and Eurostat

3 Literature review

In this section of the paper, we review the empirical studies, which have investigated the effects of unconventional policies on bank lending. In this paper, we follow several strands of literature. The first strand of literature that we follow are those papers that investigate the effects of unconventional monetary policies in general. These studies generally concentrate on the effects of these policies on inflation or on other macroeconomic variables (i.e., GDP). Among the unconventional policies, most papers focus on the QE. Generally, papers mostly find that these policies did have a positive effect on inflation and on output – though they mostly do not empirically investigate, which transmission channels contributed most to these positive effects. An early example of such a study is Lenza et al. (2010), who use a BVAR model and find that non-standard measures that the ECB implemented during the crisis did have a positive impact on output and inflation. However, these effects only appeared with a lag. Baumeister and

Benati (2010) use BVAR to analyse the effect of yield spread compression that is caused by the asset purchases by the central bank. They found that the compression of yield spreads in the four major advanced economies did boost both output and inflation. Darracq-Paries and De Santis (2015) focused on the analysis of macroeconomic effects 3-year LTROs introduced by the ECB – their results indicated that LTROs contributed positively to prices in the Euro Area. Andrade et al. (2016) found using a DSGE model that the ECB's APP raised both inflation and inflation expectations. Weale and Wieladek's (2016) findings also confirm a positive relationship between the QE and inflation – in consensus with other studies. Their analysis using a BVAR found that an announcement of a QE worth 1% of GDP raised inflation in the USA and UK by 0.62% and 0.32%, respectively. Beck et al. (2019) investigated the macroeconomic effects of QE in 41 countries and they did find a strong and positive effect of this policy on both inflation and inflation expectations. However, they concluded that the main factor driving this positive effect on inflation was the exchange rate depreciation induced by the QE. Finally, Wang (2019) used the shadow rate as a proxy for unconventional monetary policy to estimate a DSGE model of US economy. The counterfactual simulation also found that the macroeconomic variables of the USA would have performed worse in the absence of FED's unconventional monetary policies.

The papers outlined above focus on the overall effects of unconventional monetary policies. These policies may, however, affect the real economy through many different channels of transmission. And in this paper, we aim to investigate the effects of unconventional policies on bank lending – that is, we focus on the bank lending channel. The bank lending channel is one of the traditional channels of transmission, through which the unconventional policies may affect the real economy. The second strand of literature that we follow is therefore the bank lending channel literature. The number of studies dedicated to this issue is, however, rather limited. This is so mainly because, in the case of QE, as the most significant unconventional policy measure, it is usually assumed that the effect on wider economy could operate through other channels of transmission than the bank lending channel. For example, Beck et al. (2019) believe that the QE is likely to affect expectations of future interest rates (signalling channel), the asset prices (asset valuation channel) and inflation expectations (reanchoring channel). Joyce and Spaltro (2014) further suggest that the effectiveness of the bank lending channel may be reduced during the crisis times – as banks are under pressure to deleverage. This argument is supported by empirical findings of Gambacorta and Marques-Ibanez (2011), who find that banks with less core capital and more dependence on market funding reduced their lending more significantly. There are also many earlier studies, which found that health of banks' balance sheets and especially their level of capitalisation (for example Van den Heuvel, 2007) are important for their credit provision. Consequently, during the crisis times, the bank lending channel may be expected to be less efficient, as the banks are not able to use the additional resources supplied by the central bank to provide more credit. Nevertheless, the ECB's QE (alongside many of ECB's other expansionary programmes) was only started a few of years after the GFC. Therefore, we hypothesise that the bank lending channel may have played a more significant role in the transmission of ECB's unconventional policies – as the banks were healthier at that point and the liquid reserves banks obtained from selling their assets to Eurosystem, could have enabled them to increase their loans supply. For example, Bowman et al. (2015) studied the effects of Japanese QE on bank lending and they found that the positive effect of increased liquidity on bank lending was strongest

during the first years of QE, however, this limited positive effect disappeared in the following years – indicating that the QE had in fact strongest effect when the banks were actually weaker. Additionally, as Joyce and Spaltro (2014) argue, even if the central bank purchases assets from non-bank financial institutions, the resulting additional liquidity is likely to result in higher bank deposits, thus helping banks to overcome financing constraints that they may have been facing. And some further empirical studies did find positive effects of QE on bank lending. For example, Rodnyansky and Darmouni (2017) investigated the effect of QE on US banking sector and concluded that while the QE did have a positive effect on US bank lending, banks reacted heterogeneously to the QE – depending on the type of asset being targeted by the central bank. Consequently, they found that banks with higher share of mortgage-backed securities (MBS) increased their credit provision more significantly relative to other banks (as the FED was also purchasing MBS as a part of its QE).

Finally, we also discuss the findings of empirical studies, which investigated the effectiveness of bank lending channel in the case of the Euro Area. Here, Boeckx et al. (2017a) examined the impact of expansionary and exogenous balance sheet shock of the ECB. They found that such a shock indeed does increase bank lending, depresses interest rate spreads, weakens the Euro and raises both economic growth and inflation. Looser lending standards of the banks were found to have contributed more to increased credit provision than the loan demand. Furthermore, the positive effects of expansionary monetary policies were more pronounced in member states with more capitalised banking systems. Boeckx et al. (2017b) investigated the effect of Eurosystem's credit provision policies on 131 Eurozone banks. They did find a positive effect of these policies on Euro Area banks' lending to private sector – especially on lending of smaller, less liquid and less capitalised banks. These authors use the ECB's balance sheet as a measure for ECB's credit support policies. Albertazzi et al. (2016) used a dataset on bank-level lending rates to study the effects of both conventional and unconventional monetary policies on bank lending. These authors used key policy rate as their measure of conventional policy and as a proxy for unconventional policies, they used the difference between the shadow rates and the key policy rates. They also found that the bank lending channel in the Euro Area was operational in the studied period – for both the conventional and unconventional policies. Non-standard monetary policies were found to benefit the stronger banks more. On the other hand, Behrendt (2017) used a SVAR model to examine the relationship between the unconventional monetary policy and bank lending and found that the unconventional monetary policy did not boost the bank lending very significantly. Lojschova (2017) studied the effect of ECB's QE on bank lending in Slovakia. Using bank-level data and the deposits ratio as a proxy for QE, she concluded that the QE did boost the bank lending – more so for the households than for firms. Siranova and Kotlebova (2018) used SVAR model to investigate the effects of both standard and non-standard policies on credit provision in Slovenia. They used the change in central bank claims on domestic sector as a measure of unconventional balance sheet policies and they found that while these unconventional policies did reduce interest rates on loans, this effect did not seem to have been transmitted fully into an upsurge in the provision of credit. Martins et al. (2018) found that unconventional monetary policy in the Eurozone had a positive and lagged impact on bank credit – this effect was much stronger for bank credit to general government at 1.2% monthly, than for the bank credit to households, which was up by only about 0.2% monthly. Guth (2018) used country-specific data for the Euro Area countries and concluded that the increased liquidity provided by the ECB

did boost the loan demand, loan supply and to lesser extent economic growth. When studying the effects of unconventional monetary policies, most authors concentrate either on the effects of QE or on the effects of unconventional policies in general. Nevertheless, Garcia-Posada and Marchetti (2016) represent an exception, as they focused on the effects of two very long-term refinancing operations (VLTRO) on credit supply in Spain and they found that these VLTROs had a moderately positive effect, which was driven by illiquid banks and by credit to SMEs.

4 Data and empirical strategy

In this section, we initially discuss the data used for the purpose of this research, as well as the empirical methodology.

4.1 Data

We rely on annual bank-level data from the Bankscope database and we focus primarily on the crisis and post-crisis period. As a result, in our baseline regressions, our sample represents an unbalanced panel of 56 banks from the five new EA member states. Due to data limitation, we do not include the foreign bank branches in our dataset. Our analysis covers period between the years 2008 and 2018. However, for Estonia, Latvia and Lithuania, which entered the Eurozone only in 2011, 2014 and 2015, our dataset only starts after these countries entered the Eurozone. Our dependent variable is *Bank lending*, which represents the overall lending by banks to their customers – expressed as an index with the value of 100 for the first observation available for each bank. Our main explanatory variable is one of the measures of ECB's unconventional monetary policies. We concentrate on two main measures of ECB's policies, the *QE*, which we proxy with the outstanding amounts of debt securities, held by the respective national central banks (NCB) for monetary policy purposes, and *Central bank lending*, which represents respective NCBs direct lending to commercial banks. Similar approach was taken by Horvath et al. (2018). We use the former as a proxy for QE and the latter as a proxy for TLTROs and other direct lending of the Eurosystem to the commercial banks. Both these variables are expressed in millions of Euros and enter our regressions as ratios to GDP. Apart from unconventional policies, we also control for conventional central bank policies. We follow the interest rate pass-through (IRPT) literature (i.e., Gambacorta and Marquez-Ibanez, 2011; von Borstel et al., 2016; Horvath et al., 2018) and use *Eonia* 1-day interbank interest rate as our proxy for the standard monetary policies.[5] With higher interest rates, the credit becomes more expensive and therefore the demand for credit declines. Thus, we expect the Eonia to have a negative relationship with the bank lending. Furthermore, we include several control variables in our regressions to control for individual bank characteristics in line with the literature on bank lending channel (for example Kashyap and Stein, 2000). *Capital Ratio* represents the ratio of bank equity to total assets and *ROE* is the bank return on equity. We also control for the ex-post riskiness of bank's loan portfolio by including a variable *LLR*, which represents the loan loss reserves expressed as the ratio of loan loss reserves to bank's gross loans. This measure is standardly used by the literature to control for riskiness in bank lending channel literature (Altunbas et al., 2010). Furthermore, in line with Gambacorta and Murcia (2017) we also include a control variable for bank's funding composition by

including variable *Deposits ratio*, which represents the share of bank's deposits from its customers to its total liabilities. To control for bank size, we also include the variable *Total assets* among our controls – this variable enters our regressions in logarithmic form. Lastly, to control for bank liquidity, we use the variable *Liquidity ratio*, which is expressed as a ratio of cash and deposits in central bank to total assets. In line with most assumptions of most theoretical models, we expect the bank size, liquidity and capitalisation to have a positive effect on bank lending (Gambacorta and Marques-Ibanez, 2011).

Additionally, we also include two macroeconomic variables to control for macroeconomic developments in the countries, in which the banks operate. These macroeconomic variables include GDP growth and inflation. *GDP growth* represents the annual real growth of the economy. The economic growth influences the bank lending positively – as when the economy is growing, the households and firms demand more loans (Calza et al., 2003; Egert et al., 2006). *Inflation* is expressed as the annual rate of change of the HICP index. Higher inflation is normally associated with high interest rates and thus, one could expect higher inflation to have a negative effect on demand for credit and by extension on bank lending (Martins et al., 2018). Finally, apart from macroeconomic factors, regulatory environment and the risk environment in which the banks operate have changed during the studied period. The unconventional monetary policies may have changed banks risk tolerance – with significant amount of liquidity injected in the banking sector by the central bank, the commercial banks' risk appetite may have increased. Among others, Altunbas et al. (2010) did find a significant positive link between the looseness of monetary policy and bank risk taking. As a result, we introduce a variable *Credit standards*, to our framework. This variable is taken from the ECB's quarterly Bank Lending Survey (BLS) of a representative sample of banks from all EA member states. This variable is the difference between the percentage of banks that have tightened their credit standards and the percentage of banks that have loosened their credit standards. Therefore, an increase of the value of this variable could be interpreted as tightening of banks' overall credit standards, while a decline in the value of this variable represents a loosening of banks' overall credit standards. We argue that the changes in banks' credit standards could act as a proxy for the changes in banks' risk tolerance. If the unconventional monetary policies indeed lead to an increase in banks' risk appetite, the banks will likely loosen their credit standards. On the other hand, if the banks are turning more risk averse, they will likely tighten their credit standards. The summary statistics and the sources of the data are reported in Table 1.

Based on Table 1, our sample is mostly made up of rather small banks – as half of all banks have amount of outstanding loans smaller than 2 billion euros, furthermore, the banks are rather well capitalised, not very profitable (Although these results are driven by less profitable banks – mostly due to bank restructuring in some countries from our sample during the post-crisis era), and there are few banks with very high loan loss reserves – as a result, the mean ratio of LLRs to Gross Loans is some 8%, while the median is below 5%. Finally, as our sample is made of former transition economies with rather less developed financial markets, for majority of the banks, deposits make up more than 80% of their total liabilities. Table A.1 in Appendix reports the correlation matrix for the variables included in our regressions.

Table 1 Summary statistics

Variable	*Unit*	*Obs.*	*Mean*	*Median*	*Std. Dev.*	*Source*
Bank lending	Index	423	107.36	100.00	43.12	Bankscope
Quantitative easing (QE)	%	423	8.12	3.39	8.70	NCBs
Central bank lending	%	423	2.00	1.08	2.49	NCBs
Eonia	%	423	0.30	0.09	0.99	Eurostat
Capital ratio	%	423	10.40	9.91	5.37	Bankscope
Return on equity (ROE)	%	423	–0.23	0.07	3.39	Bankscope
Loan loss reserves (LLR)	%	387	8.04	4.79	11.22	Bankscope
Total assets	mil. EUR	423	3,216.7	2031.7	3585.0	Bankscope
Deposits ratio	%	423	81.36	84.5	13.16	Bankscope
Liquidity ratio	%	403	12.12	5.59	15.80	Bankscope
GDP growth	%	423	2.21	2.80	2.85	Eurostat
Inflation	%	423	1.60	1.40	1.62	Eurostat
Credit standards	%	423	12.18	9.51	21.44	ECB

4.2 Empirical methodology

To study the effect of ECB's unconventional policies on bank lending, we regress our dependent variable, *Bank lending* on the two measures of ECB's expansionary monetary policy (QE and central bank lending to commercial banks), as well as on the set of control variables. Thus, our baseline regression takes the following form:

$$\begin{aligned} Bank\ lending_{ijt} = {} & \theta Bank\ lending_{ijt-1} + \beta_1 QE_{jt} + \beta_2 CB\ Lending_{jt} \\ & + \gamma X_{ijt} + \delta Y_{jt} + \pi_t + \alpha_{ij} + \varepsilon_{ijt} \end{aligned} \tag{1}$$

where *Bank lending* represents the total outstanding loans of a bank *i* from country *j* during time *t* to its customers. *QE* stands for ECB's Quantitative Easing, *CB lending* stands for the central bank lending to commercial banks, *X* represents bank-level control variables, *Y* represents country-level control variables and π are the time effects. Finally, α are the bank fixed effects, which we include in our regression framework to control for time invariant unobserved bank characteristics, and ε is the error term. Thus, the coefficients of interest from equation (1) are β_1 and β_2 – as they are the coefficients of the two measures of expansionary monetary policy, whose effect we investigate. The variables included in our regression framework have already been described in detail in the previous sub-section.

In the second step of our analysis, we aim to investigate, whether the characteristics of the individual banks affect the transmission of expansionary monetary policies to the bank lending. As a result, we also include an interaction term in our baseline regression:

$$\begin{aligned} Bank\ lending_{ijt} = {} & \theta Bank\ lending_{ijt-1} + \beta_1 QE_{jt} + \beta_2 CB\ Lending_{jt} \\ & + \beta_3 QE_{jt}\left(X_{ijt} - \bar{X}_t\right)_{ijt} + \gamma X_{ijt} + \delta Y_{jt} + \pi_t + \alpha_{ij} + \varepsilon_{ijt} \end{aligned} \tag{2}$$

where β_3 is the coefficient of interest, as it is the coefficient of the interaction term. This interaction term interacts the measure of the first expansionary monetary policy (QE) with some bank-level characteristics. As a result, the coefficient of this interaction term enables us to investigate the conditionality of transmission of QE to bank lending on several bank-level characteristics (i.e., capitalisation, liquidity, size, loan loss reserves or profitability). In order to deal with the issues of collinearity, we do not include the bank-level variables in the interaction term in levels – instead we demean the bank characteristics included in the interaction term. In order to study the conditionality of the central bank lending to commercial banks on bank-level characteristics, we also interacted our measure of central bank lending with the bank-level characteristics outlined above:

$$\begin{aligned} Bank\ lending_{ijt} = {} & \theta Bank\ lending_{ijt-1} + \beta_1 QE_{jt} + \beta_2 CB\ Lending_{jt} \\ & + \beta_4 CB\ Lending_{jt} \left(X_{ijt} - \bar{X}_t \right)_{ijt} + \gamma X_{ijt} + \delta Y_{jt} + \pi_t + \alpha_{ij} + \varepsilon_{ijt} \end{aligned} \tag{3}$$

where β_4 is the coefficient of interest.

We follow the bank lending channel literature and estimate our regressions as dynamic panels – as we assume that the bank lending in year t is likely to depend significantly on bank lending in the previous year (t–1). However, dynamic panels with fixed effects suffer from endogeneity bias[6] (Nickell, 1981). And this endogeneity bias is more significant in panels with small T relative to a large N (Malovana, 2017) – i.e., in our case. GMM or bias-corrected least square dummy variables (LSDVC) estimators are often utilised to deal with this bias. Since Bruno (2005) demonstrated that the LSDVC estimator outperforms other widely used estimators (LSDV, IV, GMM) in dynamic unbalanced panels with a small sample, we use the LSDVC estimator to estimate our regressions. The LSDVC estimator was first proposed by Kiviet (1995). The LSDVC estimator uses some consistent estimator to correct the bias of the standard LSDV estimator. In estimating our regressions, we follow the approach taken by Bruno (2005), who proposed to use Anderson-Hsiao, Arellano-Bond or Blundell-Bond estimators to correct for the bias of the initial LSDV estimates.

5 Results

In this next section we present the results of our estimations. We firstly report the results for the baseline regressions, then move on to the report the results of regressions with interaction terms and finally we also report the results of various robustness checks.

5.1 Baseline regressions

Table 2 reports the results of our baseline regressions estimated with the LSDVC estimator for all the banks from the five new EA members that are included in our sample. In specifications (1) and (2), we include the two measures of expansionary monetary policy separately in our regressions. In specification (3), we include both measures simultaneously, in specification (4), we also add the bank-level controls and in specifications (5) and (6), we also include the macroeconomic and country-level variables. In line with our expectations, we do find that the size of the bank positively

affects its lending provision. However, somehow surprisingly, we found that higher capitalisation and higher liquidity are negatively associated with bank lending. These findings, it seems, indicate that the 'healthier' banks were less tempted to increase their credit provision, while 'less healthy' and/or smaller banks were more likely to try to increase their lending to improve their market shares. The negative coefficient of the deposits ratio seems to indicate that the increasing role of deposits as a source of bank's funding has a negative effect on bank lending – i.e., those banks that rely too much on deposits as their funding source, increase bank lending less significantly. Nevertheless, higher deposits ratio may indicate a more solid funding composition (i.e., bank is healthier). Thus, the negative coefficient of the deposits ratio may also be in line with the findings just discussed – i.e., the healthier banks in the new EA member states may have been less likely to increase their credit provision when compared to less healthy banks. On the other hand, none of the country-level and/or macroeconomic variables included in our regression framework have a statistically significant effect on bank lending.

Furthermore, our findings indicate that neither the Eurosystem's asset purchases (QE), nor its credit provision to commercial banks had a statistically significant effect on bank lending in the new EA member states. The coefficient of the QE has the expected positive coefficient, while the central bank lending yields rather surprisingly a negative coefficient. Only in one specification (4) there seems to be some weak and statistically significant effect of QE on bank lending – this effect, however, disappears when controlling for individual bank characteristics.

Based on the results from the entire sample of banks from the five new EA member states, we may conclude that the ECB's policies do not seem to have lifted the individual bank lending. However, as Slovenian and Latvian banking sectors have undergone a significant restructuring in the post-crisis era, as demonstrated by the declining outstanding loans in Slovenia and Latvia in Figure 2, we hypothesise that the banks from these two countries, saddled with large volumes of troubled loans, may have been constrained in their credit provision and thus may not have used the liquidity injected by the ECB to extend more credit. Consequently, in the next step of our analysis, we drop banks from Latvia and Slovenia and re-run our regressions only on a sub-sample of Estonian, Lithuanian and Slovak banks. The results of these regressions are reported in columns 1–3 in Table 3. Nonetheless, this sub-sample of banks is heavily unbalanced – as the Baltic countries have only joined the Eurozone during the post-crisis era and thus, the number of observations is rather limited (especially for Lithuania). Therefore, we decided to re-estimate these regressions also for only a sub-sample of banks from Slovakia – since Slovakia has been a member of the EA for the entire studied period – and Slovak banking sector is rather healthy and did not require any restructuring in the post-crisis era. The results of these regressions are reported in Table 3 in columns 4–6. As for both these sub-samples, the number of observations is smaller than in the full sample, due to collinearity issues, we had to drop the variable *Credit standards* and the time effects.[7] Additionally, for both these sub-samples, we found rather high correlation between our measures of expansionary monetary policy – as a result, we have also included these two measures in our regressions separately. However, the results hold when compared to our baseline specification where we include both measures of monetary policy in the same regressions.

Table 2 The effect of ECB's expansionary policies on bank lending in new EA member states

Variables	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
	Bank lending					
Bank lending (t–1)	0.781***	0.816***	0.784***	0.527***	0.508***	0.508***
	(0.057)	(0.063)	(0.057)	(0.049)	(0.050)	(0.050)
Quantitative easing (QE)	0.101		0.125	0.916*	0.598	0.598
	(0.542)		(0.556)	(0.490)	(0.530)	(0.530)
Central bank lending		–0.170	–0.050	–1.121	–1.892	–1.892
		(1.193)	(1.184)	(0.994)	(1.165)	(1.165)
Capital ratio				–1.801***	–1.771***	–1.771***
				(0.627)	(0.618)	(0.618)
Return on equity (ROE)				–0.266	–0.270	–0.270
				(0.390)	(0.385)	(0.385)
Loan loss reserves (LLR)				–0.268	–0.195	–0.195
				(0.220)	(0.219)	(0.219)
Total assets (log)				65.188***	65.794***	65.794***
				(7.230)	(7.368)	(7.368)
Deposits ratio				–0.630**	–0.666**	–0.666**
				(0.269)	(0.267)	(0.267)
Liquidity ratio				–0.351***	–0.387***	–0.387***
				(0.124)	(0.124)	(0.124)
GDP growth					0.307	0.307
					(2.535)	(2.535)
Inflation					–1.187	–1.187
					(2.839)	(2.839)
Credit standards					0.267	0.267
					(0.177)	(0.177)
Eonia						2.083
						(4.555)
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Time effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	365	365	365	327	327	327
Number of banks	56	56	56	54	54	54

The estimated coefficients report the results of the baseline regressions performed on the full sample of banks from new EA member states. The estimated coefficients were estimated with the LSDVC estimator, which was conducted with the *xtlsdvc* Stata routine. Blundell-Bond (BB) estimator was used to correct the bias of the initial LSDV estimator. The sample covers the period from 2008 to 2018 (depending on the year the country joined the Euro Area). Bootstrapped standard errors, which were estimated with 250 repetitions, are reported in parentheses. *** indicates 1% level of significance, ** indicates 5% level of significance and * indicates 10% level of significance.

Table 3 The effect of ECB's expansionary policies on bank lending in Estonia, Lithuania and Slovakia

Variables	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*
	Bank lending					
Bank lending (t–1)	0.258***	0.283***	0.263***	0.102	0.127**	0.106
	(0.068)	(0.066)	(0.068)	(0.065)	(0.063)	(0.065)
Quantitative easing (QE)	0.320		0.370	0.391*		0.411*
	(0.243)		(0.246)	(0.220)		(0.222)
Central bank lending		–0.177	–0.290		–0.054	–0.138
		(0.262)	(0.267)		(0.199)	(0.202)
Capital ratio	0.250***	0.244***	0.245***	0.310***	0.300***	0.306***
	(0.082)	(0.083)	(0.082)	(0.078)	(0.079)	(0.078)
Return on equity (ROE)	–0.110	–0.094	–0.113	–0.484**	–0.424*	–0.478**
	(0.214)	(0.217)	(0.214)	(0.235)	(0.232)	(0.236)
Loan loss reserves (LLR)	–0.082	–0.087	–0.089	–0.247***	–0.237***	–0.248***
	(0.072)	(0.073)	(0.072)	(0.080)	(0.081)	(0.081)
Total assets (log)	6.328***	6.488***	6.190***	10.344***	10.586***	10.250***
	(1.172)	(1.158)	(1.178)	(1.017)	(1.031)	(1.027)
Deposits ratio	–0.042*	–0.041*	–0.043*	–0.030	–0.026	–0.030
	(0.025)	(0.025)	(0.024)	(0.024)	(0.024)	(0.024)
Liquidity ratio	–0.056***	–0.061***	–0.056***	–0.046*	–0.055**	–0.046*
	(0.016)	(0.016)	(0.016)	(0.024)	(0.024)	(0.024)
GDP growth	–0.015	–0.003	–0.073	–0.065	–0.019	–0.092
	(0.067)	(0.069)	(0.081)	(0.057)	(0.059)	(0.069)
Inflation	–0.012	0.090	0.025	–0.042	0.070	–0.020
	(0.103)	(0.100)	(0.102)	(0.092)	(0.088)	(0.097)
Eonia	–0.064	–0.124**	–0.044	–0.008	–0.086*	0.000
	(0.070)	(0.060)	(0.074)	(0.065)	(0.050)	(0.067)
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Time effects	No	No	No	No	No	No
Observations	152	152	152	125	125	125
Number of banks	24	24	24	15	15	15
Countries	EE, LT, SK	EE, LT, SK	EE, LT, SK	SK	SK	SK

The coefficients estimated in columns 1–3 report the results of the baseline regressions performed on the sub-sample of banks from Estonia (EE), Lithuania (LT), Slovakia (SK), while the coefficients from columns 4–6 were estimated on a sub-sample of banks from only Slovakia. The estimated coefficients were estimated with the LSDVC estimator, which was conducted with the *xtlsdvc* Stata routine. Blundell-Bond (BB) estimator was used to correct the bias of the initial LSDV estimator. The sample covers the period from 2008 to 2018 (depending on the year the country joined the Euro Area). Bootstrapped standard errors, which were estimated with 250 repetitions, are reported in parentheses. *** indicates 1% level of significance, ** indicates 5% level of significance and * indicates 10% level of significance.

The results reported above, indicate that neither the QE nor the direct lending to commercial banks had a statistically significant effect on bank lending of Estonia, Lithuanian and Slovak banks. However, in the case of Slovak banks, we did find a small but statistically significant[8] positive effect of QE on bank lending of only the Slovak banks. These findings seem to confirm that only in the case when the banks are operating in a rather healthy banking sector, the QE may contribute to higher credit provision of banks. At the same time, it seems that the QE is not among the major drivers of bank lending – which seems to be driven mainly by other factors. This somewhat surprising finding, which is at odds with the findings of the previous studies, could be explained by the structure and character of ECB's QE policies – most of the asset purchases were conducted under the PSPP program – that is, they concentrated on the purchases of public securities. And the new EA member states have only very low public debts and on the top of that rather underdeveloped financial systems. Thus, while the large-scale asset purchases may have helped in some EA countries, in new EA, the NCBs did not have many appropriate and available domestic assets that they could purchase under the QE. We also do not find a statistically significant effect of the central bank lending policies. This finding could be attributed to the fact that among these policies, the TLTROs were the operations with highest volumes – and Italian and Spanish banks alone represented some 60% of overall TLTROs. Consequently, in new EA the overall proportion of these operations was rather limited – it seems that the banks here were either able to obtain enough funding resources (as the economy was doing comparatively well), or they could not extend more loans (precondition of policies such as TLTROs) because they were deleveraging.

Moreover, for both these sub-samples of banks we do find the expected positive effect of bank's capitalisation on credit. The coefficients of bank size and liquidity remain unchanged when compared to baseline regressions. For only the Slovak sub-sample of banks, we also find negative and statistically significant effect of bank profitability (ROE) and of loan loss reserves (LLR) on credit provision. The later result is in line with the theoretical expectations – banks, which are saddled with more non-performing loans are less likely to extend more credit. The negative coefficient of ROE is somehow startling – we may, however, assume that this result could be explained by the willingness of some banks to extend more credit and increase their market share – even at the cost of lower interest rates imposed on their clients and by extension of lower temporary profits. The macroeconomic and country-level control variables remain insignificant – with the exception of Eonia interbank interest rate, which is statistically significant in two specifications – with the expected negative coefficient.

5.2 Regressions with interaction terms

In the second part of this analysis, we study the role of bank-level characteristics in the transmission of ECB's expansionary policies to commercial bank lending. Therefore, we include several interaction terms in our baseline regressions. These interaction terms interact either of our two measures of expansionary monetary policies with several bank-level characteristics (capitalisation, liquidity, size, loan loss reserves or profitability). As discussed earlier, the standard assumption of the bank lending channel literature is that standard monetary policies are likely to affect weaker banks more significantly. On the other hand, some authors (such as Albertazzi et al., 2016) assume that non-standard

policies could have a more significant effect on stronger banks – as the non-standard policies are usually introduced in time of great stress on the financial markets. The results of these regressions for full sample of banks are reported in Tables A.2 and A.3 in Appendix. Table A.2 contains the interactions of bank-level characteristics with QE policies, while Table A.3 reports the results with the interactions of the bank-level characteristics with central bank lending. Once again, for the full sample of banks from all five new EA member states, we do not find much evidence that ECB's policies had a noticeable effect on credit provision – and consequently, the individual bank characteristics also did not affect the transmission of expansionary monetary policy. We only find very weak evidence that weaker banks may have been affected less by the quantitative easing when compared to healthier banks. Namely, the coefficient of the interaction term of the loan loss reserves ratio and the QE is significant and negative. This result indicates that the bank lending of the banks, which had higher loan loss reserves (i.e., their loan portfolios were riskier and the banks were thus weaker), was affected more negatively by the QE. As a result, for the full sample of banks from all five new EA member states, we do find some weak evidence that the theoretical assumptions about the more positive effects of QE on healthier banks may hold.

We also re-run the regressions with interaction terms on only the sub-sample of banks from Slovakia. The results for the role of bank-level characteristics in the transmission of QE policies are reported in Table A.4in the Appendix. In this case, we once again find a negative and statistically significant coefficient of the interaction term between the QE and the loans loss reserves. Consequently, the evidence for the Slovak sub-sample of banks also indicates a more positive effect of QE on bank lending of healthier banks. Furthermore, the coefficient of the interaction term with the liquidity ratio is also negative and significant – indicating that the bank lending of more liquid Slovak banks is less affected by the QE. However, we treat this result with some grain of salt – as we use annual data and the liquidity ratios may also simply reflect the particular liquidity management strategies of the banks at the end of the year and may be thus very subjective indicator. Instead, we consider the loan loss reserves ratio to represent a more objective indicator of bank's health. The remaining coefficients of the interaction terms are not statistically significant.

The regressions with interaction terms between the bank-level characteristics and the Eurosystem's lending to commercial banks for the Slovak sub-sample of banks are then reported in the Table A.5 in Appendix. Our findings also tentatively confirm the expected more positive impact of unconventional policies on bank lending of healthier banks. Namely, the coefficient of the interaction term with capital ratio is positive and statistically significant – indicating that the more capitalised banks were more likely to increase their lending to private sector thanks to the lending from the central bank. The remaining interaction terms are not statistically significant – apart from the interaction term with ROE (that is banks' profitability), which is negative and only significant at 10% level of significance. However, we once again consider the capital ratio to represent a more objective and thus preferred measure of bank's health, when compared to profitability, which may be affected by subjective accounting policies and decisions of a particular bank. These findings therefore seem to indicate that the central bank lending to commercial banks may not have helped the weaker (i.e., less capitalised) Slovak banks overcome their funding constraints and instead, it may have been used by the stronger

banks to increase their lending even further (and use the relatively cheaper funding provided by the central bank).

5.3 Robustness checks

Finally, in this sub-section, we conduct series of robustness checks to verify, whether our results are robust and stable. We conduct all the robustness checks on a full sample of banks from the five new EA member states and the results of these robustness tests are reported in Table A.6 in Appendix. In the first robustness check, we drop the annual time effects, which we included in our baseline regressions. The results in column (1) of Table A.6 confirm that the exclusion of time effects does not affect our main conclusions – namely that ECB's expansionary monetary policies do not seem to have affected the bank credit provision of the sampled banks. The column (2) reports the results of the second robustness check, where we replace the Eonia interbank interest rate, which we use as a proxy for standard monetary policy, with the interest rate on main refinancing operations (MRO) – the key policy rate of the ECB. In our baseline regressions, we prefer to use Eonia – due to the better statistical properties of this variable. However, in this robustness check, we aim to verify, whether the selection of this variable does not affect our main findings. The results indicate that similarly to Eonia, the coefficient of MRO is statistically insignificant and its inclusion in our baseline regression does not affect our main conclusions. In the third robustness check, we address the possible issue of endogeneity of the (mainly) the bank-level variables included in our baseline regressions. Especially in small countries, such as those included in our sample, the issue of endogeneity could arise. Therefore, we lag all explanatory and control variables by one period. Here, we once again do not find a strong and statistically significant effect of either of our two measures of ECB's expansionary policies (lagged by one period) on the bank lending in the new EA member states. Nonetheless, we do find a weak and statistically significant (at 10% level of significance) positive effect of QE on bank lending – indicating that the QE policies may contribute to higher bank lending – albeit with some lag. Furthermore, in the fourth robustness check, we use the bootstrap-based bias-corrected FE estimator (BCFE) of De Vos et al. (2015) to estimate our baseline regression. De Vos et al. (2015) argue that the LSDVC estimator of Bruno (2015) relies on rather strict assumptions (i.e., homoscedasticity) – therefore, their BCFE estimator uses different bootstrap error resampling schemes to control for general heterogeneity, as well as for contemporaneous cross-sectional dependence. In terms of the coefficients and standard errors estimates, the BCFE estimator provides comparable results with the LSDVC estimator – hence providing some additional support to our conclusions. In the final robustness check, we further aim to control for the problems posed by endogeneity and so we estimate our baseline regression with the system GMM estimator of Arellano and Bover (1995), and Blundell and Bond (1998). The results reported in column (5) corroborate our baseline findings, even though with the GMM estimator, none of the regressors is found to be statistically significant – however, we take the GMM results with a grain of salt –as the Hansen and Sargan test results are weakened by too many instruments.

In the post-crisis era, the policymakers have not only affected the bank lending with the expansionary, unconventional monetary policies – macroprudential policies also started to be used more often. Therefore, in another robustness check, we control for macroprudential policies. We use the Integrated Macroprudential Policy (iMaPP)

database constructed by Alam et al. (2019) to construct our measure of macroprudential policies. In constructing our measure of macroprudential policies, we follow the approach applied previously by many papers (i.e., Buch and Goldberg, 2017; Gambacorta and Murcia, 2017; Akinci and Olmstead-Rumsey, 2018) and we first define a dummy-type index that takes the value of 1 in the case the macroprudential policy had been tightened, a value of –1 if the policy had been eased and the value of 0 if there had been no change in policy. The iMaPP database provides such dummy-type indices for 17 macroprudential instruments. Our measure of macroprudential policy then represents the sum of these dummy-type indices (indicators of policy actions). We lag our measure of macroprudential policy by one period to deal with endogeneity issue – as the macroprudential policies could be affected by current bank lending developments. We include the measure of macroprudential policies in our baseline regression as a control variable – the results are reported in column (1) of Table 4.[9] The coefficient of macroprudential policy is rather surprisingly positive, but not statistically significant. Additionally, we study the role of macroprudential policies in the transmission of monetary policies. Consequently, we interact our measure of macroprudential policies with the two measures of ECB's unconventional, expansionary monetary policies, as well as with Eonia interbank interest rate – our proxy for standard monetary policies. The results of these regressions are available in columns (2), (3) and (4), respectively. For our two measures of unconventional policies, we do not find a statistically significant coefficient of interaction terms. However, for standard monetary policies, the coefficient of interaction term between the monetary and macroprudential policy is statistically significant and negative. This result indicates that when tightening of standard monetary policy (i.e., rise in interest rates) is coupled with tighter macroprudential policies, the overall effect on bank lending is more negative. That is, the macroprudential policies seem to have been reinforcing the monetary policies in the five new EA states (and vice versa). Thus, our findings are in line with the theoretical expectations and also with the results of Gambacorta and Murcia (2017) for five Latin American countries.

Table 4 The role of macroprudential policies in the transmission of ECB's lending policies to bank lending in new EA member states

	(1)	*(2)*	*(3)*	*(4)*
Variables	*Bank lending*			
Bank lending (t–1)	0.622***	0.609***	0.618***	0.591***
	(0.055)	(0.056)	(0.056)	(0.056)
Quantitative easing (QE)	–1.414	–1.285	–1.435	0.243
	(2.567)	(2.559)	(2.898)	(2.612)
Central bank lending	–2.419**	–2.470**	–2.443**	–1.631
	(1.076)	(1.078)	(1.130)	(1.193)
Capital ratio	–2.030***	–2.008***	–2.022***	–1.957***
	(0.698)	(0.698)	(0.699)	(0.698)
Return on equity (ROE)	–0.224	–0.209	–0.227	–0.206
	(0.378)	(0.381)	(0.379)	(0.381)
Loan loss reserves (LLR)	–0.243	–0.262	–0.240	–0.216
	(0.207)	(0.207)	(0.210)	(0.207)

Table 4 The role of macroprudential policies in the transmission of ECB's lending policies to bank lending in new EA member states (continued)

Variables	*(1)*	*(2)*	*(3)*	*(4)*
	Bank lending			
Total assets (log)	54.813***	55.892***	55.179***	58.259***
	(7.894)	(7.880)	(7.951)	(7.854)
Deposits ratio	–0.691***	–0.689***	–0.685***	–0.683***
	(0.264)	(0.264)	(0.263)	(0.265)
Liquidity ratio	–0.348**	–0.364***	–0.346**	–0.376***
	(0.138)	(0.137)	(0.138)	(0.137)
GDP growth	–1.221	0.056	–1.152	0.698
	(2.606)	(2.799)	(2.655)	(2.841)
Inflation	–0.329	–2.581	–0.314	–6.244
	(2.657)	(3.034)	(2.973)	(3.886)
Credit standards	0.173	0.105	0.172	–0.065
	(0.182)	(0.185)	(0.217)	(0.209)
Eonia	–2.074	–0.967	–2.097	1.801
	(4.169)	(4.157)	(4.615)	(4.382)
Macroprudential policies (t–1)	3.026	–2.402	2.936	1.529
	(2.498)	(4.313)	(3.920)	(2.604)
Interact (QE*Macropru)		0.680		
		(0.443)		
Interact (CB Lending*Macropru)			0.009	
			(4.846)	
Interact (Eonia*Macropru)				–2.761**
				(1.355)
Fixed effects	Yes	Yes	Yes	Yes
Time effects	Yes	Yes	Yes	Yes
Observations	295	295	295	295
Number of banks	53	53	53	53

The estimated coefficients report the results of the baseline regressions performed on the full sample of banks from new EA member states. The estimated coefficients were estimated with the LSDVC estimator, which was conducted with the *xtlsdvc* Stata routine. Blundell-Bond (BB) estimator was used to correct the bias of the initial LSDV estimator. The sample covers the period from 2008 to 2017 (depending on the year the country joined the Euro Area). Bootstrapped standard errors, which were estimated with 250 repetitions, are reported in parentheses. *** indicates 1% level of significance, ** indicates 5% level of significance and * indicates 10% level of significance.

6 Conclusions

In this paper, we studied the effect of unconventional monetary policies of the ECB in the five new Euro Area member states on bank lending – using the bank-level data on 54 banks over the years 2008-2018. We used two measures representing two main groups

of ECB's unconventional policies – holdings of sovereign bonds, as a measure of QE, and central bank loans to commercial banks, as a measure of other expansionary policies, such as TLTROs. Results obtained from our baseline regressions do not seem to indicate that these policies had any noticeable effect on bank lending of banks from the new EA members. Consequently, we also did not find evidence that individual bank characteristics affected the transmission of the unconventional monetary policies. We hypothesise that these results could be explained by a rather underdeveloped capital markets in these countries (with many of the assets that were purchased as a part of the QE simply not being available on the domestic markets), and the deleveraging and restructuring of the banking sectors in some of the Baltic countries and in Slovenia. Therefore, we re-run our baseline regressions on only a sub-sample of banks from Slovakia and we did find that the QE had a positive effect on bank lending in Slovakia. However, the central bank lending to commercial banks does not seem to have had any noticeable effect on bank lending – even in Slovakia. This finding could be attributed to comparatively low volume of these operations in all new EA member states – as it were mainly banks from southern member states that have drawn heavily on these operations (i.e., TLTROs). For Slovakia, we also found some tentative evidence that stronger banks' lending was more affected by the central bank lending policies – as evidenced by higher transmission of expansionary policies to credit provision of more capitalised banks – suggesting that the stronger banks were readier to obtain additional sources of funding from the central bank to extend even more credit to the private sector. On the other hand, we also found some tentative evidence that weaker Slovak banks benefitted less from the QE policies, suggesting that the overall increase in the liquidity of the banking sector caused by the QE also benefitted mostly the stronger banks. These findings indicate that the theoretical assumptions that the stronger banks benefit more from the unconventional policies hold also in the case of Slovakia. In other words, those banks, which are healthier, are also more likely to be able to use the additional liquidity pumped by the central banks to the financial market to extend more credit. The policymakers should therefore take into account that the unconventional expansionary monetary policies are more likely to benefit only healthier banks – while they seem to be rather less effective in stimulating the lending of less healthy banks. Thus, the unconventional monetary policies may not necessarily represent an effective measure of improving the positions of weaker banks. Instead, policymakers should look at other measures, if their aim is to make the banking sector healthier and they should also take into account that the healthier the banking sector, the more effective is the transmission of unconventional policies through the bank lending channel.

Finally, we also studied the role of macroprudential policies in the transmission of monetary policy through the bank lending channel. We fail to find an effect of macroprudential policies on the transmission of unconventional policies. However, we also found that the standard monetary policies and the macroprudential policies do reinforce each other. To summarise our findings, we may conclude that we do not find evidence that the bank lending channel operated effectively in the case of the new EA member states – with the possible exception of Slovakia. Consequently, any positive effects of ECB's policies in these countries seem to have operated through other channels. At the same time, we acknowledge limitations of our data and consider this research to be the first step in the analysis of effectiveness of bank lending channel in the case of ECB's unconventional policies – using more detailed balance sheet data and higher frequency data, one may be able to better investigate the transmission of ECB's

policies to bank lending. Furthermore, future research may also concentrate on actual effects of ECB's policies on bank liquidity and subsequently on relationship between liquidity of banks and their lending.

Acknowledgement

We thank Maria Siranova, the participants of the 17th International Conference on Finance and Banking and anonymous referees for their helpful comments. The authors acknowledge that this paper is the partial result of the project VEGA (1/0613/18) *Deepening of Economic Inequalities as a Consequence of Distributional Effects of Unconventional Monetary Policy*.

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Notes

[1]This particular set of expansionary monetary policies (such as Quantitative Easing) introduced in the post-crisis era are very often referred to as the *unconventional* monetary policies. As a result, in this article we use the terms expansionary policies or unconventional policies interchangeably. The reason why we also use the term expansionary policies lies in the character of 'unconventional' monetary policies. Namely, these policies were referred to as 'unconventional' because of their non-standard nature. However, as these policies have now been widely used by many central banks for many years and have often become an important part of the monetary policy toolkit, the attribute 'unconventional' may not necessarily be best to describe these policies. Consequently, we also use the term expansionary or ultra-loose monetary policies to describe them.

[2]Where the main policy instrument are the key interest rates of the central bank.

[3]For ease of comprehension, we refer to these policies as central bank lending, central bank lending policies, ECB lending throughout the paper.

[4]Indeed, the ratio of market capitalisation to GDP in all the five post-transition economies in our sample is significantly lower than the in most old EA member states.

[5]Eonia interbank rate is often used as a proxy for ECB's key monetary policy rate due to its better time series properties. Indeed, von Borstel et al. (2016) used Eonia as a proxy for the monetary policy rate, but their results were very similar, when they used the ECB's interest rate on Main Refinancing Operations (MRO) instead of Eonia.

[6]As the within transformation leads to a correlation between the error term and the regressor.

[7]As a part of the robustness checks, we have also re-estimated our baseline regressions on a full sample of banks from all five new EA member states without the time effects. The results are reported in Table A.6 in Appendix and our conclusions are not affected by the exclusion of time effects.

[8]Albeit at only 10% level of significance.

[9]Due to missing data on macroprudential policies, the number of observations is slightly lower than in the case of baseline regressions – therefore, in order to maximise the sample size, we do not include the macroprudential policies among the controls in the baseline regression.

Appendix

Table A.1 Correlation matrix for variables included in our regressions

Variable	*Bank lending*	*Quantitative easing (QE)*	*Central bank lending*	*Eonia*	*Capital ratio*	*Return on equity (ROE)*	*Loan loss reserves (LLR)*	*Total assets*	*Deposits ratio*	*Liquidity ratio*	*GDP growth*	*Inflation*	*Credit standards*
Bank lending	1.0000												
Quantitative easing (QE)	0.0737	1.0000											
Central bank lending	0.0935	–0.2801	1.0000										
Eonia	0.0239	–0.4957	0.1066	1.0000									
Capital ratio	–0.0922	0.1355	–0.2211	–0.1531	1.0000								
Return on equity (ROE)	0.0862	0.0621	–0.2101	0.0119	0.1331	1.0000							
Loan loss reserves (LLR)	–0.1683	–0.0399	0.2095	–0.1031	–0.1563	–0.4534	1.0000						
Total assets	0.0191	0.0129	0.0633	0.0114	0.0034	0.0729	–0.1760	1.0000					
Deposits ratio	0.0435	0.0652	0.0586	–0.0708	–0.6325	–0.0402	0.1061	–0.0179	1.0000				
Liquidity ratio	–0.0619	–0.0279	–0.1480	0.0191	–0.0894	0.0525	0.0513	–0.3279	–0.0085	1.0000			
GDP growth	–0.0852	0.3844	–0.6482	–0.0043	0.1496	0.0762	–0.0311	–0.0269	–0.0368	–0.0079	1.0000		
Inflation	0.0545	–0.0396	0.1331	0.5452	–0.0199	–0.0055	–0.0818	0.0134	–0.1528	–0.0346	0.1662	1.0000	
Credit standards	0.1242	–0.1753	0.3096	0.6436	–0.1160	0.0107	–0.1379	0.0845	–0.0526	–0.0479	–0.3673	0.4514	1.0000

Table A.2 The role of bank-level characteristics in the transmission of ECB's QE policy to bank lending in new EA member states

Variables	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*
	Bank lending				
Bank lending (t–1)	0.510***	0.510***	0.517***	0.485***	0.505***
	(0.049)	(0.050)	(0.051)	(0.050)	(0.050)
Quantitative easing (QE)	0.663	0.598	0.562	0.680	0.370
	(0.526)	(0.531)	(0.530)	(0.541)	(0.573)
Central bank lending	–1.868	–1.864	–1.885	–2.070*	–1.902
	(1.141)	(1.165)	(1.167)	(1.178)	(1.164)
Interact (QE*Capital ratio)	–0.066				
	(0.047)				
Interact (QE*Liquidity ratio)		0.007			
		(0.014)			
Interact (QE*Total assets)			0.138		
			(0.129)		
Interact (QE*LLR)				–0.046**	
				(0.021)	
Interact (QE*ROE)					0.868
					(1.014)
Capital ratio	–1.260*	–1.736***	–1.744***	–1.531**	–1.815***
	(0.740)	(0.621)	(0.617)	(0.619)	(0.629)
Return on equity (ROE)	–0.309	–0.273	–0.243	–0.199	–1.993
	(0.378)	(0.387)	(0.389)	(0.390)	(2.012)
Loan loss reserves (LLR)	–0.198	–0.197	–0.174	–0.014	–0.202
	(0.213)	(0.219)	(0.221)	(0.229)	(0.219)
Total assets (log)	63.280***	66.313***	64.228***	63.689***	64.871***
	(7.267)	(7.507)	(7.362)	(7.557)	(7.467)
Deposits ratio	–0.708***	–0.643**	–0.708***	–0.719***	–0.685**
	(0.264)	(0.270)	(0.271)	(0.271)	(0.270)
Liquidity ratio	–0.366***	–0.419***	–0.418***	–0.394***	–0.397***
	(0.123)	(0.137)	(0.127)	(0.124)	(0.123)
GDP growth	0.443	0.303	0.231	–0.047	0.121
	(2.484)	(2.541)	(2.535)	(2.563)	(2.544)
Inflation	–1.419	–1.075	–1.157	–1.646	–1.136
	(2.784)	(2.841)	(2.841)	(2.872)	(2.835)
Credit standards	0.263	0.272	0.260	0.241	0.257
	(0.174)	(0.178)	(0.177)	(0.178)	(0.177)
Eonia	1.765	2.104	2.137	2.607	2.408
	(4.459)	(4.581)	(4.556)	(4.594)	(4.564)

Table A.2 The role of bank-level characteristics in the transmission of ECB's QE policy to bank lending in new EA member states (continued)

Variables	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*
	Bank lending				
Fixed effects	Yes	Yes	Yes	Yes	Yes
Time effects	Yes	Yes	Yes	Yes	Yes
Observations	327	327	327	327	327
Number of banks	54	54	54	54	54

The estimated coefficients report the results of the baseline regressions performed on the full sample of banks from new EA member states. The estimated coefficients were estimated with the LSDVC estimator, which was conducted with the *xtlsdvc* Stata routine. Blundell-Bond (BB) estimator was used to correct the bias of the initial LSDV estimator. The sample covers the period from 2008 to 2018 (depending on the year the country joined the Euro Area). Bootstrapped standard errors, which were estimated with 250 repetitions, are reported in parentheses. *** indicates 1% level of significance, ** indicates 5% level of significance and * indicates 10% level of significance.

Table A.3 The role of bank-level characteristics in the transmission of ECB's lending policies to bank lending in new EA member states

Variables	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*
	Bank lending				
Bank lending (t–1)	0.510***	0.505***	0.506***	0.507***	0.508***
	(0.050)	(0.051)	(0.050)	(0.050)	(0.050)
Quantitative easing (QE)	0.599	0.603	0.581	0.639	0.598
	(0.531)	(0.532)	(0.540)	(0.546)	(0.531)
Central bank lending	–1.925	–1.740	–1.897	–2.030*	–1.880
	(1.177)	(1.200)	(1.169)	(1.214)	(1.167)
Interact (CB Lending*Capital ratio)	–0.019				
	(0.163)				
Interact (CB Lending *Liquidity ratio)		0.032			
		(0.058)			
Interact (CB Lending *Total assets)			0.192		
			(0.704)		
Interact (CB Lending *LLR)				0.022	
				(0.051)	
Interact (CB Lending *ROE)					0.078
					(0.321)
Capital ratio	–1.732**	–1.850***	–1.756***	–1.767***	–1.750***
	(0.706)	(0.636)	(0.621)	(0.620)	(0.631)
Return on equity (ROE)	–0.255	–0.311	–0.297	–0.143	–0.994
	(0.425)	(0.380)	(0.402)	(0.492)	(3.027)
Loan loss reserves (LLR)	–0.193	–0.208	–0.202	–0.268	–0.211
	(0.219)	(0.223)	(0.222)	(0.276)	(0.229)

Table A.3 The role of bank-level characteristics in the transmission of ECB's lending policies to bank lending in new EA member states (continued)

	(1)	*(2)*	*(3)*	*(4)*	*(5)*
Variables	*Bank lending*				
Total assets (log)	65.866***	65.489***	65.394***	65.393***	65.968***
	(7.439)	(7.454)	(7.608)	(7.454)	(7.382)
Deposits ratio	–0.662**	–0.672**	–0.667**	–0.677**	–0.678**
	(0.267)	(0.268)	(0.268)	(0.266)	(0.271)
Liquidity ratio	–0.387***	–0.445***	–0.383***	–0.389***	–0.378***
	(0.124)	(0.162)	(0.125)	(0.124)	(0.129)
GDP growth	0.312	0.324	0.308	0.290	0.331
	(2.537)	(2.543)	(2.543)	(2.549)	(2.541)
Inflation	–1.161	–1.225	–1.148	–1.313	–1.115
	(2.846)	(2.842)	(2.845)	(2.867)	(2.867)
Credit standards	0.267	0.272	0.266	0.264	0.269
	(0.177)	(0.178)	(0.177)	(0.179)	(0.177)
Eonia	2.062	2.240	2.085	2.035	2.004
	(4.565)	(4.566)	(4.570)	(4.569)	(4.571)
Fixed effects	Yes	Yes	Yes	Yes	Yes
Time effects	Yes	Yes	Yes	Yes	Yes
Observations	327	327	327	327	327
Number of banks	54	54	54	54	54

The estimated coefficients report the results of the baseline regressions performed on the full sample of banks from new EA member states. The estimated coefficients were estimated with the LSDVC estimator, which was conducted with the *xtlsdvc* Stata routine. Blundell-Bond (BB) estimator was used to correct the bias of the initial LSDV estimator. The sample covers the period from 2008 to 2018 (depending on the year the country joined the Euro Area). Bootstrapped standard errors, which were estimated with 250 repetitions, are reported in parentheses. *** indicates 1% level of significance, ** indicates 5% level of significance and * indicates 10% level of significance.

Table A.4 The role of bank-level characteristics in the transmission of ECB's QE policy to bank lending in Slovakia

	(1)	*(2)*	*(3)*	*(4)*	*(5)*
Variables	*Bank lending*				
Bank lending (t–1)	0.114*	0.126**	0.102	0.115*	0.117*
	(0.061)	(0.061)	(0.064)	(0.064)	(0.069)
Quantitative easing (QE)	0.300	0.096	0.291	0.282	0.287
	(0.226)	(0.213)	(0.231)	(0.223)	(0.227)
Interact (QE*Capital ratio)	–0.034				
	(0.043)				
Interact (QE*Liquidity ratio)		–0.027**			
		(0.011)			

Table A.4 The role of bank-level characteristics in the transmission of ECB's QE policy to bank lending in Slovakia (continued)

	(1)	*(2)*	*(3)*	*(4)*	*(5)*
Variables			*Bank lending*		
Interact (QE*Total assets)			–0.022		
			(0.075)		
Interact (QE*LLR)				–0.137***	
				(0.050)	
Interact (QE*ROE)					–0.292
					(0.939)
Capital ratio	0.551	0.273***	0.309***	0.393***	0.308***
	(0.340)	(0.077)	(0.080)	(0.082)	(0.082)
Return on equity (ROE)	–0.496**	–0.542**	–0.463*	–0.341	1.642
	(0.246)	(0.222)	(0.239)	(0.237)	(6.788)
Loan loss reserves (LLR)	–0.235***	–0.217***	–0.246***	0.851**	–0.246***
	(0.077)	(0.072)	(0.079)	(0.403)	(0.078)
Total assets (log)	10.054***	10.007***	10.278***	9.384***	10.088***
	(0.966)	(0.890)	(1.186)	(0.971)	(1.015)
Deposits ratio	–0.034	–0.055**	–0.028	–0.044*	–0.026
	(0.025)	(0.025)	(0.026)	(0.025)	(0.034)
Liquidity ratio	–0.044**	0.126*	–0.047**	–0.071***	–0.045*
	(0.022)	(0.076)	(0.022)	(0.023)	(0.024)
GDP growth	0.042	0.075	0.046	0.067	0.043
	(0.117)	(0.107)	(0.120)	(0.117)	(0.122)
Inflation	–0.054	–0.008	–0.053	–0.031	–0.052
	(0.092)	(0.079)	(0.091)	(0.088)	(0.092)
Credit standards	0.013	0.013	0.013	0.013	0.013
	(0.010)	(0.009)	(0.010)	(0.010)	(0.011)
Eonia	0.001	–0.009	0.003	–0.011	0.005
	(0.056)	(0.050)	(0.056)	(0.053)	(0.057)
Fixed effects	Yes	Yes	Yes	Yes	Yes
Time effects	Yes	Yes	Yes	Yes	Yes
Observations	125	125	125	125	125
Number of banks	15	15	15	15	15

The estimated coefficients report the results of the baseline regressions performed on a sub-sample of banks from Slovakia. The estimated coefficients were estimated with the LSDVC estimator, which was conducted with the *xtlsdvc* Stata routine. Blundell-Bond (BB) estimator was used to correct the bias of the initial LSDV estimator. The sample covers the period from 2008 to 2018. Bootstrapped standard errors, which were estimated with 250 repetitions, are reported in parentheses. *** indicates 1% level of significance, ** indicates 5% level of significance and * indicates 10% level of significance.

Table A.5 The role of bank-level characteristics in the transmission of ECB's QE policy to bank lending in Slovakia

	(1)	*(2)*	*(3)*	*(4)*	*(5)*
Variables	*Bank lending*				
Bank lending (t–1)	0.202***	0.122*	0.128**	0.125*	0.195***
	(0.057)	(0.062)	(0.062)	(0.066)	(0.064)
Central bank lending	–0.231	–0.196	–0.201	–0.232	–0.146
	(0.200)	(0.203)	(0.208)	(0.204)	(0.194)
Interact (QE*Capital ratio)	0.125**				
	(0.049)				
Interact (QE*Liquidity ratio)		–0.005			
		(0.013)			
Interact (QE*Total assets)			0.080		
			(0.106)		
Interact (QE*LLR)				0.053	
				(0.058)	
Interact (QE*ROE)					–0.808*
					(0.469)
Capital ratio	0.015	0.298***	0.297***	0.307***	0.267***
	(0.132)	(0.081)	(0.081)	(0.083)	(0.080)
Return on equity (ROE)	–0.297	–0.317	–0.344	–0.411*	0.893
	(0.221)	(0.301)	(0.231)	(0.228)	(0.763)
Loan loss reserves (LLR)	–0.194**	–0.222***	–0.227***	–0.316***	–0.203**
	(0.077)	(0.084)	(0.078)	(0.113)	(0.083)
Total assets (log)	10.148***	10.056***	9.866***	9.752***	9.039***
	(0.967)	(0.990)	(0.934)	(0.998)	(0.907)
Deposits ratio	–0.029	–0.020	–0.021	–0.029	–0.026
	(0.024)	(0.030)	(0.026)	(0.025)	(0.023)
Liquidity ratio	–0.056***	–0.047	–0.057***	–0.059***	–0.059***
	(0.019)	(0.035)	(0.020)	(0.020)	(0.018)
GDP growth	0.084	0.109	0.107	0.106	0.106
	(0.090)	(0.093)	(0.095)	(0.094)	(0.089)
Inflation	0.012	0.037	0.038	0.053	0.062
	(0.078)	(0.082)	(0.080)	(0.080)	(0.073)
Credit standards	0.017*	0.020**	0.021**	0.021**	0.019**
	(0.009)	(0.010)	(0.010)	(0.010)	(0.009)
Eonia	–0.007	–0.031	–0.029	–0.038	–0.040
	(0.053)	(0.054)	(0.053)	(0.054)	(0.050)

Table A.5 The role of bank-level characteristics in the transmission of ECB's QE policy to bank lending in Slovakia (continued)

Variables	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*
	Bank lending				
Fixed effects	Yes	Yes	Yes	Yes	Yes
Time effects	Yes	Yes	Yes	Yes	Yes
Observations	125	125	125	125	125
Number of banks	15	15	15	15	15

The estimated coefficients report the results of the baseline regressions performed on a sub-sample of banks from Slovakia. The estimated coefficients were estimated with the LSDVC estimator, which was conducted with the *xtlsdvc* Stata routine. Blundell-Bond (BB) estimator was used to correct the bias of the initial LSDV estimator. The sample covers the period from 2008 to 2018. Bootstrapped standard errors, which were estimated with 250 repetitions, are reported in parentheses. *** indicates 1% level of significance, ** indicates 5% level of significance and * indicates 10% level of significance.

Table A.6 Robustness tests

Variables	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*
	Bank lending				
Bank lending (t–1)	0.526***	0.508***	0.611***	0.455***	0.619
	(0.050)	(0.050)	(0.078)	(0.042)	(0.777)
Quantitative easing (QE)	0.122	0.598		0.051	1.510
	(0.259)	(0.530)		(0.233)	(5.295)
Central bank lending	–0.922	–1.892		–0.897	9.886
	(0.883)	(1.165)		(0.644)	(22.024)
Capital ratio	–1.701***	–1.771***		–1.654***	–7.911
	(0.621)	(0.618)		(0.501)	(21.494)
Return on equity (ROE)	–0.207	–0.270		–0.205	42.361
	(0.400)	(0.385)		(0.264)	(138.858)
Loan loss reserves (LLR)	–0.188	–0.195		–0.181	1.982
	(0.211)	(0.219)		(0.149)	(11.932)
Total assets (log)	64.138***	65.794***		66.346***	17.465
	(7.178)	(7.368)		(6.215)	(98.655)
Deposits ratio	–0.639**	–0.666**		–0.616***	–0.223
	(0.263)	(0.267)		(0.204)	(7.797)
Liquidity ratio	–0.332***	–0.387***		–0.355***	–0.310
	(0.126)	(0.124)		(0.102)	(2.779)
GDP growth	1.013	0.307	–2.371	1.131	–15.364
	(0.938)	(2.535)	(3.313)	(0.786)	(65.049)

Table A.6 Robustness tests (continued)

Variables	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*
	Bank lending				
Inflation	–0.467	–1.187	4.545	0.089	1.392
	(1.244)	(2.839)	(3.993)	(0.950)	(30.937)
Credit standards	0.271**	0.267	0.024	0.266***	–1.504
	(0.114)	(0.177)	(0.232)	(0.093)	(4.894)
Eonia	0.315		5.776	0.060	Omitted
	(0.600)		(5.847)	(0.521)	
MRO (Main refinancing operations)		15.917			
		(18.038)			
Quantitative easing (t–1)			5.946*		
			(3.483)		
Central bank lending (t–1)			–2.238		
			(1.512)		
Capital ratio (t–1)			–1.079		
			(1.055)		
Return on equity (t–1)			–0.874		
			(0.646)		
Loan loss reserves (t–1)			–0.540		
			(0.393)		
Total assets (t–1)			36.796***		
			(11.724)		
Deposits ratio (t–1)			–0.454		
			(0.484)		
Liquidity ratio (t–1)			–0.278		
			(0.184)		
GDP growth (t–1)			–2.467		
			(3.296)		
Inflation (t–1)			–0.937		
			(2.698)		
Credit standards (t–1)			–0.264		
			(0.246)		
Eonia (t–1)			3.432*		
			(2.071)		
Constant					0.000
					(0.000)
Fixed effects	Yes	Yes	Yes	Yes	No
Time effects	No	Yes	Yes	No	Yes
Sargan test					0.00

Table A.6 Robustness tests (continued)

Variables	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*
	Bank lending				
Hansen test					0.01
AB Test AR(1)					–0.37
AB Test AR(2)					0.47
Observations	327	327	328	319	327
Number of banks	54	54	53	50	54

The estimated coefficients report the results of the baseline regressions performed on the full sample of banks from new EA member states. The estimated coefficients in columns 1–3 were estimated with the LSDVC estimator, which was conducted with the *xtlsdvc* Stata routine. Blundell-Bond (BB) estimator was used to correct the bias of the initial LSDV estimator. Bootstrapped standard errors, which were estimated with 250 repetitions, are reported in parentheses. The coefficients reported in column (4) were estimated with the bootstrapped corrected FE estimator of De Vos et al. (2015) using the *xtbcfe*Stata routine. 250 iterations were used to estimate the bootstrapped standard errors. The results reported in column (5) were estimated using the system GMM estimator of Arellano and Bover (1995) and Blundell and Bond (1998). The standard errors are Windmeijer's (2005) corrected standard errors. The sample covers the period from 2008 to 2018 (depending on the year the country joined the Euro Area). *** indicates 1% level of significance, ** indicates 5% level of significance and * indicates 10% level of significance.