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Канал банкарског кредитирања у евроизованој економији: случај Србије

Срђан Кујунџић Драгиша Оташевић

The bank lending channel in an euroised economy: the case of Serbia

Srđan Kujundžić Dragiša Otašević

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Канал банкарског кредитирања у евроизованој економији: случај Србије

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Апстракт: Циљ овог чланка је истраживање канала банкарског кредитирања као дела механизма монетарне трансмисије у Србији. Прикупљени су билансни подаци за 33 банке у периоду од трећег квартала 2008. до другог квартала 2011. године а као економетријска техника је употребљен метод динамичког панела. Истражене су две функције понуде банкарских кредита у зависности од валутне деноминације или индексације кредита. Асиметрично прилагођавање количине кредита истражено је узимајући у обзир следеће карактеристике: величина банке, капитализација, ликвидност, страно власништво и задуженост према иностранству. Резултати указују на постојање канала банкарског кредитирања кроз домаћу и страну референтну стопу у понуди домаћих кредита. У случају кредита у страној валути, промене референтних стопа немају статистички значајан ефекат што се може објаснити високим учешћем дугорочних кредита у укупним девизним и девизно индексираним кредитима и ограниченом дужином узорка.

Кључне речи: Канал банкарског кредитирања, Србија, евроизована економија, метод динамичког панела на малом узорку
JEL Code: E52, E58, C33

The bank lending channel in an euroised economy: the case of Serbia

Srđan Kujundžić Dragiša Otašević

Abstract: This paper investigates the bank lending channel of monetary transmission in Serbia. We collect individual bank balance sheet data for 33 banks over the period 2008Q3-2011Q2 and employ dynamic panel estimation techniques. Two different bank loan supply functions are investigated according to the currency denomination of bank loans in Serbia. Our findings indicate that there is a significant bank lending channel through the domestic and foreign reference interest rates in the growth of domestic currency loans. In the case of foreign currency loans, there is no statistical evidence for the existence of a bank lending channel which may be related to the prevalence of long-term loans in total foreign currency loans and relatively short sample size.

Key words: bank lending channel; Serbia; euroised economy; small-size dynamic panel estimation
JEL Code: E52, E58, C33

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Non-tehnical Summary

The mechanisms through which the monetary policy of central banks affects real activity in euroised economies are not completely explored. A strand of the literature on the transmission mechanism emphasizes the special role of banks in the transmission mechanism through the so-called bank lending channel of monetary policy. The existence of the bank lending channel infers that monetary policy tightening can affect the amount of loans which, in turn, further affects investment and consumption. According to this mechanism, monetary policy affects the real economy not only through the impact of interest rates on the aggregate demand but also through shifts in the supply of bank loans.

There is a relatively large literature that analyses the bank lending channel. The findings of most empirical studies of the bank lending channel strongly support the view that banks react differently to monetary policy changes depending on bank-specific characteristics. Some studies show that larger/better capitalized/more liquid banks reduce their lending less due to a tightening monetary policy shock than smaller/less capitalized/less liquid banks do. However, the results vary dependent on country and time period analysed.

This paper investigates the role of banks in the monetary transmission mechanism in Serbia. Given the relatively high level of loan eurisation through the existence of foreign-currency loans, the domestic monetary policy measures can have a different impact on the banks' behaviour. Consequently, we analyse two loans functions depending on whether they are denominated in or indexed to a foreign currency or not. Furthermore, we assess how banks change the supply of loans in response to a change in the domestic and foreign reference rates dependent on their financial characteristics (size, capitalization, liquidity, foreign liabilities and foreign ownership). We employ disaggregated data for 33 banks over the period 2008Q3-2011Q2. We estimate the model by a two step Arellano-Bond estimator.

The results obtained suggest the existence of a significant bank lending channel through the domestic and foreign reference interest rates in the growth of domestic currency loans. On the other hand, we find weak statistical evidence for the existence of a bank lending channel through foreign currency loans. All bank specific characteristics apart from the measure for foreign liabilities seem to play a significant role in distinguishing banks' response to changes in reference interest rates.

Contents:

1. Introduction

The aim of this paper is to investigate the bank lending channel and its determinants in Serbia. The bank-lending channel theory suggests that monetary policy transmission works through bank credit. The existence of the bank lending channel infers that monetary policy tightening can affect the amount of loans which, in turn, further affects investment and consumption.

The share of foreign currency loans in total loans in the Serbian banking sector is relatively high, which is typical for post-transition countries. The supply and demand functions for foreign-currency loans can depend on different variables than the ones which determine the supply and demand functions for domestic currency loans. Regarding the managed floating exchange rate regime in Serbia, the high dependence of Serbian banks on external funding and the relatively high level of loan eurisation through the existence of foreign-currency loans, the impact of monetary policy could be significantly limited. In this sense the aim of this analysis is to econometrically assess the impact of changes in domestic and foreign reference interest rates on the Serbian banks' decision making with regard to their supply of loans and its currency composition, by controlling for the impact of another, supporting, monetary policy instrument of the National Bank of Serbia – reserve requirements.

The model which could be the basis for an investigation of the bank lending channel in Serbia is a modified version of the model introduced by Ehrmann et al., (2001), Kierzenkowski (2005) and Bogoev (2011). The modified version in this paper allows us to imply the existence of two types of loans and deposits in Serbian banks' portfolio - domestic currency loans and deposits and foreign currency loans and deposits. In this regard, we analyse two functions for loans dependent on whether they are denominated in or indexed to a foreign currency or not.

Our findings indicate that there is a significant bank lending channel through the domestic and foreign reference interest rates in the growth of domestic currency loans. In the case of foreign currency loans, there is not enough evidence on the existence of a bank lending channel. All bank specific characteristics apart from the measure for foreign liabilities seem to play a significant role in distinguishing banks' response to changes in reference interest rates. In addition, we do not find statistical evidence that the changes in the reserve requirements affect the banks' lending schedule in Serbia, at least when the changes in reserve requirements are measured through the effective reserve requirement ratio.

The remainder of this paper is structured as follows: in section 2, we conduct a review of the existing literature on the bank lending channel, especially in Central and Eastern European countries. In section 3, we give a short overview of the monetary policy framework and the banking sector in Serbia. In section 4, we explain the model and the empirical framework. In section 5, we discuss the methodological approach and the results. In section 6, we present our conclusions, limitations of the research and future areas for possible improvement.

2. Literature review

Although there have been previous attempts in the academic literature to approach the issue of the existence of a bank lending channel, the theoretical background developed by Bernanke and Blinder (1988) is the first one that formally analyzes this particular channel of the transmission mechanism of monetary policy, where the IS curve is replaced by the credit-commodity (CC) curve to produce the CC-LM model. Central to the bank lending channel is the imperfect substitutability between loans and other financial assets in the banks' balance sheet on one hand, and that between bank loans and other forms of financing on firms' balance sheets on the other hand. Kashyap and Stein (1997) study the monetary-transmission mechanism for the U.S. banking system and find that the impact of monetary policy on lending is stronger for banks with less liquid balance sheets. Ehrmann et al (2001) test the hypothesis of a significant role of banks in the monetary transmission mechanism in four developed countries in the euro area and find that monetary policy does alter banks' loan supply, with the effects most dependent on the liquidity of individual banks.

The findings of Schmitz (2004) for eight new EU member states and Köhler et al. (2005) for the Baltic States coincide in the sense that the bank lending channel works through changes in the foreign reference interest rate but not through the domestic reference interest rate.

A common finding of Schmitz (2004), Köhler et al. (2005), as well as of Havrylchyk and Jurzyk (2005) and Chmielewski (2006) for Poland, is that foreign owned banks are more resistant to a domestic monetary policy shock than domestically owned banks are (they reduce their lending activity proportionally less than domestically owned banks in response to an increase of the domestic reference interest rate). There is also evidence that better capitalized banks reduce their lending activity proportionally less than less capitalized banks do in response to an increase of the domestic reference interest rate. Such evidence is common for the studies of Wrobel and Pawlowska (2002), Köhler et al. (2005), Chmielewski (2006), Golodniuk (2006) and Pruteanu-Podpiera (2007). In other studies, like Havrylchyk and Jurzyk (2005) for example, bank capitalization turns out to play no role in the lending behavior of banks.

By examining the bank lending channel in Poland, Havrylchyk and Jurzyk (2005) find that high liquidity enables banks to insulate loans from monetary policy shocks, but find weak evidence of a significant impact of banks' size on their lending behaviour. However, the estimated coefficient indicates that smaller banks are in a better position to shield their loan portfolio from monetary policy shocks. In contrast to their results, Wrobel and Pawlowska (2002) find that bigger and better capitalized banks contract their lending activity less than smaller and less capitalized banks in response to a positive monetary policy shock. On the other side, they also find that more liquid banks are more responsive to a positive shock in the policy rate than less liquid banks are. This finding could be regarded as counterintuitive at first glance. However, since Chmielewski (2006) and Matousek and Sarantis (2009) for Poland and Köhler et al. (2005) for the Baltic States have the same finding with regard to liquidity, it can be argued that in countries like the Baltic countries

and Poland, such findings contrary to what theory would predict can be explained by the structural excess of liquidity of the banking sector.

Summing up, the empirical results strongly support the view that banks react differently to monetary policy changes depending on the above-listed characteristics. Empirical works on the bank lending channel in Serbia are nonexistent. We hope that our work will significantly contribute to deeper understanding of the bank lending channel in Serbia.

3. Some stylized facts about the monetary system in Serbia

Since August 2006 the National Bank of Serbia (we will further refer to it as NBS) has been gradually introducing principles of inflation targeting as monetary strategy into practice. The NBS pursues a managed floating exchange rate regime. This means that interventions can be made in order to limit excessive daily oscillations in the foreign exchange market, contain threats to financial and price stability and safeguard an adequate level of foreign exchange reserves.

The NBS implements its monetary policy in an environment with a banking sector which is:

- mainly foreign-owned (21 out of 33 banks were foreign owned at the end 2011)
- considerably fragmented (top five and top ten banks hold high shares of the total assets of the Serbian banking sector ; 46% and 70%, respectively).
- well-capitalised (the capital adequacy ratio of the banking sector equalled to 19.7% at the end of September 2011).
- very liquid

Regarding the banks' balance sheets, Serbia is one of the most euroised economies in Central and Eastern Europe. The share of strictly foreign-currency loans is not particularly high, but the share of loans indexed to exchange rate fluctuations is very high. Loan euroisation[1] in Serbia is higher than in most Central and Eastern European countries and stood at about 71% at the end of December 2011 (See Figure 1). Deposit euroisation was similarly high at about 77 % at the end of December 2011, being significantly more prominent in the household sector than in the corporate sector (see Figure 2).

Euroisation weakens the monetary transmission channel and reduces the effectiveness of monetary policy. Due to high eurisation of loans the interest rate channel in Serbia is rather weak (Aleksić at al., 2008). Monetary policy rates may be reflected in lending rates for domestic currency loans, but the volume of these loans is much less than foreign-currency loans with doubtful response to monetary policy rates.

[1] Official statistics comprise data of the household and the corporate sector. RSD loans indexed to a foreign currency are classified as foreign currency loans. The same applies to deposits.

Another characteristic of the Serbian loan market which could weaken the effectiveness of monetary policy is the term structure of loans. Namely, total loans to enterprises and households are mostly long-term loans[2]. This is due to the dominance of long-term loans in total foreign currency loans. At the end of December 2011, around 74% of total loans in foreign currency were long-term loans. These long-term loans were mainly loans with maturity of more than five years (see Charts 5 and 6). On the other side, domestic currency loans were mainly short-term (around 53%). Charts 3 and 4 illustrate this. Due to the small portion of domestic currency loans in total loans, such a term structure of loans could weaken the influence of domestic and foreign monetary policy on lending rates of total loans in Serbia.

Figure 1: The share of Serbian banks' foreign currency loans in total loans to enterprises and households*
(in %)

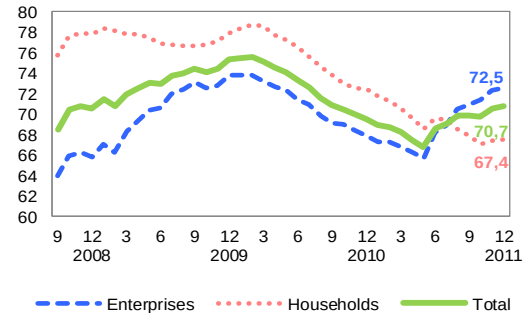


Figure 2: The share of foreign currency deposits in total deposits of enterprises and households with Serbian banks*
(in %)

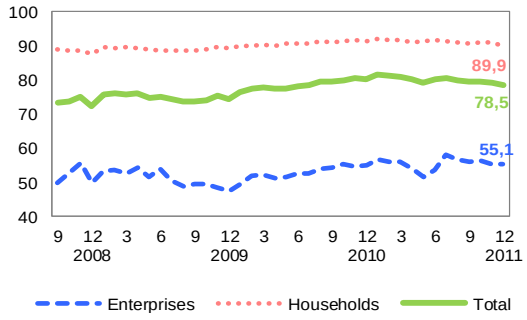


Figure 3: Term structure of Serbian banks' domestic currency loans to enterprises*

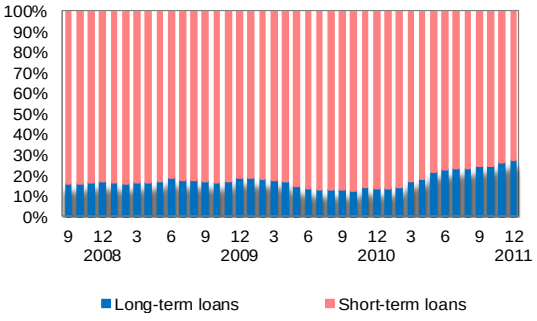
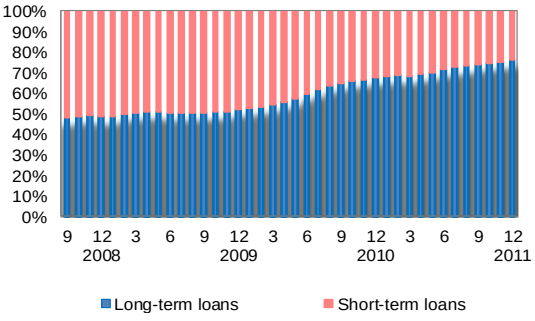


Figure 4: Term structure of Serbian banks' domestic currency loans to households*



[2] In accordance with official statistics long-term loans are loans with maturity longer than one year.

Figure 5: Term structure of Serbian banks' foreign currency loans to enterprises*

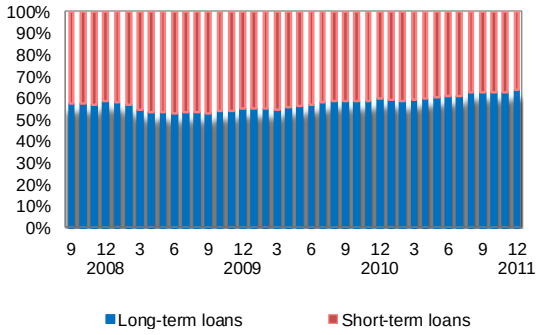
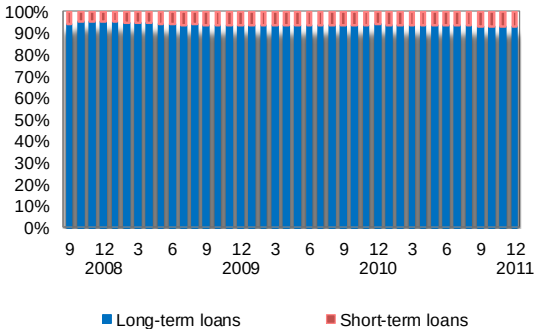


Figure 6: Term structure of Serbian banks' foreign currency loans to households*



*Source for Figures 1-6: National Bank of Serbia

4. A model of the bank lending channel in Serbia

The model relies on three main equations: an equation for bank deposits, an equation for credit demand and an equation for credit supply. The model is closely linked with the literature which emerged after the publication of Ehrmann et al. (2001), Kierzenkowski (2005) and Bogoev (2011).

We assume banks' deposits (D) to equal money (M) and to be composed of domestic currency deposits D^d and foreign currency deposits D^f. Those are negatively correlated with the domestic reference rate r^d and the foreign reference rate r^f, respectively:

$$M = D = D^d + D^f = -\psi^d r^d - \psi^f r^f + c \quad (1)$$

We differentiate two credit demand and credit supply functions dependent on the currency deposits are denominated in or indexed to.

Since the aim of this paper is to analyse the effect of the key policy rate of the NBS, the two-week repo rate[3] (we will further refer to it as REPO rate) on the supply of domestic currency and foreign currency credit (controlling for the effect of the reserve requirements), it is necessary to make some important remarks. Although the REPO rate is the main monetary policy instrument of the NBS, it does not serve as a 'funding cost' of the commercial banks' credit operations. It is rather the return on an alternative investment for the banks in which they may decide to invest their structural excess liquidity. Due to excess

[3] It is the interest rate which NBS applies in its main open market operations (currently, two-week reverse repo transactions) as the main monetary policy instrument.

liquidity banks can purchase risk free securities issued by the NBS, with maturity of two weeks for a relatively high return. Since the REPO rate does not represent the 'theoretical' basis of the model we used the market interest rate at which banks borrow from each other, the BELIBOR 3M rate[4].

The demand for domestic currency loans is a function of two macroeconomic variables, income (X) and the inflation rate (π). The demand for domestic currency loans is negatively correlated with interest rates on domestic currency loans $\left(i^d\right)$ and positively correlated with interest rates on foreign currency loans $\left(i^f\right)$. On the other hand, the demand for foreign currency loans is positively correlated with interest rates on domestic currency loans $\left(i^d\right)$ and negatively correlated with interest rates on foreign currency loans $\left(i^f\right)$. Besides this, in an economy with a floating foreign-exchange regime and the exchange rate er, representing the domestic currency value of a unit of foreign currency[5], demand for foreign currency loans is positively correlated with exchange rate fluctuations.

$$L_D^d = \alpha_1 x + \alpha_2 \pi + \alpha_3 er - \alpha_4 i^d + \alpha_5 i^f \tag{2}$$

Equation (2) can be further simplified by the introduction of the interest rate differential s (the difference between the interest rate on domestic currency loans and the interest rate on foreign currency loans).

$$L_D^d = \alpha_1 x + \alpha_2 \pi + \alpha_3 er - \alpha_6 s \tag{3}$$

The same analogy applies to the demand for foreign currency loans where we now have a positive sign before the coefficient associated to the difference between the interest rate on foreign currency loans and the interest rate on domestic currency loans:

$$L_D^f = \beta_1 x + \beta_2 \pi + \beta_3 er + \beta_6 s \tag{4}$$

Since the formulae for the supply and demand functions for domestic currency and foreign currency loans are similar, we will further elaborate the case of domestic currency loans. The supply function for foreign currency loans can be derived analogically.

The supply of domestic currency loans is positively correlated with the domestic currency deposits $\left(D^d\right)$ which are one of the main sources for the credit activity of the banks in Serbia. The supply of domestic currency loans is also positively correlated with the interest rate on domestic currency loans $\left(i^d\right)$.

[4] The Belgrade Interbank Offer Rate is the reference interest rate for dinar funds offered on the Serbian interbank market. It is calculated as the arithmetical mean of the prevailing quotations after the elimination of the highest and lowest bid rate and rounded to two decimals.

[5] Thus, an increase of *er* denotes a depreciation of the domestic currency.

On the other side, the supply of domestic currency loans is negatively correlated with the interest rate on foreign currency loans $\left(i^f\right)$ and the domestic reference rate $\left(r^d\right)$ since they represent a kind of opportunity cost for banks.

$$L_S^d = \gamma_1 D^d + \gamma_2 i^d - \gamma_3 i^f - \gamma_4 r^d - \gamma_5 r^f - \gamma_6 RR\_rsd \tag{5}$$

RR_rsd represents the effective reserve requirement ratio on funds that banks are required to keep on deposit accounts with the NBS calculated on RSD funding sources. It is calculated as a ratio of calculated required reserves and the net required reserve base for domestic currency and foreign currency funding sources. We expect it to be negatively correlated with the supply of domestic currency loans[6]. In this way we control for the influence of another monetary policy instrument of the NBS – the required reserves. In the remaining text the expression $\gamma_2 i^d - \gamma_3 i^f$ is substituted with the expression $\gamma_7 s$.

Since the influence of deposits with banks on the supply of loans depends on other characteristics of the banks' balance sheets such as size, capital, liquidity, foreign liabilities and foreign-ownership, the influence of these variables on the supply function for loans is incorporated in the following equation:

$$\gamma_1 = \gamma_8 - \gamma_9 z \tag{6}$$

where γ_1 represents the change of deposits with banks and z represents one of the aforementioned bank-specific characteristics.

If we express s from equation (3) as:

$$s = \frac{\alpha_1 x + \alpha_2 \pi + \alpha_3 er - L_D^d}{\alpha_6} \tag{7}$$

and then, with a subtle change of notation for loan supply, evaluate the reduced form model by assuming a supply-demand equilibrium for loans, we can show that the equilibrium amount of domestic currency loans equals:

$$\begin{aligned} L_d = & \frac{-\alpha_6\gamma_8\psi^d r^d + \alpha_6\gamma_9 z\psi^d r^d - \alpha_6\gamma_8\psi^f r^f + \alpha_6\gamma_9 z\psi^f r^f + \alpha_6\gamma_8 c}{\alpha_6 + \gamma_7} \\ & + \frac{-\alpha_6\gamma_9 zc + \alpha_6\gamma_4 r^d - \alpha_6\gamma_5 r^f - \alpha_6\gamma_6 RR\_rsd + \alpha_1\gamma_7 x + \alpha_2\gamma_7\pi + \alpha_3\gamma_7 er}{\alpha_6 + \gamma_7} \end{aligned} \tag{8}$$

Equation (8) can be further simplified:

$$L_d = \phi_0 + \phi_1 x + \phi_2 \pi - \phi_3 r^d + \phi_4 r^f + \phi_5 z r^d + \phi_6 z r^f - \phi_7 RR\_rsd + \phi_8 er + \phi_9 z \tag{9}$$

where $\phi_5 = \frac{\gamma_9\psi^d\alpha_6}{\alpha_6 + \gamma_7}$ and $\phi_6 = \frac{\gamma_9\psi^f\alpha_6}{\alpha_6 + \gamma_7}$.

[6] By increasing (decreasing) the reserve ratio, the central bank induces a reduction (expansion) of commercial banks' lending potential.

The coefficients ϕ_5 and ϕ_6 are coefficients for the interaction terms between the domestic and foreign reference rate, on the one hand, and the bank-specific characteristics, on the other hand. These coefficients will show how banks change the supply of loans in response to a change of the domestic and foreign reference rates dependent on their financial characteristics (size, capitalization, liquidity, foreign liabilities and foreign ownership).

The representation of the generalized model without restrictions for every bank has the following form (the notations for the coefficients for the parameters have been changed in order to make the difference between different regressors more clear)[7]:

$$\begin{aligned}
&\Delta \ln L^d_{it} = \sum_{j=1}^{l} \alpha_j \Delta \ln L^d_{i(t-j)} + \sum_{j=0}^{l} \beta^{dd}_j \Delta r^d_{t-j} + \sum_{j=0}^{l} \beta^{df}_j \Delta r^f_{t-j} + \sum_{j=0}^{l} \gamma^d_j \Delta \ln x_{t-j} \\
&+ \sum_{j=0}^{l} \delta^d_j \ln er^d_{t-j} + \sum_{j=0}^{l} \phi^d_j \Delta \ln RR_rsd_{t-j} + \sum_{j=0}^{l} \varphi^d_j \pi_{t-j} + \sum_{j=1}^{l} \eta^d_j \Delta \ln D_rsd_{t-j} + \kappa^d z_{i(t-1)} \\
&+ \lambda^d FDummy_{i(t-1)} + \sum_{j=0}^{l} \nu^{dd}_j \left[\Delta r^d_{t-j} \times z_{i(t-1)}\right] + \sum_{j=0}^{l} \nu^{df}_j \left[\Delta r^f_{t-j} \times z_{i(t-1)}\right] \\
&+ \sum_{j=0}^{l} \vartheta^{dd}_j \left[\Delta r^d_{t-j} \times FDummy_{i(t-1)}\right] + \sum_{j=0}^{l} \vartheta^{df}_j \left[\Delta r^f_{t-j} \times FDummy_{i(t-1)}\right] + \mu^d_i + e_{it}
\end{aligned} \tag{10}$$

$$\begin{aligned}
&\Delta \ln L^f_{it} = \sum_{j=1}^{l} \alpha_j \Delta \ln L^f_{i(t-j)} + \sum_{j=0}^{l} \beta^{fd}_j \Delta r^d_{t-j} + \sum_{j=0}^{l} \beta^{ff}_j \Delta r^f_{t-j} + \sum_{j=0}^{l} \gamma^f_j \Delta \ln x_{t-j} \\
&+ \sum_{j=0}^{l} \delta^f_j \ln er^d_{t-j} + \sum_{j=0}^{l} \phi^f_j \Delta \ln RR_eur_{t-j} + \sum_{j=0}^{l} \varphi^f_j \pi_{t-j} + \sum_{j=1}^{l} \eta^f_j \Delta \ln D_eur_{t-j} + \kappa^f z_{i(t-1)} \\
&+ \lambda^f FDummy_{i(t-1)} + \sum_{j=0}^{l} \nu^{fd}_j \left[\Delta r^d_{t-j} \times z_{i(t-1)}\right] + \sum_{j=0}^{l} \nu^{ff}_j \left[\Delta r^f_{t-j} \times z_{i(t-1)}\right] \\
&+ \sum_{j=0}^{l} \vartheta^{fd}_j \left[\Delta r^d_{t-j} \times FDummy_{i(t-1)}\right] + \sum_{j=0}^{l} \vartheta^{ff}_j \left[\Delta r^f_{t-j} \times FDummy_{i(t-1)}\right] + \mu^f_i + e_{it}
\end{aligned} \tag{11}$$

L^d_{it-1} and L^f_{it-1} represent the amount of domestic currency and foreign currency loans of bank i in the quarter $t-1$; r^d_t and r^f_t are 3-month interest rates on the Serbian interbank market (BELIBOR 3M) and the 3-month EURIBOR (EURIBOR 3M). χ is real GDP; π_t is the CPI-based inflation rate; er_t is the average exchange rate of the RSD over the EURO for quarter t; z_{it} represent size, liquidity, capitalization and foreign liabilities of bank i on a quarterly basis; $r^d \times z_{it}$ and $r^f \times z_{it}$ are interaction terms between the banks' characteristics, on one side, and the domestic and foreign interbank interest rates, on the other side; $FDummy_{it}$ is an artificially created foreign-ownership dummy variable which equals 1 if the respective bank is mainly foreign-owned and 0 if this is not the case. Since the majority of banks in Serbia are foreign-owned, it is important to include a variable reflecting this fact. $r^d \times FDummy_{it}$ and $r^f \times FDummy_{it}$ are interaction terms between the foreign-ownership dummy variable, on one side, and the domestic and foreign interbank interest rates, on the other side;

[7] Due to a very short period of analysis, the model is estimated for the current period with one lag.

D_rsd and D_eur represent domestic currency and foreign currency deposits with a bank. RR_rsd and RR_eur is the effective reserve requirement ratio on funds that banks are required to keep on deposit accounts with the NBS calculated on domestic currency and foreign currency funding sources, respectively. The residual term consists of two parts: the first part u_i^f is specific for a certain bank, does not change over time and cannot be observed, and the second part ε_{it} - i.i.d is the residual of bank i on a quarterly basis.

We believe that, due to asymmetric information problems, banks might respond differently to a change in the domestic and foreign reference interest rates dependent on bank-specific characteristics. In order to test for the existence of such distributional effects of monetary policy among banks, we introduce bank-specific financial characteristics. The financial characteristics (z) we use in the model are size, capitalization, liquidity, foreign liabilities and foreign ownership. We believe that large banks (in terms of their assets) can have easier access to non-deposit funds in order to offset monetary policy tightening and thus find it easier to keep their loan supply at a desired level. Therefore, we expect large banks to reduce lending less than small banks after a monetary policy tightening. The greater the part of liquid assets in banks' portfolios is the more the banks are able to shield their loan portfolios and thus offset a reduction of lending activity after monetary policy tightening. More specifically, liquid banks could reduce their portfolios of liquid assets (NBS bills, Treasury bills, etc.) and thus avoid cutting loans after a positive monetary policy shock. We expect well capitalized banks to have easier access to non-deposit financing and consequently reduce lending less than poorly capitalized ones after a monetary policy tightening. The fact that some banks highly depend on foreign financing and have a high share of foreign currency loans in their loan portfolio supports the inclusion of other variable – foreign liabilities. We expect banks which borrow more in foreign currency from non-residents to reduce lending less than banks which rely more on domestic currency funding after a domestic monetary policy tightening. A positive parameter for the interaction terms is equivalent to the assumption that smaller/poorly capitalized/less liquid banks and banks which borrow less from abroad react more strongly to monetary policy changes. We use the following measures:

$$
\begin{aligned}
Size_{it} &= \log A_{it} - \frac{\sum_{i=1}^{N} \log A_{it}}{N_t} \\
Liquidity_{it} &= \frac{L_{it}}{A_{it}} - \frac{\sum_{i=1}^{T}\left(\sum_{i=1}^{N}\left(L_{it}/A_{it}\right)/N_t\right)}{T} \\
Capital_{it} &= \frac{C_{it}}{A_{it}} - \frac{\sum_{i=1}^{T}\left(\sum_{i=1}^{N}\left(C_{it}/A_{it}\right)/N_t\right)}{T} \\
FL_{it} &= \frac{FL_{it}}{A_{it}} - \frac{\sum_{i=1}^{T}\left(\sum_{i=1}^{N}\left(FL_{it}/A_{it}\right)/N_t\right)}{T}
\end{aligned}
\qquad (12)
$$

In order to be able to interpret the parameters directly as the average response of loans to a monetary policy shock, we normalize the four characteristics with respect to their mean across all banks in the sample and get indicators that sum to zero over all observations in our sample. By de-meaning the assets we remove the upward trend that can be observed in banks' assets. For capitalization, liquidity and foreign liabilities we remove the overall sample mean (across banks and over time) from each observation. In such a way we adjust for distributional effects of these characteristics not only across banks, but also over time.

We use data obtained from the NBS for banks' balance sheets, real GDP growth, the inflation rate, domestic interbank interest rates and from the EuroStat database for the 3-month EURIBOR. See Table A.1 in the Appendix for a description of the data. The sample consists of quarterly data and covers the period 2008Q3–2011Q2. The analysis does not go before 2008Q3 because there is no consistent data available on banks' loans and deposits in foreign currency[8].

5. Methodological approach and empirical results

5.1. Methodological approach

We estimate the model by a two step Arellano-Bond estimator (Arellano and Bond, 1991). We consider estimation of first-order dynamic fixed-effects models for short panels that specify the dependent variable for an individual bank to depend on its values in previous periods. As in the nonpanel case, care is needed since the group specific effect, which is time invariant, is correlated with the current and all lagged values of dependent variable. This leads to inconsistent parameter estimates. To overcome this problem we start our estimation by transforming the model into differences and use Generalized Method of Moments (Hansen, 1982).

Arellano and Bond (1991) approach the instrumental variables estimation of dynamic panel models by using lagged values of the endogenous and predetermined variables as instruments for the equations in first differences. The Arellano and Bond (1991) *difference* GMM estimator was augmented by Arellano and Bover (1995) and Blundell and Bond (1998) by making an additional assumption that the fixed effects are uncorrelated with the first differences of instrumental variables, allowing for the original levels to be instrumented with differences. In other words, they create a *system* estimator which uses moment conditions for the data in levels while retaining the moment conditions for the transformed (first differenced) equation "a la Arrellano-Bond".

[8] Before July 2008 loans and deposits denominated in RSD, but indexed to a foreign currency were classified as domestic currency loans. Therefore an inclusion of data before this point in time would understate euroisation of loans and deposits and thus lead to an inconsistent sample.

Although it is well known that *system* GMM has certain advantages over *difference* GMM (more efficient estimation, it includes time invariant regressors and more valid instruments when the autoregressive parameter is very large) we apply *difference* GMM since we encounter the problem of too many instruments in comparison to the number of groups (Roodman, 2008). Consequently, during the estimation we try to circumvent the problem of creation of too many instruments by opting for *difference* GMM instead of *system* GMM in the first instance. As a rule of thumb, we keep the number of the instruments lower than the number of banks (33). In addition, we restrict the lag ranges used in generating the instrument sets and collapse the instrument set using the >collapse< option in >xtabond2<[9] in STATA 11.

In the standard (un-collapsed) form, each instrumenting variable creates one instrument for each time period and lag available to that period whereas in the collapsed form we create not a whole matrix of instruments but a single column vector of instruments. While in large samples collapsing can reduce statistical efficiency, it can be very helpful, as a tool to avoid the bias, in finite samples which are usually characterized with instrument proliferation.

We apply standard battery of diagnostic tests such as Arellano-Bond test for the second-order serial correlation in the error term of the first-differenced equation, Sargan/Hansen test for the validity of overidentifying restrictions and the Difference-in-Hansen test for the validity of some subsets of instruments. Since standard errors using the standard textbook formulas for the two-step GMM estimator are downward biased we apply Windmeijer (2005) small sample correction and obtain a better estimate of standard errors.

Both *difference* and *system* GMM estimators assume that the idiosyncratic disturbances are uncorrelated across individuals. A likely solution to this problem is to include the GDP growth rate and inflation rate that may capture the relevant time effect. In this way we are able to remove the effects of period specific and group invariant shocks from the idiosyncratic error term into the systematic part of the model. As an additional check, we use the testing procedure developed by Sarafidis, et al. (2006, p.12) which examines the possibility of remaining cross-section dependence after the inclusion of GDP growth rate and inflation rate.

We report short-run elasticities of the model. Instruments are the second and consecutive lags of the first difference of log of loans, the bank characteristics and interaction terms. As usual monetary policy indicators and the rest of explanatory variables are considered exogenous and are used as instruments for themselves. The collapsed instruments are the second and consecutive lags of the dependent variable, the bank specific characteristics and interaction terms.

[9] See Roodman, D. M. (2005), "Xtabond2: STATA Module to Extend Xtabond Dynamic Panel Data Estimator", Boston, MA: Boston College Department of Economics

5.2. Empirical results

Tables A2 and A3 in the Appendix contain short-run estimates of the model using the two-step estimation with Windmeijer (2005) corrected standard errors. The estimated results are presented according to the different bank characteristics i.e. interaction terms of bank-specific characteristics. Although we are aware that the different bank characteristics may be correlated with each other we choose not to include all bank-specific characteristics (or only two at the same time) in the estimation since that would significantly increase the number of instruments. We perform specification tests for first-order autocorrelation in the differenced error terms (AR(1)) and reject at lag 1 the null hypothesis of first-order autocorrelation in the differenced error terms. The Arellano-Bond tests for autocorrelation at lag 2 (AR(2)) accept the null of hypothesis of no second-order autocorrelation in the differenced terms for all estimated panel regressions. In all the estimations, the Hansen test returns p-value higher than 0.05 confirming the joint validity of instruments. In order to test for the remaining cross-section dependence after the inclusion of macroeconomic variables we perform the testing procedure developed by Sarafidis et. al (2006) and do not find the evidence of remaining cross-section dependence. The number of instruments in all panel regressions is smaller than the number of banks and ranges from 22 to 31. By restricting and collapsing the number of instruments we succeed in considerably reducing the value of Hansen statistic below a perfect Hansen statistic of 1. The values of Hansen statistics lie in the range (0.31-0.59) in Table A2 and (0.49-0.9) in Table A3.

In all dynamic panel specifications the estimated coefficient for the lagged value of the log-differenced loans in RSD and in Euros is highly statistically significant with positive sign. These results show high inertia in the adjustment process for log-differenced loans in both currencies.

In most of our specifications for domestic currency loans, the coefficient for 3-month BELIBOR is, as expected, negative and highly significant at lag one. We do not find statistically significant coefficients for BELIBOR 3M at lag zero. Such results indicate that domestic monetary policy affects domestic currency lending with a lag. The results on the foreign currency reference interest rate indicate that a rise in EURIBOR 3M leads to a decrease in the domestic currency lending growth rate at lag zero. The reason for this might be that Serbian banks finance a part of their domestic currency lending by foreign currency funds in the short term.

Loans denominated in or indexed to EUR do not react significantly to the foreign reference rate at lag zero and lag one. Since we hypothesize that long-term loans are less responsive to changes of the reference rates in the short-run than short-term loans, these results seem to stem from the high share of long-term loans in total foreign currency loans. We find very weak evidence that banks in Serbia adjust Euro loans in response to domestic reference rate. In other words, this finding implies that in the case of Serbia monetary authorities do not have control over the bank loan adjustment when the loans are denominated in Euros.

As expected, the macroeconomic controlling variable (GDP) has positive sign in both loan supply functions. It is statistically significant in all specifications for domestic currency loans and is statistically significant in two specifications for foreign currency loans (when we control for size and foreign liabilities). This indicates that banks will adjust their loans denominated in domestic and foreign currency upwards when the economic activity intensifies. The fact that we are able to capture the influence of GDP, as one of the variables that controls for demand shocks, also offers the assurance that we succeeded in controlling for cross-individual correlation (the alternative is to include time dummies in order to remove universal time-related shocks from errors).

The macroeconomic control variable (CPI) has positive sign in the loan supply function for loans denominated in domestic currency at lag one. In the regressions for foreign currency loans the price level enters with negative sign (at lag zero) in the regressions where controlled banks' characteristics are size and foreign ownership.

We find strong evidence of banks' currency matching in our estimations. This implies that higher supply of RSD and EUR deposits will increase banks' supply of RSD and Euro loans respectively. One percentage point increase in RSD deposits increases the growth rate of RSD loan supply for 4.5%, 7.7%, 7.3% and 6.1% in panel regressions when capitalization, liquidity, foreign ownership and foreign liabilities are controlled for (at lag one). In the panel regression for Euro loans this increases the growth rate of banks' EURO loan supply when control variable is liquidity. We see this as consistent with the term structure of foreign currency loans. Due to the dominantly long-term foreign currency loans, a specification including only one lag probably is not enough to capture banks' currency matching of foreign currency funding sources and foreign currency loans.

With regard to the linear relationship between the banks' characteristics and the growth rate of loans we notice that negative link exists between size and the growth rate of RSD loans. This indicates that the smaller banks enjoy higher loan growth rate for loans denominated in domestic currency. We find no significant linear relationship between other bank characteristics and the growth rate of domestic currency loans and Euros.

With regard to interaction terms between domestic and foreign reference rate and banks' characteristics we find several statistically significant coefficients. The interaction terms between domestic reference interest rate and banks' capitalization in the regression for domestic currency loans have positive sign, as expected, meaning that larger banks reduce the amount of loans proportionally less than smaller banks when domestic reference rate increases. In addition, we find positive and significant coefficients for the interaction terms between domestic reference rate and banks' size and liquidity. It is interesting to note that these positive coefficients come from the interaction terms in which lagged bank characteristic interacts with contemporaneous value of BELIBOR 3M. We also find negative and significant coefficients for the interaction term between domestic and foreign reference rates and banks' size when the lagged bank characteristic interacts with lagged BELIBOR 3M and EURIBOR 3M. In addition, we find negative coefficients attached to the interaction terms when lagged banks' capitalization and liquidity interact with lagged EURIBOR 3M and when banks' foreign ownership interacts with lagged BELIBOR 3M. These results appear to be counterintuitive due to heterogeneity in the sample.

The interaction term between contemporaneous foreign reference rate and lagged banks' size is positive and significant in the regression for foreign currency loans. The interaction term between domestic reference rate and banks' liquidity is significant and changes sign in the regression where controlled variable is liquidity.

The results for the effective reserve requirement ratios in RSD and EUR suggest that the estimated parameters for the variables are not significant in neither of the regressions. This is contrary to our expectations. It might be that the effective reserve requirement ratios as a measure for the reserve requirements do not fully reflect the effects of changes in reserve requirements due to the short time period, many exceptions in calculating the reserve requirement base and ununiformed ratios. It is still to be analysed whether changes in reserve requirements affect bank lending.

Tables 1 and 2 summarize statistically significant coefficients estimated with the two step Arellano-Bond estimator for domestic currency and foreign currency lending, respectively.

Table 1: Results of dynamic panel estimation – Statistically significant coefficients for domestic currency loans

Explanatory variable	Coefficient	Comment
Loans_rsd (LD)	From 0.317 to 0.632	High inertia
BELIBOR 3M (LD)	From -0.041 to -0.049	Domestic MP affects lending in DC with a lag...
EURIBOR 3M (D)	From -0.043 to -0.072	but foreign MP affects lending in DC within the same quarter
GDP (LD)	From 0.036 to 0.049	
CPI (LD)	From 0.013 to 0.015	
Deposits_rsd (LD)	From 0.045 to 0.077	Currency matching
Size (L)	-0.892	
	Interaction terms	
Size*BELIBOR 3M	0.055/-0.046	Changes sign
Size*EURIBOR 3M (L)	-0.074	
Capitalization*BELIBOR 3M	0.213	
Capitalization*EURIBOR 3M (L)	-0.501	
Liquidity*BELIBOR 3M	0.366	
Liquidity*EURIBOR 3M	0.341/-0.724	Changes sign
F_Dummy*BELIBOR 3M (L)	-0.018	

Table 2: Results of dynamic panel estimation – Statistically significant coefficients for foreign currency loans

Explanatory variable	Coefficient	Comment
Loans_eur (LD)	From 0.301 to 0.478	High inertia
GDP (LD)	From 0.022 to 0.037	
ER (LD)	From 0.008 to 0.012	
CPI (LD)	From -0.027 to -0.064	
	Interaction terms	
Size*EURIBOR 3M	0.039	
Liquidity*BELIBOR 3M	0.573/-0.533	Changes sign

Conclusion

This paper investigates the role of banks in the monetary transmission mechanism in Serbia. We employ disaggregated data for 33 banks over the period 2008Q2-2011Q3. It is important to stress that our sample is small and relates to the period of economic crisis. These facts combined make the statistical relationship harder to detect.

Our findings indicate that the growth of domestic currency bank loans is responsive to the domestic and foreign reference rate. On the other hand, there is weak evidence on the existence of a bank lending channel through foreign currency loans. This might be due to the prevalence of long-term loans in total foreign currency loans. We hypothesize that long-term lending is less responsive to monetary policy shocks within relatively short periods such as one quarter. Furthermore, using the effective reserve requirement ratio as an additional explanatory variable we did not find statistical evidence that the changes in the reserve requirements affect the banks' lending.

Looking at the cases where each bank characteristic enters on its own, we find that only in the case of size there is a significant linear relationship with the growth rate of domestic currency loans. This indicates that the bigger banks in terms of their assets have lower loan growth rate for domestic currency loans. All other bank characteristics are not significant and we do not find any statistically significant link between them and the growth rate of loans in two different bank loan supply functions.

We also examine the coefficients of the interaction terms between the bank characteristics and the domestic and foreign reference interest rates. In the specifications with capitalisation and liquidity, we find that the coefficients of the interaction terms between the bank characteristics and the domestic reference interest rate are significant and, as expected, with positive sign. The positive sign of these coefficients confirms the hypothesis that poorly capitalised/less liquid banks react more strongly to domestic monetary policy changes. In the specifications with bank size (for domestic currency loans), the interaction term is significant but changes sign when bank size interacts with lagged values of domestic and foreign reference rate. In addition, we find negative coefficients attached to the interaction terms when lagged banks' capitalization and liquidity interact with lagged EURIBOR 3M and when banks' foreign ownership interacts with lagged BELIBOR 3M. These results appear to be counterintuitive due to heterogeneity in the sample. It is interesting to note that we do not find any significant coefficient in the specifications when the measure for foreign liabilities interacts with domestic and foreign reference rates.

In the case of foreign currency loans the interaction term between contemporaneous foreign reference rate and lagged banks' size is positive and significant in the regression. The interaction term between domestic reference rate and banks' liquidity is significant and changes sign in the regression where controlled variable is liquidity.

In the future we plan to extend our study in several ways. We plan to break the domestic and foreign currency loans according to different sectors (household and corporate sector) and the loan term structure (short-term and long-term loans). In this way, we could understand in more depth how monetary policy shifts banks' loan supply schedules.

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Appendix

Table A1: Variable definitions[10]

Variable	Definition
Dependent variables	
Loans_rsd*	Log of RSD denominated loans to enterprises and households
Loans_eur*	Log of EUR denominated loans to enterprises and households
Independent variables	
BELIBOR 3M*	3 month Belgrade Interbank Offer Rate
EURIBOR 3M*	3 month European Interbank Offer Rate
GDP	Real GDP growth rate (q-on-q) calculated as the log differenced real GDP
ER*	exchange rate of the RSD against the EUR
RR_rsd*	effective required reserve ratio on RSD funding sources
RR_eur*	effective required reserve ratio on foreign currency funding sources
CPI	CPI inflation (q-o-q)
Deposits_rsd*	RSD denominated loans to enterprises and households excluding loans indexed to a foreign currency
Deposits_eur*	EUR denominated loans to enterprises and households including RSD denominated loans indexed to the EUR
Size	$\log A_{it}$ – Mean Asset ratio
Size*BELIBOR 3M 1	Laged Size times contemporaneous value of BELIBOR 3M
Size*BELIBOR 3M 2	Laged Size times laged value of BELIBOR 3M
Size*EURIBOR 3M 1	Laged Size times contemporaneous value of EURIBOR 3M
Size*EURIBOR 3M 2	Laged Size times laged value of EURIBOR 3M
Capital	$\frac{C_{it}}{A_{it}}$ – mean C/A ratio
Capital*BELIBOR 3M 1	Laged Capital times contemporaneous value of BELIBOR 3M
Capital*BELIBOR 3M 2	Laged Capital times laged value of BELIBOR 3M
Capital*EURIBOR 3M 1	Laged Capital times contemporaneous value of EURIBOR 3M
Capital*EURIBOR 3M 2	Laged Capital times laged value of EURIBOR 3M
Liquidity	$\frac{L_{it}}{A_{it}}$ – mean L/A ratio
Liquidity*BELIBOR 3M 1	Laged Liquidity times contemporaneous value of BELIBOR 3M
Liquidity*BELIBOR 3M 2	Laged Liquidity times laged value of BELIBOR 3M
Liquidity*EURIBOR 3M 1	Laged Liquidity times contemporaneous value of EURIBOR 3M
Liquidity*EURIBOR 3M 2	Laged Liquidity times laged value of EURIBOR 3M
F_Dummy	Equals 1 if a bank is foreign owned and 0 otherwise.
F_Dummy*BELIBOR 3M 1	Laged F_Dummy times contemporaneous value of BELIBOR 3M
F_Dummy*BELIBOR 3M 2	Laged F_Dummy times laged value of BELIBOR 3M
F_Dummy* EURIBOR 3M 1	Laged F_Dummy times contemporaneous value of EURIBOR 3M
F_Dummy*EURIBOR 3M 2	Laged F_Dummy times laged value of EURIBOR 3M
Foreign liabilities	$\frac{FL_{it}}{A_{it}}$ – mean FL/A ratio
Foreign liabilities*BELIBOR 3M1	Laged Foreign liabilities times contemporaneous value of BELIBOR 3M
Foreign liabilities*BELIBOR 3M2	Laged Foreign liabilities times laged value of BELIBOR 3M
Foreign liabilities*BELIBOR 3M1	Laged Foreign liabilities times contemporaneous value of EURIBOR 3M
Foreign liabilities*BELIBOR 3M2	Laged Foreign liabilities times laged value of EURIBOR 3M
Variables used to construct independent variables	
A_{it}^{*}	Total assets of bank i in quarter t
$\frac{C_{it}}{A_{it}}^{*}$	The ratio of capital and assets of bank i in quarter t
$\frac{L_{it}}{A_{it}}^{*}$	The ratio of liquid assets and assets of bank i in quarter t
$\frac{FL_{it}}{A_{it}}^{*}$	The ratio of foreign liabilities and assets of bank i in quarter t
L_{it}	Liquid assets include valut cash at the NBS, short-term deposits in accounts with banks abroad, CB bills and T-bills with maturity up to 1 year, cheques and overdrafts, short-term securities issued by banks, short-term bonds issued by the state and short-term credits granted to banks abroad.
FL_{it}	Bank liabilities towards nonresidents in foreign currency.
* Before taken in logs three-month averages were calculated.	

[10] Source: National Bank of Serbia

Table A2: Estimates of log differences of stock of total loans in domestic currency

Variables		Regression 1	Regression 2	Regression 3	Regression 4	Regression 5
		Controlling for size	Controlling for capitalization	Controlling for liquidity	Controlling for foreign ownership	Controlling for foreign liabilities
Loans_rsd						
	LD.	**0.317***	**0.457*****	**0.459*****	**0.632*****	**0.541*****
		(0.166)	(0.125)	(0.124)	(0.122)	(0.109)
BELIBOR 3M						
	D1.	0.002	0.014	0.021	0.000	0.010
		(0.019)	(0.012)	(0.013)	(0.030)	(0.015)
	LD.	-0.029	**-0.041***	**-0.049****	**-0.041***	**-0.041***
		(0.019)	(0.020)	(0.020)	(0.023)	(0.022)
EURIBOR 3M						
	D1.	-0.030	-0.035	**-0.043***	**-0.072***	**-0.047***
		(0.025)	(0.022)	(0.023)	(0.038)	(0.025)
	LD.	0.032	**0.039***	0.020	0.045	0.028
		(0.030)	(0.021)	(0.025)	(0.044)	(0.024)
GDP						
	LD.	**0.036****	**0.039****	**0.039****	**0.049****	**0.038***
		(0.017)	(0.018)	(0.015)	(0.019)	(0.020)
ER						
	D1.	0.004	-0.002	0.002	-0.002	0.001
		(0.006)	(0.004)	(0.005)	(0.006)	(0.006)
	LD.	0.006	**0.010****	0.008	0.009	0.007
		(0.005)	(0.004)	(0.005)	(0.006)	(0.006)
RR_rsd						
	D1.	-0.691	-0.370	-0.465	-0.253	-0.547
		(0.634)	(0.636)	(0.553)	(0.621)	(0.614)
	LD.	0.043	-0.170	-0.026	0.328	0.331
		(0.578)	(0.655)	(0.536)	(0.650)	(0.554)
CPI						
	D1.	0.010	0.012	0.013	0.020	0.012
		(0.014)	(0.015)	(0.012)	(0.014)	(0.015)
	LD.	0.010	0.008	**0.013***	**0.015***	**0.014***
		(0.007)	(0.007)	(0.007)	(0.008)	(0.008)
Deposits_rsd						
	D1.	0.006	-0.004	0.023	0.013	0.007
		(0.027)	(0.033)	(0.030)	(0.031)	(0.036)
	LD.	0.027	**0.045***	**0.077****	**0.073****	**0.061***
		(0.030)	(0.025)	(0.032)	(0.032)	(0.036)
Size						
	L1.	**-0.892***	-	-	-	-
		(0.441)				
Size*BELIBOR 3M 1		**0.055*****	-	-	-	-
		(0.020)				
Size*BELIBOR 3M 2		**-0.046*****	-	-	-	-
		(0.014)				
Size*EURIBOR 3M 1		-0.002	-	-	-	-
		(0.033)				
Size*EURIBOR 3M 2		**-0.074****	-	-	-	-
		(0.032)				
Capitalization						
	L1.	-	0.514	-	-	-
			(0.876)			
Capitalization*BELIBOR 3M 1		-	**0.213***	-	-	-
			(0.121)			
Capitalization*BELIBOR 3M 2		-	-0.036	-	-	-
			(0.066)			

Table A2: Estimates of log differences of stock of total loans in domestic currency (continued)

Capitalization*EURIBOR 3M 1	-	0.243 (0.345)	-	-	-
Capitalization*EURIBOR 3M 2	-	**-0.501*** (0.289)	-	-	-
Liquidity					
L1.	-	-	-0.167 (0.335)	-	-
Liquidity*BELIBOR 3M 1	-	-	**0.366**** (0.174)	-	-
Liquidity*BELIBOR 3M 2	-	-	-0.283 (0.183)	-	-
Liquidity*Euribor 3M 1	-	-	**0.341**** (0.136)	-	-
Liquidity*Euribor 3M 2	-	-	**-0.724**** (0.341)	-	-
F_Dummy					-
L1.	-	-	-	-0.275 (0.783)	-
F_Dummy*BELIBOR 3M 1	-	-	-	0.011 (0.030)	-
F_Dummy*BELIBOR 3M 2	-	-	-	**-0.018*** (0.010)	-
F_Dummy*EURIBOR 3M 1	-	-	-	0.018 (0.040)	-
F_Dummy*EURIBOR 3M 2	-	-	-	-0.008 (0.046)	-
Foreign liabilities	-	-	-	-	-
L1.	-	-	-	-	0.590 (0.791)
FL*BELIBOR 3M 1	-	-	-	-	0.093 (0.077)
FL*BELIBOR 3M 2	-	-	-	-	-0.056 (0.042)
FL*EURIBOR 3M 1	-	-	-	-	-0.038 (0.099)
FL*EURIBOR 3M 2	-	-	-	-	0.007 (0.109)
Number of observations	288	288	288	288	288
Number of banks	32	32	32	32	32
Number of instruments	23	30	26	31	30
F-test for the significance of the whole regression (p-value)	36.54 (0.000)	12.03 (0.000)	24.08 (0.000)	9.62 (0.000)	29.94 (0.000)
AR(1)/(p-value)	0.010	0.004	0.005	0.007	0.010
AR(2)/(p-value)	0.137	0.143	0.181	0.108	0.088
Hansen (p-value)	0.307	0.589	0.536	0.504	0.232
Difference in Hansen cross sectional correlation (p-value)	0.307	0.994	0.334	0.663	0.096

Dependent variable: log difference of the stock of loans (outstanding amounts) denominated in and indexed to domestic currency.
Notes: D1. refers to the first difference of the variables. LD. refers to the lagged differenced variables.
Estimated by two-step 'difference' GMM estimator with Windmeijer (2005) corrected standard errors, by restricting and collapsing the instrument set with the command xtabond2.
***/**/* denote significance at 1%, 5% and 10% level of significance, respectively.
Windmeijer (2005) corrected standard errors in parenthesis.
Computations have been done in STATA 11.

Table A3: Estimates of log differences of stock of total loans in foreign currency

Variables		Regression 1	Regression 2	Regression 3	Regression 4	Regression 5
		Controlling for size	Controlling for capitalization	Controlling for liquidity	Controlling for foreign ownership	Controlling for foreign liabilities
Loans_eur						
	LD.	**0.357*** **	**0.478*** **	**0.394*** **	**0.337*** **	**0.301*** **
		(0.059)	(0.141)	(0.053)	(0.072)	(0.104)
BELIBOR 3M						
	D1.	-0.027	0.013	0.011	-0.161	-0.013
		(0.018)	(0.041)	(0.018)	(0.120)	(0.013)
	LD.	**0.031***	0.041	-0.005	-0.140	-
		(0.017)	(0.043)	(0.016)	(0.105)	
EURIBOR 3M						
	D1.	-0.022	0.149	-0.028	-0.196	-0.005
		(0.024)	(0.148)	(0.026)	(0.136)	(0.041)
	LD.	0.058	0.101	0.010	0.313	0.001
		(0.039)	(0.089)	(0.021)	(0.231)	(0.054)
GDP						
	LD.	**0.022***	0.030	0.016	-0.019	**0.037***
		(0.011)	(0.021)	(0.012)	(0.026)	(0.020)
ER						
	D1.	-0.002	-0.003	0.005	0.006	**0.012** **
		(0.004)	(0.006)	(0.005)	(0.004)	(0.006)
	LD.	**0.012***	0.021	**0.008***	0.010	-0.000
		(0.007)	(0.020)	(0.005)	(0.007)	(0.010)
RR_eur						
	D1.	-0.071	-0.061	0.092	**0.261***	-0.022
		(0.153)	(0.235)	(0.116)	(0.141)	(0.330)
	LD.	-0.092	0.010	-0.102	0.044	-0.058
		(0.088)	(0.159)	(0.062)	(0.112)	(0.116)
CPI						
	D1.	**-0.027** **	-0.010	**-0.026** **	**-0.064***	0.003
		(0.013)	(0.024)	(0.012)	(0.036)	(0.014)
	LD.	-0.009	-0.004	-0.003	-0.026	0.006
		(0.007)	(0.017)	(0.006)	(0.022)	(0.008)
Deposits_eur						
	D1.	-0.120	-0.341	-0.091	**-0.261** **	-0.000
		(0.119)	(0.347)	(0.082)	(0.113)	(0.130)
	LD.	0.202	0.124	**0.306***	0.239	0.181
		(0.125)	(0.137)	(0.163)	(0.183)	(0.152)
Size						
	L1.	-0.249	-	-	-	-
		(0.503)				
Size*BELIBOR 3M 1		0.046	-	-	-	-
		(0.035)				
Size*BELIBOR 3M 2		-0.040	-	-	-	-
		(0.028)				
Size*EURIBOR 3M 1		**0.039***	-	-	-	-
		(0.022)				
Size*EURIBOR 3M 2		-0.094	-	-	-	-
		(0.062)				
Capitalization						
	L1.	-	9.630	-	-	-
			(8.077)			
Capitalization*BELIBOR 3M 1		-	0.310	-	-	-
			(0.404)			
Capitalization*BELIBOR 3M 2		-	0.575	-	-	-
			(0.760)			

Table A3: Estimates of log differences of stock of total loans in foreign currency (continued)

Capitalization*EURIBOR 3M 1	-	2.689 (1.952)	-	-	-
Capitalization*EURIBOR 3M 2	-	-0.914 (0.751)	-	-	-
Liquidity					
L1.	-	-	-0.227 (0.588)	-	-
Liquidity*BELIBOR 3M 1	-	-	**0.573*** (0.331)	-	-
Liquidity*BELIBOR 3M 2	-	-	**-0.533*** (0.267)	-	-
Liquidity*Euribor 3M 1	-	-	0.124 (0.451)	-	-
Liquidity*Euribor 3M 2	-	-	-0.549 (0.622)	-	-
F_Dummy					-
L1.	-	-	-	3.806 (2.482)	-
F_Dummy*BELIBOR 3M 1	-	-	-	0.206 (0.169)	-
F_Dummy*BELIBOR 3M 2	-	-	-	-0.130 (0.107)	-
F_Dummy*EURIBOR 3M 1	-	-	-	0.315 (0.221)	-
F_Dummy*EURIBOR 3M 2	-	-	-	0.436 (0.337)	-
Foreign liabilities	-	-	-	-	-
L1.	-	-	-	-	-1.652 (2.147)
FL*BELIBOR 3M 1	-	-	-	-	-0.260 (0.243)
FL*BELIBOR 3M 2	-	-	-	-	0.094 (0.238)
FL*EURIBOR 3M 1	-	-	-	-	-0.234 (0.235)
FL*EURIBOR 3M 2	-	-	-	-	0.364 (0.464)
Number of observations	270	270	270	270	270
Number of banks	30	30	30	30	30
Number of instruments	25	25	26	24	26
F-test for the significance of the whole regression (p-value)	41.38 (0.000)	2.69 (0.007)	21.70 (0.000)	40.95 (0.000)	7.12 (0.000)
AR(1)/(p-value)	0.038	0.045	0.083	0.022	0.078
AR(2)/(p-value)	0.733	0.997	0.966	0.232	0.674
Hansen (p-value)	0.804	0.728	0.903	0.646	0.489
Difference in Hansen cross sectional correlation (p-value)	0.452	0.322	0.831	0.646	0.460

Dependent variable: log difference of the stock of loans (outstanding amounts) denominated in and indexed to EUR.
Notes: D1. refers to the first difference of the variables. LD. refers to the lagged differenced variables.
Estimated by two-step 'difference' GMM estimator with Windmeijer (2005) corrected standard errors, by restricting and collapsing the instrument set with the command xtabond2.
***/**/* denote significance at 1%, 5% and 10% level of significance, respectively.
Windmeijer (2005) corrected standard errors in parenthesis.
Computations have been done in STATA 11.