

## BANK LENDING CHANNEL IN SLOVENIA

*Channels through which monetary policy affects aggregate demand can be divided into three categories: traditional interest rate channel, other asset price channels and credit channel composed of balance sheet channel (named also broad credit channel), bank capital channel and bank lending channel. Banks face troubles in keeping their present or acquiring new financial sources, when central bank tightens its monetary policy. Banks characterized by differences in size, capitalization, liquidity and ownership face different levels of informational asymmetry and are therefore differently affected by changes in monetary policy. If larger, better capitalized, more liquid and/or home owned banks respond weaker to changes in monetary policy it is possible to argue that bank lending channel is effective. This hypothesis is tested on a panel of annual data for individual Slovenian banks using general method of moments. Although evidence of bank lending channel is mixed, results go in a direction where a confirmation of its existence could be given.*

*Key words: monetary policy transmission, banking sector, bank lending channel*

### 1. Introduction

Since the seminal paper of Bernanke and Blinder (1988) credit channel became widely analysed in empirical literature. Strong bank lending channel in-

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creases the efficacy of the monetary policy therefore it is of great importance for every economy to analyse it.

Slovenia became a member of the euro area in 2007 and exchange rate channel of monetary transmission mechanism that was present in the period before 2004, practically ceased to exist, therefore other transmission mechanism channels' relative power increased. Profound analysis of bank lending channel is therefore necessary. Despite the fact that entering new monetary area represents a structural break in the monetary transmission, it can be argued that monetary transmission mechanism cannot be totally altered by this act since historical development will always influence the present condition (Ehrmann, 1998; Cecchetti, 1999). Some characteristics that can be used for prediction about the characteristics of the bank lending channel can be identified in earlier periods as well. Besides that current conditions in financial and banking system structure can be used for conclusions about the existence of a bank lending channel.

The goal of the paper is to find the existence of a bank lending channel and to explore its intensity and characteristics. Structure of the paper is as follows: theoretical background is presented first, followed by description of historical situation and present conditions in Slovenian banking sector, compared to the situation in European Union and euro area members. Description of the data and finally panel data econometric analysis based on annual bank level data for the period 1994-2007 and presentation of results follow.

## 2. Theoretical overview

Channels through which monetary policy affects aggregate demand can be divided into three categories: (1) traditional interest rate channel, where a contractionary monetary policy leads to a rise in real interest rates, which increases the cost of capital, which further causes a fall in investment and consumption spending, that leads to a reduction in the aggregate demand and output; (2) asset price channels, where contractionary monetary policy affects foreign exchange rates and price of equities, which causes decrease in net exports and consumption and consequently a fall in output and (3) credit channel composed of balance sheet channel, bank lending channel and bank capital channel.<sup>1</sup> When tight monetary policy decreases firms' net worth, information asymmetry increases and banks become reluctant to lend (balance sheet channel, named also broad credit channel).

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<sup>1</sup> Bank capital channel has received more attention only recently, after the introduction of the Basel Accord I.

On the other hand contractionary monetary policy reduces banks' reserves and deposits and accessibility of non-deposit sources, which consequently reduces the quantity of bank loans available, which forms bank lending channel (Mishkin, 2006). If banks face reduction in their capital (this happens when interest rates rise causing bank profits and value of bank capital to fall), they have to accommodate their balance sheet structure to fulfil solvency standards and they can either issue new equity or decrease the amount of outstanding loans (Peek & Rosengren, 1995; Van den Heuvel, 2002). The later possibility further lowers investment and output.

Existence of a credit channel is based on a non-validity of assumptions of a Modigliani-Miller theorem (1958). Conditions for the validity of so called lending view<sup>2</sup> (as an opposite to the money view) are (1) delayed accommodation of prices, which is a preposition common to all Keynesian models (Romer, 2006), (2) dependency of some firms on bank loans and (3) the ability of a central bank to shift banks' loan supply schedules by conducting monetary policy operations (Kashyap & Stein, 1995). If any of the conditions is not fulfilled, the explanation turns back to the money view. Usual IS-LM structure, in which LM curve treats money as a special asset while all other instruments fall into a common category of debt instruments (bonds), was modified in Bernanke and Blinder's paper (1988).

Credit institutions specialize in gathering information, overcoming transaction costs by exploring economies of scale and monitoring the performance of borrowers (Townsend, 1979; Leland-Pyle, 1977; Diamond, 1984). As a consequence, customer and auction market credit are not perfect substitutes due to informational problems, differences in liquidity and high initial costs of raising funds in the open market (Bernanke & Blinder, 1988). Regardless of profound changes in information technology that reduced transaction costs and information asymmetry, imperfect substitutability pertains. Therefore, bank loans still have special status that cannot be equalised with the status of other debt instruments. This conclusion is especially valid for countries or regions that have a large share of bank dependent firms in their economies.

Bernanke and Blinder (1988) formed a model based on *IS LM* model that includes three types of assets: money, bonds and loans.<sup>3</sup> Borrowers choose between loans and bond according to their interest rates. *LM* curve of the model is the same as in the standard *IS LM* model

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<sup>2</sup> Lending view represents a specific case of the multi-asset models that have been present in the economic literature for a long period of time and feature imperfect substitutability among a number of assets, and allow for a number of different interest rates (Kashyap & Stein, 1995).

<sup>3</sup> Money and bonds are only assets treated separately in *IS LM* model.

**Equation 1:**

$$y = M(i, R).$$

Its position depends on interest rate ( $i$ ) and monetary policy (reserves –  $R$ ).  
Standard IS curve in the model changes to:

**Equation 2:**

$$y = Y(i, r_L),$$

where  $i$  is the interest rate on bonds and  $r_L$  represents interest rate on loans. In this model

**Equation 3:**

$$y = Y(i, \Phi(i, y, R)),$$

is called *CC (commodities and credit)*. Similarly as *IS* curve it is negatively sloped, but unlike *IS* it is shifted also by monetary policy ( $R$ ).

Existence of credit channel makes monetary policy more efficient than in a conventional *IS LM* model, since monetary policy influences both *LM* and *CC* curve. Central bank affects banks' demand for reserves and their willingness of giving loans by using monetary policy instruments, such as open market policy, required reserves ratio and standing facilities. Banks' demand for reserves depends on GDP, interest rate on bonds, required reserves and interest rate on deposits (Freixas & Rochet, 1999). Changes in required reserves ratio affect banks' demand for reserves most directly, but they are rare nowadays in developed countries. Central banks most widely use open market operations by which they affect the price of reserves and influence banks' choice of shares of reserves and deposits in their balance sheets. Larger amount of reserves means larger possible amount of deposits and greater lending potential.<sup>4</sup> If price of reserves increases, their share in banks' balance sheets falls and banks are forced to accommodate their assets and liabilities accordingly, either by acquiring non-deposit sources of funding or

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<sup>4</sup> Usually chain of events runs in the opposite direction: banks give loans first and try to find appropriate sources after.

by reducing the amount of outstanding loans or other components of their assets (securities).

If Modigliani-Miller theorem does not apply, than banks cannot compensate for reduction in deposits with non-deposit sources without costs. Which model of accommodation is chosen by the bank, depends on the level of information asymmetry<sup>5</sup> that it encounters. Stein (1998) developed a model based on information asymmetry that offers a microeconomic explanation of bank lending channel. Banks' management let alone their investors (depositors, stockholders, securities investors), are not familiar with the value of banks' assets that importantly determine revenues on non-deposit sources of financing that the banks issue. The problem is reduced by deposit financing, since depositors are not preoccupied with banks' assets value, because their deposits are (at least partially) insured by deposit insurance schemes or state guarantees.<sup>6</sup>

Response of banks to tight monetary policy crucially depends on their balance sheets structure. Stein (1998) divides banks into "bad" and "good" banks. The former, banks with lower quality of their assets that face higher information asymmetry, are required to pay higher revenues to non-deposit investors, when their stance becomes familiar to their investors. Therefore they keep a precautionary amount of securities in their assets and reduce their quantity when confronted with tight monetary policy. Another possible response is to reduce the amount of outstanding loans, which would mean a reduction of the core banking business. "Good" banks can acquire non-deposit sources cheaper. Different responses of banks to changes in monetary policy can help to differentiate between "good" and "bad" banks and consequently identify changes in bank loan supply.

Financial crisis has severely hampered functioning of bank intermediation and bank lending channel. Banks actually act contrary to the measures of monetary policy instead of amplifying them, as suggested by theorists of bank lending channel. Reason for this type of banks' behaviour is strongly increased asymmetry of information.<sup>7</sup> Therefore second condition for bank lending channel functioning (central bank is capable of influencing the supply of bank loans) is not fulfilled. Regardless of the amounts of liquidity injected by central banks commercial banks continue to retain liquidity instead of passing it on to enterprises. Central banks have become substitutive intermediaries for interbank transactions which can be noticed in the steep increase of the size of their balance sheets (Bini Smaghi, 2008). Since some enterprises are dependent on banks and they suffer shortages of

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<sup>5</sup> Situation, when one party has more or better information than the other party of the transaction.

<sup>6</sup> Importance of this type of insurance is well acknowledged in period of current financial crisis – governments widely guarantee total amount of depositors' deposits.

<sup>7</sup> Despite the fact that asymmetry of information originated in "financial" and not the "real" world, it successfully made its way also into the later one.

credit, they will have to cut their investment, therefore banks will deepen and prolong the recession. As Gai et al. (2007) point out, frictions in financial markets are fundamental to the occurrence of a systemic financial crisis. If intermediaries are forced to sell their assets to remain solvent this can create a feedback to net worth reducing its price that affects the balance sheets of all intermediaries, potentially leading to further asset sales. Since atomistic intermediaries do not account for the effect of their own sales on asset prices, the allocation of resources implied by the market is inefficient. This externality is therefore capable of generating a systemic financial crisis that may be self-fulfilling.

### **3. Stylized facts on slovenian financial system**

Presence of lending channel of monetary policy crucially depends on the characteristics of a financial and banking system. It has been argued that changes in financial market structure and bank balance sheets (securitization, development of market financing ...) have reduced the potential for bank lending channel (Altunbas, Gambacorta & Marqués, 2007), but recent financial market turmoil could lead to more bank-based financial systems, which would increase the potential for the presence of a bank lending channel again. This chapter will present some relevant historical data on Slovenian financial system and describe characteristics that are important for the existence of a bank lending channel together with theoretical explanation of their importance for the bank lending channel. Data from the recent period will be compared to the averages of the European Union (EU)<sup>8</sup> and euro area (EA) financial systems' data, since the discrepancies from the averages can cause differences in the functioning of the lending channel (Cecchetti, 1999).

#### ***3.1 Historical overview***

After Slovenia declared independence Slovenian banks experienced loss of their assets in other republics of ex-Yugoslavia and a great increase in bad loans in Slovenia, which led to illiquidity and insolvency of the two biggest banks. The government became their owner by providing capital injection. Bank rehabilita-

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<sup>8</sup> All of the EU countries, except Denmark and United Kingdom are obliged to become members of the euro area therefore they are included in the analysis.

tion was concluded in the middle of 1997 (Štiblar & Voljč, 2004). In the period of 1992-1995 micro-distortions existing in financial markets and interventions of the economic policy reduced the efficiency of the monetary transmission mechanism. Financial markets were characterized with high interest-rate elasticity of deposit supply and low interest-rate elasticity of credit demand until the interbank agreement about deposit rates was reached in 1996 (Bole, 1999). On the other hand this agreement reduced the reaction of banks to changes in central bank policy rate. Efficiency of central bank measures increased after the de-indexation (Zbašnik, 2003). Interbank market remained undeveloped and mostly based on bilateral agreements (Ahtik & Gramc, 2006).

### *3.2 Present conditions in the banking sector*

Liquidity, size and capitalization of banks are considered as typical outside signs of information asymmetry that banks encounter. They will be analyzed in detail together with ownership structure of banks, since they play an important explanatory role. Besides that attention shall be given to some other characteristics of the banking sector that can be either analyzed only at a macro level or insufficient amount of data is provided for them, such as concentration of the banking system and off-balance sheet activities of banks.

Slovenian households are net providers of financial assets, while enterprises are net users of those assets (Table 1), which is in accordance with theory and empirical findings for other countries (Mishkin, 2006). Balances of financial sector, government and rest of the world are slightly positive.

*Table 1:*

#### STANCE OF INTER-SECTOR FINANCIAL CLAIMS AND LIABILITIES OF SLOVENIAN ECONOMY; 3RD QUARTER 2007, % OF GDP.

	Enterprises	Financial sector	Government	Households	Rest of the world	SUM
Claims	129.60%	191.10%	54.00%	101.40%	130.90%	607.00%
Liabilities	243.00%	188.10%	44.40%	30.00%	101.10%	607.00%
Net claims	-113.40%	3.00%	9.60%	71.40%	29.80%	0.00%

Source: Bank of Slovenia: Financial Stability Review, May 2009, own calculations.

All parts of the Slovenian financial sector are underdeveloped when compared with averages of EU and EA. Capitalization of stock exchange as a percentage of GDP in the boom year of 2007 represented 67.9 % of EU and 100.2 % of EA average, assets of credit institutions as percentage of GDP represent 38.8 % and 42.1 % of EU and EA averages, respectively. Importance of insurance companies, investment funds and pension funds in Slovenian financial system if compared to financial systems of EU and EA is even lower.

Table 2:

SLOVENIAN FINANCIAL SECTOR AMONG EU  
 AND EA MEMBERS, 2007.<sup>9</sup>

	capitalization of stock exchange % GDP	assets of credit institutions, % GDP	assets of insurance companies, % GDP	assets of investment funds, % GDP	assets of pension funds, % GDP
<b>SI</b>	<b>61.4%</b>	<b>129.67%</b>	<b>12.92%</b>	<b>12.34%</b>	<b>3.24%</b>
<b>AVERAGE EU</b>	<b>90.4%</b>	<b>334.09%</b>	<b>27.08%</b>	<b>64.79%</b>	<b>14.43%</b>
<b>AVERAGE EA16</b>	<b>61.3%</b>	<b>308.34%</b>	<b>59.36%</b>	<b>55.15%</b>	<b>32.09%</b>
<b>SI/AVERAGE EU</b>	<b>67.9%</b>	<b>38.8%</b>	<b>47.7%</b>	<b>19.1%</b>	<b>22.5%</b>
<b>SI/AVERAGE EA</b>	<b>100.2%</b>	<b>42.1%</b>	<b>21.8%</b>	<b>22.4%</b>	<b>10.1%</b>

Sources: World Bank Statistics – Finance, ECB: EU Banking Structures, 2008; own calculations.

The importance of a lending channel in a certain economy can be judged from financing structures of enterprises and households as well. Slovenian households' financial liabilities mostly originate from financial sector and only a minority of them originates directly from non-financial corporations. Households are, as usual for all financial systems, bank dependent borrowers.

Small and medium enterprises (SME's) represent 99.7 % of all enterprises in Slovenia, they employ 66.4 % of working force and they represent 60.4 % by value added. Numbers are comparable with other EU countries and they allow for a conclusion that a potential for the existence of a lending channel is rather big,

<sup>9</sup> Euro area (EA) is here already considered in the new structure with recent members Slovenia, Malta, Cyprus and Slovakia included, despite the fact that last three were not members of the euro area at the time of data collection (2007).



since only large enterprises have an access to financial markets in case of bank credit rationing, while SME's have to rely fully on bank lending. Statistical data<sup>10</sup> confirm that enterprises are mostly financed with bank loans, although some of them get loans directly from foreign sources (mostly banks), but this share is reducing now. Share of securities issued in enterprises' balance sheets in 2005 was smaller in Slovenia than in other EU and EA countries (it represented 48.3% and 50.0 % of their averages) and this is not expected to change any time soon, especially considering the consequences of a financial crisis. Share of loans compared to the share of loans in other EU and EA countries represented 62.2 % and 64.5 %, respectively.

Trade credit can be considered as an alternative possibility to bank financing of enterprises in Slovenia. It represents an important financial source for Slovenian enterprises compared to other EU (especially EA) members' enterprises, which is at least for intra-country trade a consequence of a small territory and good personal connections among businesses. Use of this source helps them to lower asymmetry of information, since trade partners are better equipped to evaluate credit risk of their partners than financial institutions. Companies with better access to financial sources function as financial intermediaries for companies with limited access to financial markets (Petersen & Rajan, 1997). Therefore this characteristic of enterprises' financing in Slovenia could limit the power of the reduction of bank loans, reduce the power of the lending channel and mitigate its effect on output, although after some time elapsed large enterprises would feel the effect of loan rationing as well.

Analysis shows that Slovenian banks share a large number of characteristics that are considered to be connected with the existence of a bank lending channel. Slovenian banks are small; their average size, measured by their assets was only 29.80 % of EU average or 33.61 % of EA average in 2006 (Table 3).

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<sup>10</sup> Sources: Eurostat, ECB, SURS.

*Table 3:*

RELATIVE SIZE OF SLOVENIAN CREDIT INSTITUTIONS, 2006.<sup>11</sup>

	<b>A/CI</b>	<b>NET INCOME</b>
<b>SLOVENIA</b>	<b>1291.81</b>	<b>48.18</b>
<b>EU AVERAGE</b>	<b>4334.30</b>	<b>85.08</b>
<b>EA AVERAGE</b>	<b>3843.78</b>	<b>97.13</b>
<b>S/EU AVERAGE</b>	<b>29.80%</b>	<b>56.63%</b>
<b>S/EA AVERAGE</b>	<b>33.61%</b>	<b>49.61%</b>

Source: ECB, European Banking Structures, 2007; own calculations.

Kashyap and Stein (1995) develop two predictions on bank behaviour: (1) Lending volume of small banks declines more rapidly in response to a given contraction in deposits than does the lending volume of large banks and (2) securities holdings of small banks decline more slowly in response to a given contraction in deposits than do securities holdings of large banks.

Further Kashyap and Stein (1997) propose that among banks of the same size illiquid or less liquid banks have difficulties in protecting their loan portfolio and they have to cut their loans significantly when confronted with tight monetary policy. Of course, banks that expect this type of problems may acquire additional amounts of liquid funds in advance and overcome the contractionary monetary policy without accommodation of loans (Juks, 2004).

Slovenian credit institutions are relatively less liquid than European institutions, regardless of the method and time period used for comparison. This is true for the year 2006 as well, despite the fact that banks should show excess liquidity due to the preparations for the introduction of the euro.

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<sup>11</sup> Latest data available were for 2006.

Table 4:

LIQUID ASSETS IN SLOVENIA, EU AND EA.<sup>12</sup>

	<b>LIQUID ASSETS AS % OF AMOUNTS OWED TO CREDIT INSTITUTIONS, 2006</b>	<b>LIQUID ASSETS, AS % OF TOTAL ASSETS, 2001-2005</b>
<b>SLOVENIA</b>	<b>35.46%</b>	<b>6.66%</b>
<b>EU AVERAGE</b>	<b>167.22%</b>	<b>14.70%</b>
<b>EA-16 AVERAGE</b>	<b>97.75%</b>	<b>15.52%</b>
<b>SI/EU AVERAGE</b>	<b>21.21%</b>	<b>45.28%</b>
<b>SI/EA-16 AVERAGE</b>	<b>36.27%</b>	<b>42.90%</b>

Source: ECB, European Banking Sector Stability, 2007, World Bank Group, own calculations.

By ECB indicator<sup>13</sup> Slovenian banks' liquidity represented only 21.2 % of average liquidity of EU credit institutions and 36.3 % of liquidity of EA credit institutions in 2006, while situation is a bit better in the longer period of 2001-2005 and measured as liquid assets to total assets – Slovenian liquidity is above 40 % of liquidity of EU and EA institutions. Since less liquid banks are considered as less able to mitigate changes in monetary policy, this is another argument for the existence of a bank lending channel in Slovenia.

Since banks are highly-leveraged enterprises even a slight change in their revenues can cause relatively great change in their capital (Van den Heuvel, 2007). Kishan and Opiela (2006) predict that monetary policy has asymmetric effects, regarding the banks with different levels of capital. In case of contractionary monetary policy, loans' growth of banks that face capital constraints should fall more than that of the high-capitalized banks. When faced with expansionary monetary policy, the loan growth of the low-capital banks should increase by less than that of the high-capital banks. Bank capital channel<sup>14</sup> is supposed to be stronger in countries with higher information asymmetry, where banks face difficulties in gathering new equity, when necessary (Markovic, 2006). Capitalization of Slovenian banking sector was lower than, but close to EU and EA levels in 2006 (Štiblar & Ahtik, 2008; Table 5), which means that possibility of the existence of

<sup>12</sup> Latest data available were for 2006.

<sup>13</sup> Measured as liquid assets as % of amounts owed to credit institutions.

<sup>14</sup> Some authors have been lately (after the introduction of the Basel standards) considering the bank capital channel as a separate channel (Van den Hevel, 2002; Markovic, 2006), while others analyze it as a part of the lending channel (Kishan & Opiela, 2000).

bank lending channel should not be higher than in other EU members. It was possible to notice that several Slovenian banks<sup>15</sup> issued new equity in a recent period, despite the fact that economic situation was not suitable for that. This means that they preferred relatively expensive source of financing to cutting loans.

*Table 5:*

**SOLVENCY OF BANKS IN SLOVENIA, EU AND EA, 2001-2006.<sup>16</sup>**

	TIER I RATIO	OVERALL SOLVENCY RATIO	
	2006	2006	AVERAGE 2001-2005*
<b>SLOVENIA</b>	8.27%	10.78%	11.36%
<b>EU AVERAGE</b>	9.88%	12.32%	13.72%
<b>EA-16 AVERAGE</b>	9.31%	11.91%	13.05%
<b>SI/EU AVERAGE</b>	83.74%	87.49%	82.82%
<b>SI/EA-16 AVERAGE</b>	88.87%	90.55%	87.07%

Source: ECB: EU Banking Structures, 2007, World Bank Group, own calculations.

\* Without data for Malta and Cyprus.

State or foreign ownership of the bank can influence the functioning of the bank lending channel. State owned banks are found to exhibit less procyclicality. Micco and Panizza (2004) offer three explanations for this type of behaviour: (1) government internalizes benefits of a stable environment that anticyclical behaviour of banks brings, (2) government owned banks are more trusted in times of crisis and they do not face reduction of deposits and (3) managers of those banks lack motivation for adjustment to economic situation. Slovenian banks' government ownership reduced a lot in recent period: from 42.5 % of assets in 2000 to 12.0 % in 2005 (EBRD);<sup>17</sup> therefore it is not possible to conclude that Slovenian government could influence the functioning of a lending channel by active bank management importantly.

Foreign credit institutions that own some of the Slovenian banks received a capital injection of their or foreign<sup>18</sup> governments (Štiblar, 2008). In general,

<sup>15</sup> Banka Celje, Nova kreditna banka Maribor.

<sup>16</sup> Latest data available were for 2006.

<sup>17</sup> The number is higher if ownership of para-state funds is included.

<sup>18</sup> Unicredit is partly owned by Lybia.

foreign owned banks could add to procyclicality in a certain economy, since they are able to acquire cheaper means of financing and place them where they expect highest revenues. When they face lack of means in their home countries, they can withdraw the means as well (Micco & Panizza, 2004). Besides that their power in the banking system cannot be measured only by their market share measured by assets, but by their owners' assets, relationships with other banks and some other criteria as well. Foreign ownership could influence the behaviour of those banks, despite the fact that the share of foreign ownership in Slovenian banking is only slightly higher than in the EA average (Table 6).

*Table 6:*

MAJORITY FOREIGN OWNERSHIP OF BANKS,  
SLOVENIA, EU AND EA, 2004.

	<b>% OF FOREIGN OWNED ASSETS</b>
<b>SLOVENIA</b>	<b>38.0%</b>
<b>EU-25 AVERAGE</b>	<b>44.3%</b>
<b>EA-16 AVERAGE</b>	<b>34.1%</b>
<b>EU-25 WEIGHTED AVERAGE</b>	<b>29.2%</b>
<b>SI/EU AVERAGE</b>	<b>85.8%</b>
<b>SI/EA-16 AVERAGE</b>	<b>111.4%</b>
<b>SI/EU-25 WEIGHTED AVERAGE</b>	<b>130.1%</b>

Source: Allen, Bartiloro, Kowalewski (2005), own calculations.

Market concentration in the banking sector could importantly influence the functioning of the banking sector and the transmission of monetary policy. This influence is especially noticed in the pass-through of interest rates, which fits into the interest rate channel of the monetary transmission mechanism. Sander and Kleimeier (2004) claim that higher concentration of the banking system causes banks to change their deposit rates when faced with contractionary monetary policy, while due to the asymmetry of information they accommodate the amount of loans in the lending market and not their lending rates (credit rationing). Concentration in the Slovenian banking market is higher than EU and EA averages.<sup>19</sup> But difference is not very big (only 5 % and 9 % when it is measured

<sup>19</sup> This is the case especially when weighted averages are taken into account. If conditions among states are compared, use of unweighted averages is more appropriate.

with concentration ratio of five largest banks for the EU and EA, respectively), which means that concentration in the Slovenian banking market cannot influence the bank lending very much differently than in other EU (EA) countries.

*Table 7:*

CONCENTRATION IN SLOVENIAN, EU AND EA  
 BANKING MARKETS, 2007.

	<b>Concentration ratio - 5 (% assets)</b>	<b>Herfindahl-Hirschman index</b>
<b>SLOVENIA</b>	62.0	1300
<b>EU AVERAGE</b>	58.9	1105
<b>EA-16 AVERAGE</b>	56.8	1020
<b>EU WEIGHTED AVERAGE</b>	42.1	590
<b>EA-16 WEIGHTED AVERAGE</b>	42.9	633
<b>SI/EU AVERAGE</b>	105.2%	117.7%
<b>SI/AVERAGE EA-16</b>	109.1%	127.4%
<b>SI/WEIGHTED AVERAGE EU</b>	147.2%	220.5%
<b>SI/WEIGHTED AVERAGE EA-16</b>	144.4%	205.4%

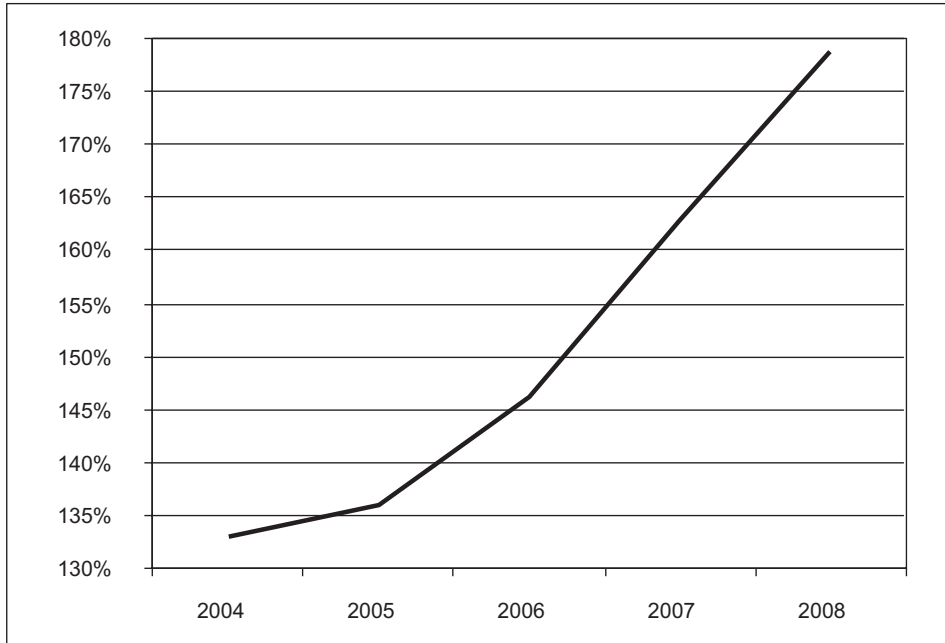
Source: ECB (2008), own calculations.

Off-balance sheet activities became increasingly important in the last decade, but due to the present financial crisis, their importance will probably decline in the future because of stricter supervision rules. Basel Accord provided an incentive for banks to move risky assets off their balance sheets, which caused a fast growth of off-balance sheet activities (Štiblar, 2008). This enabled banks to mitigate the effects of changes in monetary policy, which reduced the power of the lending channel. It is difficult to say what will the response to the crisis be but there is an agreement that all banking and other financial activities should be put under supervision, which was not the case so far. Besides that it is possible to notice that re-intermediation of European banks' off-balance sheet activities has already started (ECB, 2008).

Similarly as in other countries, Slovenian banks' off-balance sheet activities have grown fast in recent years (Figure 2), so we might expect a decreasing efficiency of bank lending channel throughout the period analyzed, but its power could increase again after the crisis is finished.

*Figure 1:*

## OFF-BALANCE SHEETS AND BALANCE SHEET ITEMS RATIO



Source: Bank of Slovenia, own calculations.

Present financial crisis influenced functioning of Slovenian banks as well. They face difficulties in getting long-term sources in international financial markets therefore they reduce lending to firms (Bank of Slovenia, 2009). Besides that, similarly as banks in Europe and other parts of the world Slovenian banks retain liquidity instead of passing it to other banks through the interbank market or to the real sector which is the purpose of financial intermediation.

Several measures have been taken at monetary authority (ECB) and state level in order to mitigate the effects of increased distrust in financial markets and provide sufficient financial sources for banks and restore credit activity. ECB faced a conflict between achieving sufficient liquidity and smaller fluctuations between short-term interest rates on one hand and aim to maintain an active interbank market for short maturities. Priority was given to the first (Bini Smaghi, 2008). The usage of ECB's deposit facility increased by more than 350-times in last quarter of 2008 when compared to previous values showing that banks

place their liquidity back to the central bank instead of injecting it further into real economy. This behaviour was further encouraged by narrowing the corridor between two standing facilities' interest rates from 200 to 100 basis points; the measure that aimed to keep short term interest rates under tighter control and was revoked in January 2009. According to Gaspari (2009) widening of the interest rates corridor did not help building trust among banks and revitalizing the interbank market. Prolonging the maturity of ECB's operations from one week to maximum six months (later even 12 months) on a fixed rate basis (without auctioning the interest rate) was more helpful measure. Besides that ECB increased the list of eligible counterparties for its operations and started accepting a much wider range of securities as collateral. The practice of accepting private papers as collateral was established already before the crisis, which was not the case for some other central banks (Trichet, 2009). Actions taken on a state level such as deposit guarantee schemes are to be followed by state guarantees of loans that could finally revive credit market.

## 4. Econometric analysis

### 4.1 Overview of previous analyses

Slovenia has been included in researches mostly conducted for Central and Eastern European countries. Analyses vary from VAR analyses to panel data analyses, later being mostly based on BankScope data.

Delakorda (1998) conducted analysis of monetary transmission mechanism in Slovenia for the period between 1992 and June of 1997 on aggregated monthly and quarterly data. VAR analysis shows evidence of credit channel and exchange rate channel, although effects of supply and demand on amounts of credit are not separated. In earlier periods of Slovenian independency some channels of transmission, like interest rate channel, were obstructed by the peculiarities of transition period (Zbašnik, 2003).

Jimborean (2006) conducted analysis using generalized method of moments (GMM)<sup>20</sup> using BankScope data for the period 1995-2005 testing if size, liquidity, capitalization and ownership influence the functioning of a lending channel in Slovenia. Money market interest rate is used as a monetary policy stance indicator. She discovered that none of the traditional banking characteristics (size, liquid-

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<sup>20</sup> A method appropriate for dynamic panel data models with cross-section dimension (N) relatively large when compared to time dimension (T).



ity, capitalization) was statistically significant if regressed on bank loans' growth. On the other hand it is possible to notice that foreign owned banks increase loans when monetary policy tightens.

Matousek and Sarantis (2007) conducted a micro economic analysis using BankScope annual data for the period 1994-2003. They use GMM as well. Short term nominal interest rate was used as a proxy for monetary policy stance. They found out that size, liquidity and capitalization statistically significantly influence the transmission of the monetary policy.

Coricell et al. (2006) conduct both macroeconomic SVEC<sup>21</sup> analysis and microeconomic GMM firm-level analysis. First one analyses the whole transmission mechanism using quarterly aggregate data for a period of 1995Q1-2005Q3. Spread between 60-day tolar denominated bills issued by the Bank of Slovenia (TBZ60) and 3-month EURIBOR is used as measure of monetary policy stance. They notice that monetary policy shock lowers credit growth, which they describe as an indication for the existence of a bank lending channel. Microeconomic analysis is conducted on annual firms' data for a period of 1994-2004. Since authors do not investigate if central bank in fact influences the supply of bank loans they actually analyze only bank dependency of Slovenian firms and not the existence of a bank lending channel (as argued in Cecchetti, 1995).<sup>22</sup> Using US proxies for optimal financing structure of firms that do not face supply constraints developed by Rajan and Zingales (1998), they discover that sectors that need higher shares of external financing face slower growth of their sales, when supply of loans falls. Further they discover, using similar proxy for optimal inter-firm financing, that bank and trade credit function as substitutes. Despite the fact that these data are one of rare proxies for optimal financial structure, it can be argued that optimal financing structure cannot be determined for the whole world equally, especially if giving unjustified advantage to the US economic and financial system, since many other (institutional...) factors influence what is an optimum for a certain country or geographic area.

#### *4.2 Model and methodology used*

Model used in econometric analysis is simplified version of Bernanke and Blinder (1988), presented earlier and is based on similar microeconomic empiri-

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<sup>21</sup> Structural vector error correction model.

<sup>22</sup> As Cecchetti (1995) points out this is the problem of a majority of analyses of a bank lending channel.

cal analyses conducted for United States (Kashyap & Stein, 1997) and European Union member states (Ehrmann et al., 2001). Analysis focuses on lending and deposit market while it neglects the effects of loans on investment and product.

We assume that deposits ( $D$ ) equal money ( $M$ ) and that both depend on the policy interest rate  $i$ , that influences banks' demand for reserves and their preparedness for deposit financing, since policy rate influences deposit rates.

**Equation 4:**

$$M=D=D(i, \chi)$$

The demand for loans ( $L_i^d$ ) that a bank faces depends on real GDP ( $y$ ), inflation rate ( $p$ ), policy interest rate ( $i$ ) and interest rate on loans ( $r_l$ ).

**Equation 5:**

$$L^d = L(r_l, i, y, p)$$

The supply of loans of a bank ( $L_i^s$ ) depends on the amount of money (or deposits) ( $D$ ) available, the interest rate on loans ( $r_l$ ), and the monetary policy rate ( $i$ ). This direct effect of the monetary policy rate arises in the presence of opportunity costs for the bank, when banks use the interbank market to finance their loans or in the case of mark-up pricing by banks, which pass on increases in deposit rates to lending rates. Both, deposit and lending rates either directly (through variable interest rates) or indirectly depend on interbank interest rate (like Euribor), that tightly follow central bank interest rate.

The supply of loans is therefore modelled as:

**Equation 6:**

$$L_i^s = \lambda(r_l, i, D)$$

It is assumed that banks are not equally dependent on deposits. Impact of deposit changes on loans depends on characteristics such as size, liquidity, capitalization, profitability, foreign ownership ( $x_l$ ). Parameter on deposit variable ( $\mu_l$ ) is therefore composed out of two components, one of them being dependent on bank characteristic(s) ( $\mu_l x_l$ ).

**Equation 7:**

$$\mu_i = \mu_0 - \mu_i x_i$$

If combined, equations 4 to 7 lead to:

**Equation 8:**

$$L(r_i, i, y) = \lambda(r_i, i, D(i, \chi))$$

Loans are therefore equal to

**Equation 9:**

$$L_i = ay + bp + c_0 i + c_1 i x_i + dx_i + const$$

The coefficient  $c_1$  connects the reaction of bank lending to monetary policy changes with bank characteristic. If significant, parameter for  $c_1$  implies that monetary policy affects loan supply. Reaction of loan demand across banks has to be homogeneous in order to identify the loan supply effects of monetary policy. This presumption excludes cases where some bank customers are more interest rate sensitive. Given that bank loans are the main source of financing for all, even large firms in Slovenia, this as a reasonable benchmark. Besides that none of the banks in Slovenia specializes for particular type of customers.

Since some of the variables turned-out non-significant final specifications do not include all of the variables presented here.

Methodology used is panel data estimation. Fixed effects estimation method is biased and inconsistent due to the inclusion of a lagged dependant variable (Baltagi, 2008). Therefore general method of moments (GMM) was used. Lagged values of first differences of dependent variable were used as instruments as suggested in Arellano and Bover (1995).

**4.3 Data description<sup>23</sup>**

Data for bank and savings banks balance sheet characteristics, performance indicators and bank ownership (Slovenian or foreign majority ownership) are

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<sup>23</sup> List of variables and data sources is provided in the appendix.

taken from Slovenian Banking Association publications Financial Statements of Banks in Slovenia for years 1993-2005 and bank financial statements published in individual banks' web pages (for years 2006 and 2007). Data for monetary aggregates, interest rates, GDP growth and inflation are taken from Bank of Slovenia Statistics and Statistical Office of the Republic of Slovenia. Data were adjusted for price growth. Some variables are used as lagged and not all of the data are available for the whole period, therefore regressions exploit time series dimensions from nine to eleven years. Panel is unbalanced since some mergers, liquidations and green-field investments happened during the period analyzed. Mergers of banks of similar size result in a "creation" of a new bank, while previous banks do not appear anymore among the data. If the merger is between banks of significantly different sizes, the data of the merged bank is considered as data of the largest merging institution and no new bank appears.

Similarly as in other transition economies it is very difficult to choose monetary policy stance indicator. Monetary policy of Bank of Slovenia was strongly determined by its goal of keeping real exchange rate stable in order to support exporters. Bank of Slovenia kept buying foreign exchange that increased amount of money in circulation. Excessive amount of money was sterilized by issuance of Bank of Slovenia bills. Therefore several monetary policy stance indicators had to be taken into consideration. Simple indicators such as monetary aggregate 2 (M2), composed of demand deposits, deposits with agreed maturity up to two years and deposits redeemable at notice up to three months, while currency is excluded (in order to take into account the change of monetary policy regime in 2007), central bank interest rate (IR\_CB) and money market interest rate (IR\_MM) were considered. All of those variables exhibit several advantages and disadvantages, so they have been used alternatively. M2<sup>24</sup> levels and growth rates exhibit endogeneity, since the movement of bank liabilities and assets is tightly connected. Main argument for choice of M2 is that the period of monetary sovereignty was determined by the use of a wide variety of monetary policy instruments<sup>25</sup> therefore it was very difficult to determine central bank interest rate (Kranjec & Košak, 1996). Money market deposit rate is problematic since money market was rather undeveloped, consequently movements of the money market interest rate did not exhibit central bank activity very well as it is usual for developed money markets of USA or euro area. Besides that money market rate was not the explicit target

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<sup>24</sup> M1 and M3 growth rates were actually intermediate targets of the central bank until 1997 and 2002, respectively. Problem with these targets is, that they were not calculated using the same method as in later periods, so data calculated using EA harmonized method were used to ensure comparability. Under this construction M2 and M3 practically do not differ. Main reason for choice of M2 is in large part composed out of reservable deposits, although rules on required reserves changed in the period analyzed as well.

<sup>25</sup> More than fifteen instruments were used in 1994 and 1995 (Kranjec & Košak, 1996).

of central bank's activities. Considering central bank interest rate it is difficult to decide which interest rate to use or how to calculate it, because several monetary policy instruments were used, therefore the calculation of the interest rate could be complicated and would make it difficult to believe that money market participants would have based their decisions on *ex post* calculated interest rate. Central bank interest rate used here is an interest rate on bills that Bank of Slovenia was issuing in order to remove primary money from circulation and is determined for the period from 1997 on. As explained before it is actually a deposit and not a lending rate as it is usual.

Introduction of new accounting standards that stopped the practice of obligatory revalorization of capital and some other balance sheet items that happened in 2002 was taken into consideration by including a dummy variable taking value of 1 in years 1993 till 2001, and 0 from 2002 on.

Data for loans to non-banking sector were used, since it is reasonable to expect that these types of loans actually affect investment, consumption and production. Measures of bank characteristics included in equations are size, liquidity, capitalization, profitability and foreign ownership. As a measure of relative size of a bank, share of bank assets in total banking sector (market share) is used. Alternatively total assets are used as a measure of size and bank activity. Liquidity is measured as a share of cash in total assets. Alternatively sum of cash and securities to total bank assets are used. Official data for capital adequacy ratio (CAR) were used as measures for capitalization, while data for revenues on assets or revenues on equity are used as a measure of profitability. Dummy for foreign ownership takes the value of 1, if bank is in domestic ownership and the value of 0 if bank is foreign owned.

Data on loans, GDP and assets enter equations as first differences of logarithms (approximations of growth rates), while levels are used for liquidity, capitalization, profitability and size data, since those data are all expressed in percentages. Also data on real exchange rate enter in levels. Alternative specifications use first differences also for assets and loans data. Growth rates and first differences are used in order to take care of non-stationarity of the data (Baltagi, 2008).

### 4.3 Results of the analysis

In following equations credit to non-banking sector is regressed on lagged values of itself, GDP, inflation rate, monetary policy stance indicator and exchange rate, followed by interactions of bank characteristics like size, liquidity, capitalization, revenue on assets and ownership with monetary policy stance indicator in order to measure responses of banks with different characteristics to changes in

monetary policy. Not all of the described variables are used in all of the equations, while some additional explanatory variables are used in some equations.

Table 8:

MONEY MARKET INTEREST RATE AS INDICATOR  
 OF MONETARY POLICY STANCE, 1997-2007.

VARIABLE	GMM		
	COEFFICIENT	T-STAT	p
LOG(CRED_NBAN)			
LOG(CRED_NBAN(-1))	0.6431	10.18	0.0000
LOG(GDP(-1))	2.1511	6.43	0.0000
INFL(-1)	0.2282	0.28	0.7814
LOG(M2(-1))	1.1910	3.35	0.0010
ER_R(-1)	0.0419	7.52	0.0000
SIZE*LOG(M2(-1))	-0.2889	-0.12	0.9056
LIQA*LOG(M2(-1))	-5.1329	-1.82	0.0700
CAR*LOG(M2(-1))	-4.0352	-3.35	0.0010
ROA*LOG(M2(-1))	-1.8292	-0.15	0.8773
D_OWN*LOG(M2(-1))	-0.2924	-1.90	0.0597
K5	-0.0489	-0.17	0.8616
SIZE	5.9461	0.32	0.7483
LIQA	42.4371	1.86	0.0642
CAR	32.3372	3.38	0.0009
ROA	17.6698	0.18	0.8564
D_OWN	2.5174	1.92	0.0563
J-statistic	23.2863		
Sargan test (p)	0.05576		

Source: own calculations.

Table 8 shows results for specification with M2 as an indicator of monetary policy stance. Lagged credit influences its present value positively. The parameter on M2 is positive, as expected. GDP influences credit positively, while parameter on inflation rate turned out non-significant. Exchange rate influences credit positively, meaning that depreciation causes credit to increase. Bank characteristics used independently are size measured as market share of the individual credit institution, liquidity, capitalization, revenue on assets and ownership. Size and ROA are not significant, while all the other bank characteristics influence credit positively, which is in accordance with expectations.<sup>26</sup> Size interacted with mon-

<sup>26</sup> This is true for indicator on ownership as well, since home owned institutions are larger and they give more credit as well.

Table 9:

CENTRAL BANK INTEREST RATE AS INDICATOR  
OF MONETARY POLICY STANCE, 1997-2007.

VARIABLE	GMM		VARIABLE		GMM		VARIABLE		GMM	
	COEFFICIENT	T-STAT	LOG(CRED_NBAN)	LOG(CRED_NBAN(-1))	COEFFICIENT	T-STAT	LOG(CRED_NBAN(-1))	LOG(CRED_NBAN_G(-1))	COEFFICIENT	T-STAT
D(CRED_NBAN)	-0.1575	-3.88	0.0002	0.0002	0.4099	3.05	0.0027	0.0027	-0.0563	-0.41
D(CRED_NBAN(-1))	-0.2271	-3.13	0.0021	0.0000	6.8105	6.31	0.0000	0.0000	1.4217	3.81
D(GDP(-1))	-1200996	-4.78	0.0000	0.0000	5.9674	3.25	0.0014	0.0014		
INFL(-1)	-3553.98	-0.77	0.4425	IR_CB(-1)	-0.0558	-1.19	0.2340	IR_CB(-1)		
IR_CB(-1)	-8390.60	-15.13	0.0000	ER_R(-1)	0.1734	5.08	0.0000	DI_R(-1)	-0.0470	-3.81
D(ASSETS)*IR_CB(-1)	0.049236	8.75	0.0000	LOG(ASSETS)*IR_CB(-1)	0.0111	3.82	0.0002	ASSETS_G*IR_CB(-1)	-0.0286	-5.47
LIQA*IR_CB(-1)	-69195.96	-1.31	0.1930	LIQA*IR_CB(-1)	-0.2079	-0.78	0.4381	LIQA_D*IR_CB(-1)	0.1348	5.06
CAR*IR_CB(-1)	34122.79	2.39	0.0181					LIQA_D*IR_CB(-1)	-0.0424	-2.12
ROA*IR_CB(-1)	50464.94	1.78	0.0776					CAR_D*IR_CB(-1)	-0.2677	-5.66
D_OWN*IR_CB(-1)	8812.811	4.62	0.0000	D_OWN*IR_CB(-1)	-0.0702	-4.01	0.0001	D_OWN*IR_CB(-1)	0.5550	2.44
K5	295237.2	13.66	0.0000	K5	-1.8910	-3.35	0.0010		0.0562	4.96
				LOG(ASSETS)	0.3671	3.39	0.0009			
				LIQA	0.5018	0.34	0.7362			
				D_OWN	-1.0386	-1.33	0.1850			
J-statistic	14.7726			J-statistic	19.5999			J-statistic	19.5999	
Sargan test (p)	0.19314			Sargan test (p)	0.0511			Sargan test (p)	0.0511	

Source: own calculations.

etary stance indicator influences credit negatively, but it is not significant. Same is valid for revenue on assets. More liquid banks are, as expected, less motivated to decrease credit when confronted with tight monetary policy. Similar is true for capitalization. Banks that are more liquid and better capitalized are therefore better able to overcome tight monetary policy. Domestic ownership negatively influences growth of credit, which means that foreign owned banks are less able to overcome monetary policy restrictions, which is surprising since we would expect that they enjoy their parent institutions' support and are therefore better equipped to overcome consequences of a tight monetary policy.

Table 9 shows specifications with central bank interest rate as monetary policy stance indicator. As expected the interest rate influences credit negatively in both specifications. Result is a bit more ambiguous with GDP, inflation rate and exchange rate, since in first equation with first differences they influence credit negatively and in the other, with logarithms they affect credit positively, as expected. In equation with growth rates effect of GDP on credit growth is positive, while exchange rate affects it negatively. Higher concentration is connected with higher levels of credit in first of the equations while it is connected with lower levels of credit in the second one. Among bank characteristics size, measured by assets, increases level of credit in all of the equations specified. Liquidity influences credit negatively, but it is significant only in the last equation. Capitalization and profit both affect credit positively in first equation, while capitalization's influence is negative in the last equation. Domestic ownership has a positive influence on credit in two of the equations specified, while its influence is negative in one of them.

Results are similar to previous results in specification with money market rate as an indicator of monetary policy stance (Table 10). As expected, GDP positively influences credit in two of the specified equation, while the first stands out with negative influence of GDP on credit. Inflation rate is significant only in the first specification and it affects credit positively. Interest rate has a negative and significant influence on credit in all of the equations specified. Real exchange rate increase positively influences credit in two of the equations. Banks have more customers when exchange rate depreciates which makes their credit relatively cheaper compared to direct borrowing from foreign banks. It is also possible that the relationship between the exchange rate and the volume of lending is a consequence of revaluation of loans that were largely indexed to foreign currency. Bank size influences credit to non-banking sector positively as well, regardless of the variable used. Liquidity affects credit positively in two of the equations specified, while its effect on credit is negative in the first one, but is significant only in one of the equations. Capitalization, when significant, positively influences credit, as expected in two of the equations, while its effect on credit is negative in the last equation with growth rates. Same is true for profit, although it is significant in only



Table 10:

MONEY MARKET INTEREST RATE AS INDICATOR  
OF MONETARY POLICY STANCE, 1997-2007.

VARIABLE	GMM		VARIABLE		GMM		VARIABLE		GMM		
	COEFFICIENT	T-STAT	LOG(CRED_NBAN)	p	COEFFICIENT	T-STAT	p	COEFFICIENT	T-STAT	p	
D(CRED_NBAN(-1))	0.26246	6.29	LOG(CRED_NBAN(-1))	0.0000	0.7499	40.67	0.0000	CRED_NBAN_G(-1)	0.1228	5.77	0.0000
D(GDP(-1))	-0.163602	-3.75	LOG(GDP(-1))	0.0002	2.7900	14.58	0.0000	GDP_G(-1)	0.7311	4.62	0.0000
INFL(-1)	-645649.4	-3.47	INFL(-1)	0.0007	0.7882	1.58	0.1170				
IR_MM(-1)	-15947.55	-5.01	IR_MM(-1)	0.0000	-0.0180	-2.18	0.0302	IR_MM(-1)	-0.0294	-7.77	0.0000
ER_R(-1)	6949.511	6.18	ER_R(-1)	0.0000	0.0472	9.58	0.0000				
D(ASSETS)*IR_MM(-1)	0.169769	35.06	SIZE*IR_MM(-1)	0.0000	0.1605	5.23	0.0000	D(SIZE)*IR_MM(-1)	1.3334	4.60	0.0000
LIQA*IR_MM(-1)	-17796.09	-0.77	LIQA*IR_MM(-1)	0.4442	0.0468	4.09	0.0001	LIQA_D*IR_MM(-1)	0.0483	1.00	0.3207
CAR*IR_MM(-1)	43940.51	5.36	CAR*IR_MM(-1)	0.0000	0.0383	2.13	0.0345	CAR_D*IR_MM(-1)	-0.1049	-4.26	0.0000
ROA*IR_MM(-1)	120133.6	5.74	ROA*IR_MM(-1)	0.0000	0.1242	0.77	0.4401				
D_OWN*IR_MM(-1)	-6025.002	-3.85	D_OWN*IR_MM(-1)	0.0002	0.0158	3.24	0.0014	D_OWN*IR_MM(-1)	0.0215	4.42	0.0000
K5	104926.6	0.98	K5	0.3307	-0.1737	-0.70	0.4859				
D_REVALOR	-14878.33	-2.84	D_REVALOR	0.0090	-0.0509	-3.61	0.0004	D_REVALOR	-0.0500	-2.85	0.0049
J-statistic	17.08826		J-statistic		20.9258			J-statistic	24.24771		
Sargan test (p)	0.5107		Sargan test (p)		0.28317			Sargan test (p)	0.23173		

Source: own calculations.

one of the two equations, where it is used as an explanatory variable. Results are more ambiguous for ownership – it affects loans negatively in one of the equations and positively in the other two. The revalorization dummy is significant, showing that before the introduction of the new accounting standards growth of credit was lower than afterwards. Measure of concentration is not significant in any of the equations presented here.

## 5. Discussion and conclusion

Bank characteristics that represent proxies for information asymmetry influence the transmission of monetary policy in Slovenia. Banks that differ in size, capitalization, liquidity, profitability and ownership respond differently to monetary policy changes, although not all of the responses are in accordance with theoretical predictions. Therefore, an answer to the question about the existence of bank lending channel is not straight forward.

Larger banks, measured by their assets or assets' growth are less influenced by monetary policy changes, which is in accordance with theoretical predictions. Similar conclusion can be given, if size is measured as market share of the credit institution. As explained earlier, all Slovenian banks are rather small if analyzed in euro area environment. An analysis with larger banks from euro area environment would be very beneficial for a final conclusion about the influence of credit institutions' size on their credit activity.

Higher liquidity is, as theory suggests, connected with smaller response to changes in monetary policy stance in majority of the equations specified. Different result can be found only in the equation where liquidity is measured as share of cash and securities in total assets (LIQ1A). Stein (1998) argues that banks facing higher information asymmetry build a buffer of liquid assets to overcome the impact of tight monetary policy. Considering a result from one of the equations with LIQ1A that uses central bank interest rate as a measure of monetary policy stance it could be argued that liquid assets had another function in Slovenia. An increase in central bank's interest rate (that is actually a deposit rate) increased the attractiveness of Bank of Slovenia bills and encouraged banks to invest in them which on one hand increased liquidity and on the other hand used sources that could have been invested in loans otherwise. This also explains why the effect on credit is positive when only cash in credit institutions' balance sheets is used as measure of liquidity.

Results for capitalization are a bit more indifferent. Higher capital adequacy ratio is connected with decreased effectiveness of monetary policy in majority of

specifications, which is in accordance with expectations, but it exhibits negative influence on credit growth in two of the equations specified (both using growth rates of credit). Amplified influence of capitalization on monetary transmission could be caused by the fact that banks do not suffer from shortage of capital, which means that capital does not represent an obstacle to credit activity. Banks that according to theoretical predictions feel tight monetary policy most strongly are banks that operate on the bottom level of required CAR. However average capital adequacy ratios in Slovenia were never lower than 11 %, levels lower than Basel I's 8 % appeared only twice in the whole sample. Bank of Slovenia actually insisted on higher capital adequacy ratios at the beginning of the period analyzed. But this does not explain the increased transmission of monetary policy changes to bank loans of banks with higher CAR. Possible explanation could be that management of banks with higher buffers of capital is more risk averse. Tightening of monetary policy consequently leads to an increase of their prudence which further leads to reduction of loans in the period analyzed.

Higher profits (measured as ROA) are connected with lower responsiveness to monetary policy, as expected. Banks with higher profits do not have to act so cautiously, because profits create a buffer for credit activity of those banks. They can afford to risk more, although this could add to procyclicality of their activity since it is possible to expect that they will also suffer greater losses if economic situation deteriorates and share of bad loans increases.

Interaction of ownership and interest rate does not give straight forward results either, but specifications where reaction of domestic credit institutions counters the action of monetary policy authorities instead of amplifying them as suggested in theory, prevail. Therefore it is possible to conclude that domestically owned banks respond to monetary policy weaker than foreign owned banks, which is a result confirmed for Slovenia also in Jimborean (2006).

Evidence of bank lending channel is mixed, although they go in a direction, where a confirmation of its existence could be given. However, a natural extension of the research would be to perform an analysis on quarterly or monthly data that offer more degrees of freedom on one hand and show more precise response to changes in monetary policy which can occur more often than just once a year, on the other hand.

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## 7. Appendix – data description

VARIABLE	DESCRIPTION	SOURCE
ASSETS	total assets	Slovenian Banking Associations
CAR	capital adequacy ratio	Slovenian Banking Associations
D_OWN	ownership dummy; 1, if domestically owned; 0, if foreign owned	Slovenian Banking Associations
D_REVALOR	change in accounting standards, value of 1 in period 1993-2001; otherwise 0	
ER_R	real exchange rate	Statistical Office of Slovenia
GDP	GDP	Statistical Office of Slovenia
INFL	inflation rate	Statistical Office of Slovenia
IR_CB	central bank interest rate	Bank of Slovenia
IR_MM	money market interest rate	Bank of Slovenia
K5	market share of five largest banks	Slovenian Banking Associations, own calculations
LIQ	liquidity; cash to total assets	Slovenian Banking Associations
LIQ1	liquidity; cash and debt securities to total assets	Slovenian Banking Associations, own calculations
LOANS_NBAN	loans to non-banking sector	Slovenian Banking Associations
M2	M2	Bank of Slovenia
ROA	revenue on assets	Slovenian Banking Associations
SIZE	market share	Slovenian Banking Associations, own calculations

## BANKOVNI KREDITNI KANAL U SLOVENIJI

### Sažetak

Monetarna politika može djelovati na agregatnu potražnju kroz slijedeća tri kanala: kroz tradicionalni kanal kamatnih stopa, kroz cijenu ostale aktive, i putem kreditnog kanala koji se sastoji od bilančnog kanala, kapitalnog kanala i kreditnog kanala banaka.

Kada središnja banka uvodi mjere restriktivne monetarne politike, poslovne se banke suočavaju s teškoćama pri očuvanju postojećih i pribavljanju novih financijskih izvora. Budući da u bankarskom sustavu postoje banke različite po svojoj veličini, vlasničkoj strukturi, kapitalizaciji i po stupnju likvidnosti, restriktivna monetarna politika na njih nejednako djeluje zato što među njima postoje različite razine asimetričnosti informacija.

Ako su banke veće, bolje kapitalizirane, likvidnije i/ili u domaćem vlasništvu, a slabije reagiraju na promjene u monetarnoj politici središnje banke, moguće je tvrditi da je bankovni kreditni kanal učinkovit.

Ta je hipoteza testirana na panelu godišnjih podataka za pojedine slovenske banke pomoću opće metode trenutka. Iako dobiveni rezultati nisu jednoznačni, oni ipak upućuju na postojanje ovoga kanala.

Ključne riječi: transmisija monetarne politike, bankarski sektor, bankovni kreditni kanal