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Faculty of Social Sciences
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MASTER'S THESIS

Monetary Policy Transmission - Bank Lending Channel and Banking Market Structure. The Case of Georgia, Azerbaijan, and Armenia.

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Declaration of Authorship

The author hereby declares that he compiled this thesis independently; using only the listed resources and literature, and the thesis has not been used to obtain a different or the same degree.

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Prague, June 29, 2019

Signature

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Abstract

In the thesis, we examine the bank lending channel and the effect of banking market structure on the transmission of monetary policy in Georgia, Armenia, and Azerbaijan. We employ bank-level data for the period of 2011-2017 to detect if banks with different characteristics react differently to monetary policy shocks. Banking market structure is proxied by three measures-CR5, HHI, and Lerner Index. We estimate two types of models: dynamic (with system GMM) and static (with FE) models. We also consider the effect of dollarization on bank loan supply as well as on monetary policy. We do not find consistent evidence that banks react differently to monetary policy shocks depending on bank characteristics (size, capitalization, and liquidity). Hence the existence of the lending channel is not conclusive. Nevertheless, the results show that monetary policy is less effective in more concentrated markets. This finding is robust in all specifications with both types of models. In this sense, competition is not significant. The results also suggest that dollarization weakens the effect of domestic monetary policy.

Keywords bank lending channel, CR5, HHI, Lerner Index, system GMM, dollarization

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Abstrakt

V této diplomové práci zkoumáme bankovní úvěrový kanál a vliv struktury bankovního trhu na transmisní mechanismus monetární politiky v Gruzii, Arménii a Ázerbájdžánu. Využíváme bankovní data za období 2011-2017, abychom zjistili, zda banky s různými charakteristikami reagují na změny monetární politiky odlišně. Struktura bankovního trhu je vyjádřena třemi měřítky - CR5, HHI a Lernerova Indexu. Rozlišujeme dva typy modelů: dynamický (se systémovým GMM) a statický (s FE). Dále také zvažujeme vliv dolarizace na nabídku bankovních úvěrů a na měnovou politiku. Nenacházíme žádné konzistentní důkazy, že banky s odlišnými charakteristikami (velikostí, kapitalizací a likviditou) reagují odlišně na změny monetární politiky. Z tohoto důvodu není existence bankovně-úvěrového kanálu prokazatelná. Výsledky nicméně ukazují, že monetární politika je na koncentrovaných trzích méně účinná. Toto zjištění je robustní ve všech specifikacích u obou typů modelů. V tomto smyslu není hospodářská soutěž významná. Výsledky rovněž naznačují, že dolarizace oslabuje účinek domácí monetární politiky.

Klíčová slova bankovní úvěrový kanál, CR5, HHI, Lernerův Index, systémový GMM, dolarizace

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Acronyms

MTM Monetary policy Transmission Mechanism

CEE Central and Eastern Europe

CD Certificate of Deposits

CRA Community Reinvestment Act

CR5 Concentration Ration of 5 largest banks

SCP Structure-Conduct-Performance

IO Industrial Organization

OECD Organisation for Economic Co-operation and Developmen

OMO Open Market Operations

VAR Vector Autoregression

GMM Generalized Method of Moments

OLS Ordinary Least Squares

FE Fixed Effects

Master's Thesis Proposal

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Proposed Topic:

Monetary Policy Transmission-Bank lending channel and Banking market structure. The case of Georgia, Azerbaijan, and Armenia

Motivtion:

Banking institutions, in general, are still the main source of financing for small and medium businesses. As such banking markets' effect on the real economy remains significant. King & Levin (1993) show this on an example of the data from 80 countries. They find that different measures of financial development are strongly associated with real per capita GDP growth, increase rate of physical capital accumulation and improvements in the efficiency of its employment. Consequently, accessible external financing through banking sector would facilitate the positive movements in the economy. Nevertheless, due to risky nature (information opaqueness, moral hazard problem) of small businesses, it is quite hard to obtain bank funding in general and if it is possible, with relatively higher risk premium than for larger firms (Beck & Kunt, 2006). Supply and demand for bank loans may be also affected by monetary policy changes (Bernanke & Gertler, 1995), although banking market structure imperfections such as monopoly, may undermine policy efficiency and initial aims. The thesis will explicitly focus on the impact of banking market structure on the transmission mechanism.

As mentioned above, monetary policy transmission may alter the number of outstanding loans through the credit channel. It can happen through the Balance Sheet and Landing channels (Bernanke & Gertler, 1995). The former implies that in the case of contractionary monetary policy (an increase of policy rate) decreases businesses net worth and cash flows that ultimately reduce the loan amounts. The later works from a bank perspective implying the same contractionary monetary policy increases costs of bank external funding that is passed on the lending, which in the end will result in fewer loans in the economy.

Even though literature is quite extensive, the results are somewhat mixed and non-conclusive in the sense of the existence of the lending channel and its impact. Some of the most recent papers find that contractionary monetary policy is less effective in case of the monopolistic banking sector, specifically when banks have limited access to uninsured funding. Khan, Ahmad & Gee (2016) examine the relationship on the sample of Asian countries and find that when using Lerner index (as a measure of competition) greater market concentration and monopolization weaken monetary policy transmission through the lending channel. Authors also discuss the measures of competition as a possible explanation of mixed results in the literature. To check this hypothesis their paper uses four measures of the market structure: two structural and two non-structural and finds that significance of the market environment for transmission mechanism differs if a different measure of competition is considered. Yang & Shao (2014) find that bank competition is associated with positive loan

growth, but in contrast with other studies, they find that competition weakens the impact of monetary policy on bank lending. Adams & Amel (2005) reach the conclusion that as concentration increases the sensitivity of bank lending to the federal funds rate (monetary policy indicator in this case) decreases. Fungáčová, Solanko & Weill (2014) also conclude that banks with more market power were less affected by monetary policy and banks with small market power were more affected before crisis than after.

The thesis will focus on Georgia, Armenia, and Azerbaijan. To the best of my knowledge, there has not been any comprehensive analysis (if any) of monetary policy transmission through landing channel and implications of banking market structure on its effectiveness for this region. Furthermore, characteristics like a high concentration in the banking market, high dollarization and short experience of inflation targeting in Georgia and Armenia (from 2009 and 2006 respectively, Azerbaijan has not implemented it yet) might add valuable points to the existing discussion.

Hypotheses:

1. Hypothesis #1: Bank Lending Chanel exists
2. Hypothesis #2: Banks, with higher market power, are less affected by the monetary policy changes than banks with less market power.
3. Hypothesis #3: Overall result depends on the measure of competition.

Methodology:

The most frequent methodologies employed are dynamic GMM (e.g., Khan et al., 2016) and Panel Fixed effect (e.g., Fungáčová et al.). The thesis will follow this literature and use appropriate panel data methodology. System GMM methodology offers one of the best tools for estimation as it assumes endogeneity of regressors, dynamic process, where the dependent variable is influenced by its previous realizations and it works even with the smaller number of time periods. Details of system GMM implementation is provided by Roodman (2006), along with a discussion of challenges entailed to the estimation process.

For obvious reasons, the data availability is quite limited for most of the banks in the studied area. In Bank Focus they exist only from 2013-17 for the majority of banks. The Thesis will provide additional data for 2011-12 years gathered individually from banks financial statements. Variables that are not available directly from balance sheets are calculated in accordance with BankFocus calculation methods.

More challenging, as expected, might be calculating the competition measures. Structural indices as shown in multiple studies are not good measures of competition as they are based more on concentration than market power of banks (Bikker et al., 2012). The literature suggests Lerner index in order to measure the market power for each bank and as such, is based on bank-level data, which is hard to obtain. The thesis will try to measure competition with the bank-level method as well as the structural method. The methodology of calculation of Lerner index is well defined in the literature, thesis will employ it as well (e.g., Fungáčová et al., Khan et al., 2013). For the structural approach of measuring the banking market competition the work will employ five-bank concentration ratio and Herfindahl Hirschman Index (HHI).

Expected Contribution:

The thesis aims to contribute to the existing literature in two main ways: the first, focusing on a different set of countries in the analysis of bank lending channel and the second, examining the impact of banking market structure on lending channel efficiency. Due to data restrictions and a small amount of depository institutions,

there are few (if not none) studies concentrating on this area, thus the work will put together the bank level dataset for a reasonable number of years (employing Bank Focus and individual audit reports) to provide needed estimates.

Testing one of the hypothesis entails estimation of Lerner index for individual banks that is quite challenging on its own right due to the data restrictions. Nevertheless, in addition to the above, the work will aim to provide sensible estimates of the Lerner index for the studied banks.

Outline:

1. Introduction
2. Literature Analysis Does Monetary Policy Transmission Mechanism through Lending Channel exist?
3. Data description and general statistics (how was data obtained and data limitations)
4. Methodology and Model (more detailed description of the used methodology and how it differs)
5. Main results
6. Conclusion and suggestions for future research.
7. Summary
8. Appendices

Core Bibliography:

1. H.H. Khan, R.B. Ahmad, C. S. Gee (2016), *Bank Competition and monetary policy transmission through the bank lending Channel: Evidence from ASEAN*, International Review of Economics and Finance 44

2. Fungáčová, Z., Solanko, L., & Weill, L. (2014). *Does competition influence the bank lending channel in the Euro area?* Journal of Banking & Finance, 31, 296–314.

3. Adams, R. M., & Amel, D. F. (2005). *The effects of local banking market structure on the banking-lending channel of monetary policy,* Division of Research and Statistics, Board of Governors of the Federal Reserve System, Washington, D.C. 20551

4. Allen, F., Jackowicz, K., Kowalewski, O., & Kozłowski, Ł. (2015). *Bank lending, crises, and changing ownership structure in central and eastern European countries*. Journal of Corporate Finance

5. Jun Yang a, Shao H., (2014). *Impact of bank competition on the bank lending channel of monetary transmission: Evidence from China*. International Review of Economics and Finance 43 (2016) 468–481

6. Bernanke, B.S., Gertler, M., (1995). *Inside the Black Box: The Credit Channel of Monetary Policy Transmission.* NBER Working Paper No. 5146

7. Roodman, D., (2006). *How to do xtabond2: An Introduction to "Difference" and "System" GMM in Stata.* The Stata Journal Volume 9 Number 1: pp. 86-136

8. King, R.G., Levine, R., *Finance and Growth: Schumpeter Might be Right*, The Quarterly Journal of Economics, Vol. 108, No. 3. (Aug., 993), pp. 717-737.

9. Beck, T., Kunt, A.D., *Small and medium-sized enterprises: Access to finance as a growth constraint,* Journal of Banking & Finance, Volume 30, Issue 11, November 2006, Pages 2931-2943.

Author **Supervisor**

1 Introduction

The policymakers aim to stabilize the economy, find a way to facilitate economic development, and be proactive in the pre-crisis period to avoid it entirely or lessen the damages caused by it. The monetary policy, to affect the real economy, work through several major transmission channels: the interest rate channel, exchange rate pass-through, and the credit channel.

Mishkin (1996) summarizes the theoretical framework by which these channels work. In case of interest rate channel (traditional IS-LM view), the expansionary monetary policy makes investments more affordable (real interest rate goes down, through sticky prices and rational expectations) for the firms and that results in increased investments and ultimately higher output. Initially, the channel considered investment decisions made only by the firms, but later studies include the households' decisions on investments in housing and durables. The interest rate channel (money channel) goes through two stages to affect the real economy: first, between short term to long term interest rates, and second from long term interest rates to aggregate demand and output. Although pass-through is not always smooth, it may be sluggish to a different extent in short-run apart from being incomplete in long-run and even more so for transition economies (Egert and McDonald, 2009).

The Exchange rate pass-through functions through adjustment of the net export. A decrease in interest rates makes domestic currency denominated deposits less attractive relative to foreign currency deposits. Increased demand for the foreign currency rises its relative price and depreciates the local currency. A cheaper currency makes domestic goods more competitive relative to foreign products, as a result increasing the net-export and consequently, output. Egert and McDonald (2009) suggest that exchange rate pass-through is higher for developing countries and declines over time. One notable link between exchange rate channel and credit channel might be the ability of exchange rate movements affect the assets on firms' balance sheets and consequently their net worth and as a result their external finance premium. The effectiveness and full pass-through of the policy through the exchange rate channel largely depends on

setting on prices in an economy, central bank communication and interventions, inflation and exchange rate volatility (Egert and McDonald, 2009).

Mishkin (1996) discusses additional channels in the paper: equity price channels, wealth effect, housing, and land price channels that are part of the asset price channel. The efficiency of two former channels depends highly on developed financial markets such as stock and bond markets; thus, may not be relevant for economies with less advanced financial systems.

The third primary transmission channel is the broad credit channel that, in turn, covers the bank lending channel and balance sheet channels. Balance sheet channel focuses on businesses net worth, adverse selection, and moral hazard problems. Contractionary monetary policy that increases interest rates, decreases business net worth through, for example, devaluation of collateral. In this setting, there is a higher probability that banks will have insufficient collateral for the loans, as such costs of this problem increases (Mishkin, 1996). Reduced net worth decreases firm owner's stakes in the company that motivates riskier projects. In contrast, monetary policy that increases businesses net worth decreases the moral hazard problem and adverse selection issue, encourages banks to increase lending in the economy. Although, asymmetric information problem affects not only the credit channel but interest rate channel as well, in the sense of interest rate pass-through to lending rates. The higher interest rates may increase the riskier borrowers' willingness to borrow (adverse selection) and/or higher interest costs, and by extension project costs, lead the borrowers to riskier projects (moral hazard problem) (see De Bondt, 2002). Bank lending channel focuses on banks' ability to lend to the economy. Expansionary monetary policy increases banks deposits, in other words, loanable funds. Increased amounts of loans on its part facilitate the investments and, as a result, output growth. The functional lending channel depends on many characteristics of the financial sector and the whole economy. For example, bank holdings, concentration in the banking sector, depth of financial markets, government involvement, foreign currency denomination, and factors concerning borrowers' external finance abilities.

Due to monetary policy implications on the real economy, the literature on the monetary policy transmission mechanism (MTM) is extensive. Most of it aims to uncover how exactly these channels work and what might impede the pass-through of

the policy. Egert and MacDonald (2009) summarize the literature on transmission mechanism with a focus on Central and Eastern Europe (CEE). As we focus on the credit channel in the thesis, we discuss a significant part of this literature starting with Bernanke and Blinder (1988), who introduced the credit channel of monetary policy transmission. Significant publications include: Romer and Romer (1990), who express some doubt regarding the existence of such channel; Kashyap et al. (1992) study the lending channel existence through firms' external finance composition; Kashyap and Stein (1994) review the literature around the lending channel; Bernanke and Gertler (1995) discuss the potential of credit channel to solve some of the puzzles that conventional monetary policy may fail to do; Kashyap and Stein (1995, 2000) propose new empirical methodology using bank balance sheet data to study the lending channel existence, which addresses aggregate data problems for studying the lending channel; Later Ehrmann et al. (2001) conduct a similar analysis for euro area and propose bank-level data-based model for estimation. Further studies focus on different countries or regions to investigate the credit channel and/or testing effect of different factors on the lending channel.

The thesis aims to contribute to the existing literature on the bank lending channel in several ways. First, we focus on the countries that are studied to a lesser extent (Georgia, Armenia, and Azerbaijan) and even more so for a period 2011-2017. Second, we analyze the effect of concentration and competition on the bank lending channel, where we employ three concentration/competition measures. Third, we study the effect of dollarization on the bank lending channel. Our findings are mostly in line with the above literature. Even though we do not find consistent evidence of the lending channel existence, high concentration in the market seems to caution the adverse shock of the monetary policy stance. We further support the literature suggestion that multiple measures of concentration/competition should be considered in research to reach accurate inferences. Moreover, results indicate that dollarization weakens the monetary policy strength.

The structure of the work is following: chapter two focuses on literature analysis and country overview, chapter three provides data description, chapter four discusses the methodology and reports the results and chapter six summarizes and concludes.

2 Literature Analysis: Credit Channels

The credit channel, suggested by Bernanke and Blinder (1988), is an addition to already well-established traditional IS-LM interest rate channel. Authors assume that loans and other credit options may not be perfect substitutes. Imperfect substitutability can be the result of informational asymmetries, differences in liquidity, and/or high transaction costs of rising funds in open market. The research to this direction surged when empirical evidence to support the traditional interest rate channel became unconvincing due to the insignificance of interest rates through the cost of capital in empirical studies (Mishkin, 1995).[1] Bernanke and Gertler (1995) find it puzzling that adjustment of investments is slow even after policy rate returns to its initial level and that short term interest rates affect long-lived assets. It may not be entirely possible to explain through traditional transmission channels (interest rate channel). Authors suggest credit channel as an additional, amplifying, but not the separate mechanism that might fill the missing gaps in understanding the monetary policy transmission.

As mentioned above, the credit channel (broad credit channel. See, for example, Gambacorta, 2005) is the generic name for two sub-channels: bank lending channel and balance sheet channel. Moral hazard and adverse selection problems play major role in the discussion of credit channels. Bank lending channel views the transmission from banks' perspective, whereas balance sheet channel focuses on businesses' (and with extension on households, in the sense of investments in housing and other long-lived assets) net worth and their external risk premium. Firms' net worth can change in the following three scenarios outlined in Mishkin (1996). First, expansionary monetary policy that positively affects equity prices increases businesses net worth and thus effectively decreases adverse selection and moral hazard problems, which in turn motivates the banks to issue more loans to businesses and increase overall output in the economy. Second, expansionary monetary policy- decrease of short-term nominal (note, nominal rather than real, Mishkin (1996) highlights these distinctions from all other channels) rates, positively affect the firms' cash flows that consequently reduces

[1] Mishkin quotes Bernanke and Gertler here.

the adverse selection and moral hazard problems. Third, as debt payments are fixed in nominal terms, unanticipated price level increase lowers the debt burden in real terms without lowering the value of firms' assets, which in turn lowers the moral hazard and adverse selection issues and increases lending that ultimately boosts the investments and overall output (Mishkin, 1996).

Although, due to challenges empirical research faces, the existence of the channels may be doubtful. Romer and Romer (1990) conclude that after examining the episodes of monetary policy change, they do not find any evidence to support the lending channel. Authors suggest that examined data looks more consistent with a textbook interest rate channel and that banks can diversify their funding sources that would ultimately reduce the importance of the lending channel. Nonetheless, the paper finds that bank loans are imperfect substitutes for other bank assets and as channel importance may vary over time, the lending channel may become critical in the future. Taylor (1995) argues that many empirical studies found a significant relationship between interest rates and investment spending, ultimately supporting the existence of a strong interest rate channel of monetary transmission rather than credit channel. The main opposition to the employed empirical approaches is that findings based on aggregate data, cannot fully distinguish if a decline in lending is a result of supply or demand shocks. Bernanke and Gertler (1995) conclude that there is almost no doubt in existence of credit channel of monetary policy, although it is quite challenging to distinguish or show the difference between lending channel and balance sheet channel empirically. Increased policy rate adversely affecting the borrowing firms' balance sheets might as well worsen the small, less capitalized banks' balance sheets. Which means that banks are special cases of firms in the market. Further empirical research focused on overcoming these deficiencies of aggregate data and support or reject credit channels existence or its strength.

As the focus of the thesis is the lending channel, the following literature analysis will focus on this particular sub-channel.

2.1 Bank Lending Channel

Banks have a special role in the bank lending channel due to their ability to deal with adverse selection and moral hazard problems. The overall idea is following - the contractionary monetary policy that decreases banks loanable funds (deposits) decreases available loans for the economy, which in turn adversely affects the investment and spending of firms and households. Bernanke (2007) and later Dysiatat (2011) alternatively focus on external finance premium as a means through which lending channel works. Along with the financial development and liberalized financial system, there is no constraint on the supply of credit apart from capital requirements, and in case of the strong capital position, an economy can finance any credit needs in the system (Dysiatat, 2011). In other words, the lending channel will not necessarily depend on changes in reserves, but characteristics affecting the bank's balance sheet strengths, which ultimately, alters the external finance premium. Both Bernanke (2007) and Dysiatat (2011) highlight the importance of bank capital and its determinants for quality of bank balance sheet.

Bernanke and Blinder (1988), Kashyap and Stein (1994), and Bernanke and Gertler (1995) propose conditions that need to be true for the lending channel to exist. First, banks should not be able to replace the retail deposits easily with other sources of funding, such as Certificates of Deposits (CD) and/or new equity. Otherwise, banks would refer to other funding options to avoid changes on their liability side. Although it is not necessary that other sources of funding was unreachable for banks as long open-market liabilities are not perfect substitutes for retail deposits (Kashyap and Stein, 1994). Second, non-perfect substitutability needs to be true for bank-dependent firms as well. If firms are able without cost or even with insignificant costs to attain needed funds (for example commercial papers), then the effect of monetary contraction, through bank lending channel, can have near to none real influence on the economy. Therefore, the bank lending channel likely plays a more significant role in monetary policy transmission in countries with a large number of bank-dependent firms and less developed financial markets.

Two conditions, mentioned above, may lose their impeding quality if we consider that the bank lending channel works through the external finance premium. On the contrary, it may amplify the strength of the lending channel. If banks can substitute wholesale deposit funding with uninsured funds from the market, the effect of external finance would be greater, and hence, the strength of the lending channel will increase (Bernanke, 2007). Although, for countries with less developed financial systems and a considerable percentage of bank-dependent firms, the lending channel working through reserves (deposits) still might be more relevant. Empirical studies provide inconclusive evidence on existence, strength, and ability of the bank lending channel to affect the real economy. Being highly dependent on many aspects of financial development, the market structure, as well as bank-specific characteristics studies find quite substantial differences in its effect on different markets.

As briefly discussed earlier, empirical studies using the aggregate data face difficulties in distinguishing the reduction of loan growth caused by supply shock and reduction caused by demand shock. Kashyap and Stein (1995) suggest bank-level data analysis to ensure that only supply shocks are considered. According to this method, banks' responses to the same monetary policy differ depending on the characteristics of the banks in the economy. Therefore, the significance of bank characteristics interacted with monetary policy rate suggests lending channel existence.

Economic literature highlights the following three main bank characteristics- size, liquidity, and capitalization that might affect banks' ability to access non-deposit funding and consequently impede or enable lending channel of monetary policy.

Most empirical studies suggest that well-capitalized and highly-liquid banks are more efficient in shielding their loan supply from unanticipated adverse shocks of monetary policy. Strong capital positions may imply smaller informational frictions for the banks and easier access to alternative funding sources. The bank size, generally represented by the logarithm of bank assets, matters when it comes to issuing the market instruments for replacing retail deposits as loanable funds. Furthermore, the informational asymmetry problem is assumed to be more severe for smaller banks than a larger bank. As such, smaller banks may face difficulties in raising uninsured funds when needed (Kashyap and Stein, 1995; Ehrmann et al., 2001).

Kishan and Opiela (2000)[2] employ a modified version of the model from Peek and Rosengren (1996) to support the existence of a bank lending channel. Following common practice to study the question, authors divide data into sub-samples according to bank size and capitalization to find that small, undercapitalized banks are more responsive to monetary policy than bigger better-capitalized banks. Besides, the paper highlights the unresponsiveness of large term-deposits to monetary policy in small and undercapitalized banks, which is consistent with the hypothesis that small, undercapitalized banks are unable to resort to alternative funds during the contractionary monetary policy. Altunbas et al. (2000) reach a similar result for banks of any size. Concentrating more on liquidity, Kashyap and Stein (2000) find that monetary policy impact is stronger on banks with less liquid balance sheets and that this result is more relevant for smaller banks, simply because liquid banks can easily avoid significant changes in loans by relying on its large stock of securities. Unlike many studies, Gambacorta (2005) analyzing the Italian banking market finds that coefficient in front of the bank size is never relevant, but banks with higher liquidity ratios, are better cushioned against contractionary monetary policy. Contrary to other studies, the author finds capitalization insignificant when measured as the ratio of capital to assets, but its coefficient is significantly different from zero when excess capital is considered.[3] Capitalization appears to be an only significant factor in the cross-sectional analysis based on the Russian banking sector (during the 1999-2007 period, Juurikkala et al., 2011). Authors find that well-capitalized banks are likely to react less to monetary policy changes than other banks. The bank size is not important. Furthermore, due to the poor interbank market, Russian banks tend to hold sizable liquidity buffers to resort to in case of a liquidity shortage, making liquidity irrelevant in explaining cross-sectional differences in banks responses to monetary policy shocks.

Among the three characteristics, most debatable seems to be the importance of the bank size. Empirical papers on the sample of US banks (see Kashyap and Stein, 1995)

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[2] Kishan and Opiela (2000) as other authors note that findings apart from bank lending channel might be consistent with balance sheet channel as well. Authors use inverse relationship between bank capital and average delinquency rate to show that findings is related to bank lending channel rather than balance sheet channel.

[3] Excess capital – capital that exceeds regulatory requirements - considered to capture effect of the Basel capital requirements

find bank size significant, whereas research on European banking markets suggests its irrelevance. Ehrmann et al. (2001) analyze countries of the euro area and find size characteristics irrelevant for explaining different responses to monetary policy among banks and that it might be due to less accentuated asymmetric information problem in the euro area than in US markets. Although lending relationships and bank networks might provide an additional explanation for this difference. Matousek and Sarantis (2009) summarize results from empirical studies regarding the bank size and provide additional analysis on the example of CEE countries. Authors show that bank size is significant in all studied countries when it enters with more bank characteristics in the model and suggests that explanation of different result might be a larger number of small banks in CEE countries.

Apart from individual bank characteristics, the potency of the lending channel might be dependent on overall banking market characteristics (Ehrmann et al., 2001). As mentioned above, monetary policy might affect marginal costs faced by banks in the market. In this sense, market imperfections such as banking structure would have a quite significant influence on the sensitivity of loan prices[4]and by extension on lending channel strength. Olivero et al. (2011) find that monetary policy transmission through bank lending channel becomes less effective when concentration increases in the banking market. For robustness check, authors sample the data based on bank characteristics such as size, liquidity, and capitalization to find that banking market consolidation cushions the effect of monetary policy shock that arises through small banks. In a similar sense, the results on capitalization and liquidity are not clear. Similarly, Adams and Amel (2005) study the effect of consolidation in the banking sector on the potency of the lending channel for the U.S economy on CRA (Community Reinvestment Act) data. Authors find that in more-concentrated markets, the effect of monetary policy is weaker.

Concentration measures, like the k-bank concentration ratio (CR_k) and the Herfindahl-Hirschman Index (HHI), can be an additional subject of discussion. CR_k index is based on the assumption that the market is dominated by a small number of

[4] The banking market is unique in the sense of pricing, although it is still true that higher competition implies high prices sensitivity to marginal costs, whereas monopolistic markets are affected less by shocks on marginal costs. (see Adam and Amel ,2005).

large banks, whereas *HHI* takes market shares as weights and assigns greater weights on larger banks to stress their importance by including all banks into calculations (Bikker and Haaf, 2002). Both concentration index and HHI are structural measures, Structure-Conduct-Performance (SCP) in their core. According to the SCP paradigm in concentrated markets, it is easier for firms to act in an uncompetitive manner and realize higher returns (Leon, 2015). Advantage of concentration measures such as low data requirements, may be outweighed by their shortcomings. One of the major shortcomings is uncertainty regarding the relationship between concentration (structure) and competition (conduct). Even concentrated markets can be competitive if entry and exit in the market is easy to a certain extent.[5] Moreover, concentration might not be an indicator of uncompetitive conduct if the cause of higher market shares of firms is differences in productive efficiency (Leon, 2015). Northcott (2004) summarizes earlier literature on concentration and competition and concludes that concentration is not a sufficient indicator of competitive conduct in all cases. Degree of competitive behavior in the market depends on market characteristics itself, on presence of foreign banks, the flexibility of supplied services and the development of financial systems (among others). Bikker and Haaf, (2002) find an inverse relationship between concentration and competition (consistent with SCP paradigm) but notes that concentration measures may be highly dependent on the size of country and banking market, values might be overestimated for small countries with large international banks as they ignore non-bank financial institutions. Consequently, relying on structural measures to assess banks conduct in the market may lead (in some cases) to inaccurate conclusions on the effect of competition on the lending channel.

An alternative to market-based measures is to employ non-structural measures (Industrial Organization (IO) approaches) such as-Lerner Index, Panzar Rosse H-statistics, the conjectural variation model, and Boone indicator. Leon (2015) provides a comprehensive literature analysis and comparison of the approaches listing advantages and disadvantages of different measures. Lerner index is a ratio mark-up (price (P)-marginal cost (MC)) relative to price, which measures banks' ability to set a price above marginal cost. In this setting, greater pricing power indicates the ability to

[5] The threat of entry may keep market competitive (Leon, 2015).

behave monopolistically in the market. The popularity of Lerner index is due to many advantages as described in Leon (2015)- it does not require defining relevant markets, easier to interpret, can be estimated with a limited number of observations (this feature is more important for developing countries, where firm-level information is somewhat limited). With many advantages, there are considerable disadvantages worth mentioning. The Lerner index is not a direct proxy of competition, rather a measure of pricing power and increase of average pricing power may prevail even during the increase of competition due to the reallocation effect from inefficient to efficient firms (Leon, 2015). H-Statistics reflects the elasticity of interest revenues with respect to input prices (Demirguc-Kunt & Peria, 2010). Weak transmission of price increase on revenues suggests market power in pricing (Leon, 2015). H-statistics can be between 0 and 1, where 1 refers to perfect competition and implies that increase in input prices is reflected in equal percentage increase in costs (due to cost function homogeneity of degree one) and banks' revenue to ensure zero profit conditions (Leon, 2015). H-statistics less or equal to zero suggest monopoly (collusion) and if statistics is between 0 and 1-monopolistic competition. Like the Lerner index, H-statistics' advantages lie in its simplicity and fewer data requirements, but unlike the Lerner index, in some cases, the interpretation of H-statistics is not straightforward (Leon, 2015). Demirguc-Kunt & Peria (2010) note as well that H-statistics is valid only during the long-run equilibrium in banking markets that is when the return on assets is not correlated with input prices[6]. The assumption of long-run equilibrium is quite strong, especially for financial markets considered here. As different measures of competition and/or concentration captures a different aspect of monopolistic behavior/competition they cannot be considered as perfect substitutes and ideally, the empirical analysis should consider multiple measures to ensure result accuracy (Leon, 2015).[7] Nonetheless, economic literature generally alternates between these measures depending on the information needs to be captured and/or assumptions regarding the banking market. The Lerner index does not require the assumption of long-run equilibrium in the

[6] Discussed in more details in Bikker and Haaf (2002)

[7] Other measures, such as Conjectural variation model and Boone indicator, are not explicitly described here. As these measures are more complex than Lerner index and H-statistics and less often used in literature, choice of bank based measure fell on two later ones.

banking market and as such can be calculated at each point of time[8], it is employed to measure the competition in the thesis along with two concentration measures. We describe methodologies for estimation of concentration and competition measures in the methodology part of the thesis.

Unlike previously discussed studies using concentration measures as a proxy for market structure, further empirical studies refer mostly bank-based measures to study the impact of banking market structure on monetary policy transmission. Olivero et al. (2011) augment their previous study to replace concentration with competition measure (Panzar and Rosse H statistics) to assess the effect of competition on the strength of the bank lending channel. Authors find that monetary policy transmission becomes less effective when competition increases in the market.[9] Authors suggest three channels for the competition to affect bank lending. (1) If increase in competition is due to the increase of the shares of larger banks, it may weaken the lending channel. Authors base the hypothesis on the premise that bigger and more competitive banks are able to get funds more easily and hence shield their loan portfolios. (2) The lending channel may be weaker, if increased competition entails reduction in asymmetric information on borrowers. In this case, borrowers of small banks (generally more affected by adverse monetary policy) will be able to switch costlessly to different lenders, which in turn implies weaker real influence of the lending channel.[10] (3) In contrast, competition may make bank lending rates more sensitive to costs of deposits and hence increase strength of the lending channel. Overall it depends which of these factors is stronger.

Fungáčová et al. (2014), contrary to the above paper, concludes that a high level of competition strengthens the transmission of monetary policy through the lending channel in the euro area for the period 2002-2010. The paper examines two periods: before and after the crisis. Bank characteristics appear to be significant only before the

[8] Advantage of Lerner index over H-statistics (Demirguc-Kunt & Peria, 2010).

[9] If we consider that increased concentration should indicate monopolistic behavior their earlier study with concentration measure comes to opposite result.

[10] Authors refer to market imperfections such as switching costs and customer “lock-in”. One can refer to Kashyap and Stein (1996) for further discussion.

crisis and become irrelevant during the crisis. Suggesting that during the crisis monetary policy may not work the same way as during the normal economic environment or even during the economic downturn without the crisis.

Leroy (2014) covers euro area countries during 1999-2011 and finds coefficient in front of the interaction term of monetary policy and Lerner index significant. Author interprets that stronger competition in the market enhances the effectiveness of the monetary policy through the bank lending channel. The paper suggests two reasoning: (1) market power allows banks to reach alternative funding more easily that ultimately reduces the adverse shock of monetary policy; (2) margins and profitability allows banks to buffer adverse shocks though price adjustment rather quantity change.

Results on the significance of competition and market structure variables for monetary policy transmission may vary even when different measures are considered. Khan et al. (2016) show this on example of five Asian countries from 1999 through 2014. Authors employ two structural (CR5, HHI) and two non-structural (Learner Index, Boone Indicator) measures. Three measures convey similar information that monetary policy is less effective in less competitive markets. Contrary to this, Boone Indicator suggests otherwise - a decrease in the level of competition makes policy transmission more effective through the lending channel. Authors suggest that different results are not surprising as inferences on level of competition differ depending on the measure. Carbo et al. (2009) also find that competition measures are not perfect substitutes and may lead to different interpretations. Authors further note that the Lerner Index and ROA (Return on Assets) perform better for assessing the competition level.

Yang and Shao (2016) analyze banking market in China and find that monetary policy is less effective when competition increases. The effect is strongest for highly-liquid and well-capitalized banks.

Apart from characteristics described above Ehrmann et al. (2001) and Egert and MacDonald (2009) stress few financial market characteristics that may affect the existence of the bank lending channel (the first stage) entirely or its real influence on the economy (the second stage). The first stage factors include- bank networks, high overall capitalization of the banking market, maturity structure of the loans,

relationship lending, state ownership or merely involvement, dollarization, foreign ownership. The second stage factors include readiness of the firms to get other sources of external financing in case of adverse shocks, government involvement, and insignificant share of small firms in total output. For countries like Georgia, Armenia, and Azerbaijan most relevant from above factors seems to be dollarization, state ownership, and maturity structure of the loans.

Dollarization may be assessed from the point of view of assets and liabilities and can be expressed as the ratio of foreign exchange (FX) deposits or loans to total deposits or loans (Naceur et al., 2015). Naceur et al. (2015) describe determinants of dollarization in The Caucasus and Central Asia (CCA), and find that it is mainly driven by volatile inflation and exchange rates, low financial depth, and asymmetric exchange rate policies. High dollarization can weaken the realization of macroeconomic policies and monetary policy transmission in the economy. Mora (2013) studies the effect of partial dollarization on the bank lending channel in Mexico. Author finds that banks with larger shares of foreign currency deposits are less sensitive to domestic monetary policy changes, and it is especially relevant for small banks. Egert and MacDonald (2009) highlight that in foreign currency dominated economies domestic interest movements have limited effect on demand and supply of the loans as in these cases price depends on the foreign interest rate rather than a domestic one.

Moreover, contractionary monetary policy that increases interest rates may lead to opposite effect than policymakers intend to achieve due to the appreciation of exchange rates and as a result decrease of the foreign-currency-denominated loans in domestic currency terms (Egert and MacDonald, 2009). Implications of state ownership or involvement are simpler than ones from the dollarization. The role of the state in this sense lies in the reduction of risk for depositors and informational asymmetries, which enables banks to avoid fund reductions in case of adverse shocks in monetary policy (Ehrmann et al., 2001). Both the above characteristics may impede the lending channel. Contrary to the short-term-loan contracts (which is more relevant for less developed countries due to the high-risk environment) can speed up the monetary policy transmission and lending channel (Ehrmann et al., 2001).

2.2 Country Overview

From the literature analysis, it is easy to see that the significant differences in results, found in the literature, can be largely explained (if not fully) by country and financial market characteristics. Many empirical papers study lending channel on the example of developed economies with considerably well-functional and deep financial markets (the USA and Euro Area for example)[11], where it is easier for economic agents to resort to different funding options and mitigate the impact of the contractionary monetary politics. Unlike these economies, financial development is still quite thin in Georgia, Armenia, and Azerbaijan, which implies that usual sources for funding may not be readily available for banks or other firms. In all three countries, banks dominate the financial sectors. Jumilov (2012) suggests that Azerbaijani banks constitute 95% of the financial sector of the country. Similar bank domination over the financial sector is true for all Caucasus region countries, which makes the banking sector even more significant for monetary transmission analysis. Moreover, it might imply that banks are the only external financing source for small businesses, making them highly bank dependent. As many bank dependent firms is one of the conditions for lending channel to have a real influence on the economy, the above characteristic seem to support the hypothesis of the significant lending channel in these countries. Although, in countries with less developed financial and legal systems external financing can be challenging to obtain (or alternative financing sources for example trade finance and supplier credit) and thus need to rely on internal sources (OECD, 2017; Beck et al., 2008), which should theoretically lessen the effect of the lending channel on real economy.

Keller and Richardson (2003) describe challenges post-soviet-union countries face in managing their monetary policies: limited monetary policy instruments (mainly foreign exchange intervention, very limited OMO, and repos, reverse repos, credit auctions), thin financial systems, low confidence in the baking system, and very high dollarization. Since then, financial markets have developed to some extent. Armenia and Georgia switched to inflation targeting in 2006 and 2009 respectively. The central bank of Azerbaijan is still preparing the economy for inflation targeting regime,

[11] One can refer to literature analysis above.

although actively framing its expectations on inflations in its official statements regarding the policy directions for the medium term. The policymakers in all three countries focus on de-dollarization of the economy, which involves stabilization of the exchange rates and other institutional measures. Figure 1 shows the dollarization from 2001 through 2017.

Both methodologies of measuring dollarization suggest a quite similar pattern in all three countries. The initial value of dollarization measured using deposit values is surprisingly close around 82% that is followed by mainly downward shifts (with significant upward shifts since the 2007-8 financial crisis). Despite de-dollarization activities introduced in monetary policy, it is a gradual process, which depends on regaining the trust in a local currency, reaching stable inflation and reduction of exchange rate volatility (Naceur et al., 2015). Detail discussion of these policies would be beyond the scope of the thesis, thus we consider the implications of dollarization here only in the context of the monetary policy transmission mechanism. As mentioned in the previous chapter, dollarization adversely affects monetary policy transmission in general. Agents in the economy where foreign currency dominates may be less affected by changes in local interest rates impairing all transmission channels. As such, one would expect the negative effects of high dollarization on monetary transmission.

In terms of loan maturity structure, banking sectors are dominated by long term loans. Almost 80% of outstanding loans in the economy is classified as long term in Azerbaijan in 2019 and percentage is even higher for Georgia for the same year. Long maturity contracts may slow down any transmission mechanisms of monetary policy.

State ownership was a quite pronounced feature of banking markets in studied countries. Nonetheless, it declined rapidly over the years. All active banks in Armenia and Georgia are private, and there is one state-owned bank remaining in Azerbaijan. It is worth mentioning that the share of state-owned bank in Azerbaijan is quite high amounting to 45% of total banking sector assets (Jamilov, 2013). Although, as per central banks statistical publications, its share in total loans to economy after increasing slightly from 33.5% in 2011 to 35% in 2016 declined to 16.4% in 2019.

Figure 1: Dollarization from 2001 through 2017

Source: Central banks of respective countries and own calculation**.**
Note: Figure displays dollarization for Georgia, Armenia, and Azerbaijan respectively. The Solid line represents the dollarization estimated by loan structure and dashed line represents its deposit counterpart.

Literature is quite scarce on the lending channel for Georgia, Armenia, and Azerbaijan. To study the matter, few other papers are using different methodologies (VAR analysis, for example) and/or focus on earlier periods. Jamilov (2013) using bank level data studies the lending channel for Azerbaijan and finds that the bank lending channel exists and that small, less capitalized banks with low liquidity are most affected. Samkharadze (2008) using VAR analysis examine if credit has some significance in explaining shocks to GDP and inflation. Author finds that overall credit does not affect macro variables. Only after decomposing it into domestic and foreign currency credits they find small evidence with domestic currency denominated credits. Author also highlights that insignificant responses of prices and GDP to loans may be due to inability of economic agents to resort to external finance at all. Dabla-Norris and Floerkemeier (2006) using VAR suggest that bank loans are significant source of shock in prices, but do not seem to affect output. Similar to Samkharadze (2008), authors suggest small share of credit to economy in total banks' assets as one of the reasons. Authors also note access reserves, substantial remittances and large shadow economy as additional impeding factors.

3 Data and Descriptive Statistics

Literature established that aggregate data provides debatable evidence to support the existence and strength of the lending channel due to the limited ability to distinguish loan demand and loan supply shocks. Here, similar to many empirical studies (Fungáčová et al., 2014; Leroy, 2014; Khan et al., 2016; Yang et al., 2016), we employ yearly bank-level data for analysis provided by Bank Focus. Unlike for the USA or Euro area, gathering the data from one source is challenging. As such, two sources are combined - Bank Focus that provides data for 2013-2017 for most of the banks and individual financial statements for 2011 and 2012, obtained from either central banks' official web page or respective banks' web pages. Due to the methodology used in the thesis, the data does not include banks with less than five years of consecutive observations. Also, the data excludes financial organizations without deposits on their liability side. Certain variables are not available directly from balance sheets or financial statements. Thus it requires separate calculation following Bank Focus methodology to ensure comparability. Timeframe and lack of sources are not the only limitations. Ehrmann et al. (2001), among others, suggest that data, obtained from Bank Focus, is biased towards larger banks. Although, after comparing two sources - Bank Focus and Eurosystem dataset, Ehrmann et al. (2001) find different outcomes on the bank level, but overall similar results on the macro level. This limitation might not be relevant in the case of Georgia, Armenia, and Azerbaijan. Considering that the number of banks operating in the studied countries is quite small compared to other larger countries.

Furthermore, because of the high concentration, small banks have insignificant market shares making their contribution to monetary policy transmission somewhat limited (nonetheless, small banks with insignificant market shares that have data on official web pages are also included). **Table 1** describes the number of banks and observations available for respective countries after excluding the non-deposit receiving banks and banks with less than five years of consecutive data. The second limitation of Bank Focus is the annual nature of the data, which might not capture the fluctuations of lending in response to monetary policy shocks. This point is, however,

considered by Gambacorta (2005), who finds that annual frequency does not limit capturing the different responses of banks to monetary policy shocks. Besides, higher frequency data of 2011-12 would not be available for banks with data manually gathered from bank financial statements.

Table 1: Number of observations and banks in respective countries

Country	Number of observations	Number of banks	Number of banks in economy
Armenia	98	14	17
Azerbaijan	161	23	30[12]
Georgia	84	12	16[13]

Note: Data source for the total number of banks is respective central bank web pages.

After gathering the data from both sources, we define three main bank characteristics: size measured simply by the log of total assets, capitalization measured by equity over total assets and liquidity measured by liquid assets over total assets. All three characteristics are normalized before entering in estimations[14]. For macro variables - GDP, inflation and variables for dollarization calculations, we resort to official webpages of national bank of respective countries and World Bank databases. Finally, to proxy the monetary policy stance, we employ the refinancing rate in all three countries. Hence overall data includes bank-level (loan growth, total assets, liquid assets, *etc*.) as well as macro-economic variables to account for business cycles in the economy. **Table 2** provides a full description of the variables, sources, and expected relationship.

The small dataset makes calculation and estimation process more challenging, although methodologies described below can be still applied. Even though the data is small, by construction it is strongly balanced, which enables usage of estimation methodologies without concerns of missing observations and gaps. **Table 3** provides

[12] From 43 active banks as of 2016 remained only 30 as of 2018 and almost half of it with foreign capital. Source: Central bank of Azerbaijan (CBA) and FIMSA.

[13] 14 of which is with foreign capital participation to some extent. From 2018 International Bank of Azerbaijan became non-bank organization. Thus currently there is 15 commercial banks operating in the market.

[14] Normalization methodology and reasons are further discussed in methodology and results part of the thesis.

pairwise correlation and summary statistics of all variables in estimation except competition measure, which is discussed in the separate chapter below after a discussion of the methodology for Lerner index calculation. Similarly to Khan et al. (2016) we employ correlation matrix describe an initial picture of the relationship between variables, even though this is far from describing the true relationship (noted by Khan et al. (2016) as well) between variables. There are quite high correlations between some variables and mostly with direction found in the literature. The correlation between loan growth and the policy rate is highly significant and negative (-0.27). Furthermore, almost all variables are significantly correlated with loan growth except log of deposits, capitalization, and the size. The correlation between dollarization and inflation and GDP growth seems to have expected signs apart from being highly significant.

Table 2. Variables used in the model, descriptions and sources

Variable	*Description*	*Relationship*	*Source*
Loan Growth	Annual percentage change in banks gross loans.	Negative/Positive	Bank Scope
Monetary Policy	Refinancing rates for respective countries.	Negative	Respective Countries' Central Banks
CR5	Share of five largest banks assets in total assets.	Negative/Positive	World Bank
HHI	Sum of squared shares across all banks in the market.	Negative/Positive	Own Calculations
Learner Index	The ratio of the mark-up to price measures monopolistic behavior.	Negative/Positive	Own Calculations
Size	Log of total assets.	Negative/Positive	Bank Scope
Liquidity	Liquid assets over total assets	Negative/Positive	Bank Scope
Capitalization	Equity over total assets	Negative/Positive	Bank Scope
GDP	Real GDP growth	Positive	World Bank
Inflation	CPI-based Inflation	Negative/Positive	World Bank
Dollarization	Deposits/Loans in foreign currency over total Deposits/Loans	Negative/Positive	Respective Central Bank pages, Own Calculation

A high correlation between the dollarization and the other macro variables might be a significant factor in estimation procedures where these variables enter at the same time.

Finally, **Table 4** reports the descriptive statistics of the major variables.

Table 3: Pairwise correlation

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) Loan Gr.	1.000									
(2) LagLiq	-0.091	1.000								
(3) lagCap	0.062	0.028	1.000							
(4) LagSize	-0.081	-0.095	-0.482*	1.000						
(5)LogDepo	0.061	-0.195*	-0.525*	0.900*	1.000					
(6) Inflation	-0.334*	0.276*	-0.160*	-0.023	-0.080	1.000				
(7) LagInfl	0.006	0.212*	-0.098	-0.048	-0.071	0.393*	1.000			
(8) PR	-0.270*	0.155*	-0.099	0.003	-0.040	0.569*	0.019	1.000		
(9)GDP Gr.	0.328*	-0.208*	0.117	0.007	0.026	-0.578*	-0.245*	-0.570*	1.000	
(10)Dollar	-0.516*	0.158*	-0.126	-0.029	-0.026	0.558*	0.282*	0.534*	-0.579*	1.000

* shows significance at the .01 level

Table 4: Summary statistics by country

Georgia	mean	sd	min	max
Loan Gr.	0.103	0.271	-0.897	0.897
Size	12.718	1.352	10.025	15.423
Capitalization	0.207	0.104	0.079	0.575
Liquidity	0.163	0.080	0.049	0.469
Inflation	3.190	3.166	-0.944	8.543
PR	-0.036	1.860	-1.500	4.000
GDP Gr.	0.041	0.012	0.028	0.062
LogDepo.	12.281	1.517	8.694	15.213
Dollarization	0.643	0.044	0.598	0.714
N	84			
Armenia				
Loan Gr.	0.105	0.255	-1.259	1.238
Size	12.770	0.676	11.316	14.212
Capitalization	0.181	0.067	0.067	0.460
Liquidity	0.251	0.107	0.039	0.612
Inflation	3.183	2.776	-1.404	7.650
PR	-0.320	1.029	-2.500	0.750
GDP Gr.	0.041	0.024	0.002	0.072
LogDepo	12.410	0.758	10.433	13.875
Dollarization	0.623	0.017	0.599	0.641
N	98			
Azerbaijan				
Loan Gr.	0.003	0.390	-1.226	1.255
Size	12.801	1.065	10.724	16.277
Capitalization	0.184	0.125	0.000	0.661
Liquidity	0.280	0.200	0.008	0.875
Inflation	5.890	4.689	-1.404	12.905
PR	1.429	4.351	-1.250	12.000
GDP Gr.	0.013	0.026	-0.031	0.056
LogDepo	12.472	1.153	9.805	15.941
Dollarization	0.628	0.118	0.495	0.793
N	161			

Source: Authors' calculation
Note: Summary Statistics of the main variables.

4 Methodology and Findings

As mentioned above, early empirical papers, using aggregate data, faced the issue - of distinguishing between supply and demand effects on loan supply. Due to this limitation, empirical findings were debatable regarding the existence or strength of the lending channel. As a result, later empirical studies employ bank-level data in research, efficiently providing more reliable evidence that banks, in response to monetary contraction, reduce the supply of loans to varying extents depending on bank-specific characteristics.

To study the effect of banking market structure on the lending channel, two separate estimations are required. First, we describe the market structure, and the second we proceed with lending channel analysis.

4.1 Measures of concentration and Lerner Index

4.1.1 Concentration measures HHI and CR5

According to the earlier discussion, we employ two structural (CR_k and HHI) and one non-structural measure (Lerner Index) to describe the market structure. Structural measure or k (common choices being 3 and 5) largest bank concentration measure appears in empirical papers quite often due to its simplicity (Bikker & Haaf, 2002).

$$CR_k = \sum_{i=1}^{k} S_i$$

Where S_i is market share of bank *i*.

Putting equal emphasize to all k banks, it sums the market shares of these bunks. In this setting, the smaller bank shares are not included. In this sense, second concentration measure the Herfindahl-Hirschman Index (HHI) sums squares of market shares across all banks.

$$HHI = \sum_{i=1}^{n} S_i^2$$

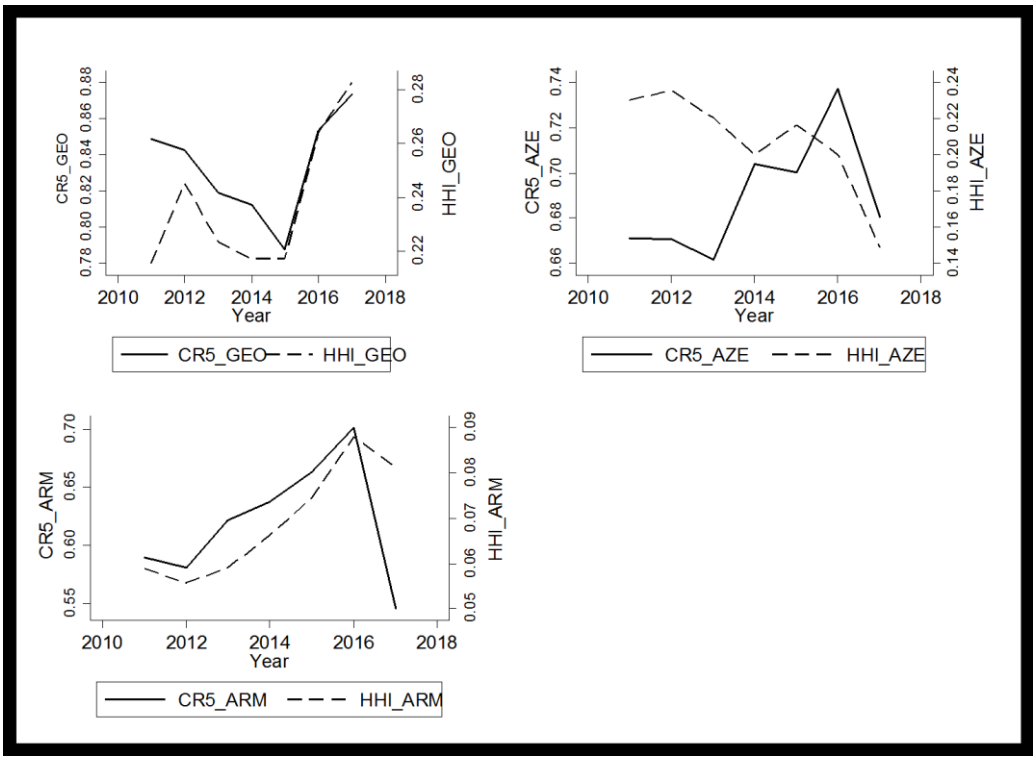
Where S_i^2 is square of market share of bank i.

The index emphasizes the importance of larger banks by assigning them greater weight. It assumes values from 0 to 10000. The index, as well as its moments (like variance), is quite sensitive to the number of banks in the market. The further drawback worth mentioning might be that various combination of banks number and their shares might lead to the same index value (Bikker &Haaf, 2002).

For CR5 we calculate only 2017 year estimate as estimates up to 2016 is available from World Bank. HHI index is based on Bank Focus data as such, it may not reflect the whole market. Bank Focus covers Georgian and Armenian markets adequately, but data covers around 80% of banks from Azerbaijan baking market (**Table 1**). We take total assets in the banking market used in the calculation of banks' market shares from respective central bank pages. **Figure 2** below describes the relationship between concentration measures.

As per the **Figure 2** in Georgia and Armenia, both concentration measures follow each other quite closely that may suggest that changes in market shares affecting overall concentration measures value are mainly due to changes in shares of bigger banks. In the case of Azerbaijan, measures suggest otherwise at the beginning but resume to suggest the same relationship from around 2015.

Figure 2 Concentration measures both CR5 and HHI:



Note: Figure shows relationship of concentration measures in three countries: Georgia, Azerbaijan and Armenia respectively. Solid line represents the CR5 and dashed line is its HHI counterpart.

4.1.2 Lerner Index

Both concentration ratios are quite simple in terms of calculation, but not always good measures of competitiveness or banks monopolistic behavior as discussed above in literature analysis. As such, many of the empirical papers (among many see Olivero et al., 2011, Berger et al., 2009, Fungáčová et al.,2014) focus on bank-level competition measure such as the Lerner Index.

$$Lerner_{i,t} = \frac{(Price_{i,t} - MC_{i,t})}{Price_{i,t}}$$

Where $MC_{i,t}$ - Marginal cost for bank i at time t.

$Price_{i,t}$ - Price of the total assets calculated as the ratio of the total revenue over total assets.

Lerner index assumes values from 0 (perfect competition) to 1 (monopoly). It is simply mark-up divided by price and larger the deviation from marginal cost ($MC_{i,t}$) the greater the monopolistic power of the bank. In the sense, learner index describes banks' conduct in the market. The value of MC is not available directly from the financial statements. As such, we proceed with estimation of Total Cost (TC) function using translog cost function. TC can be defined as a function of one output[15] (total assets, similarly to Berger et al., 2009) and three input prices (the price of labor, the price of physical capital and price of borrowed funds) (Fungáčová et al., 2014):

$$\ln TC = \alpha_0 + \alpha_1 lny + \frac{1}{2}\alpha_2 (lny)^2 + \sum_{j=1}^{3} \beta_j lnw_j + \sum_{j=1}^{3}\sum_{k=1}^{3} \beta_{jk} lnw_j * lnw_k + \sum_{j=1}^{3} \gamma_j \, lny \, lnw_j + \varepsilon$$ [16]

Where TC is the total cost, y is total output measured by total assets and w_j denotes prices of three inputs calculated as per below:

w_1- Price of borrowed funds-Interest paid over customer deposits and short-term funding.

w_2- Price of physical capital- non-interest expenses over total assets (following Berger et al., 2009; Beck et al., 2013)[17]

w_3- Price of labor proxied by personnel expenses over total assets

After the estimation of the total cost function, marginal cost is merely derivative of it with respect to total assets.

$$MC = \frac{TC}{Y}(\alpha_1 + \alpha_2 lny + \sum_{j=1}^{3} \gamma_j \, lnw_j)$$

The methodology for estimating the translog cost function ranges from simple pooled OLS to more advanced Stochastic Frontier approaches.[18] The cost function is

[15] Other studies with more than one output

[16] Fungáčová *et al*. (2014)

[17]The cost of physical capital in some cases proxied by non-interest expense over fixed assets. See Fernandez de Guevara *et al.* (2005), Fungáčová et al. (2014).

[18] For Frontier approaches one can refer to Kumbhakar SC. et al.2012

generally estimated on the country level to account for technological differences between countries (Berger et al., 2009; Ariss, 2010; Leroy, 2014; Kasman & Kasman, 2015). Although in some cases due to small number of data it is not possible to concentrate on one country, thus data is pooled to get the needed estimates (Fungáčová et al., 2014) OLS implicitly assumes that all banks are efficient, which might not be the case, but it is quite simple in terms of calculations (Koetter et al., 2012). The Frontier approach is more challenging but provides better results in most cases. The literature varies in terms of estimator depending on the focus of the study.

Cost function needs to satisfy symmetry and linear homogeneity:

$$\sum_{j=1}^{3} \beta_j = 1$$

$$\sum_{j=1}^{3} \beta_{jk} = 0$$

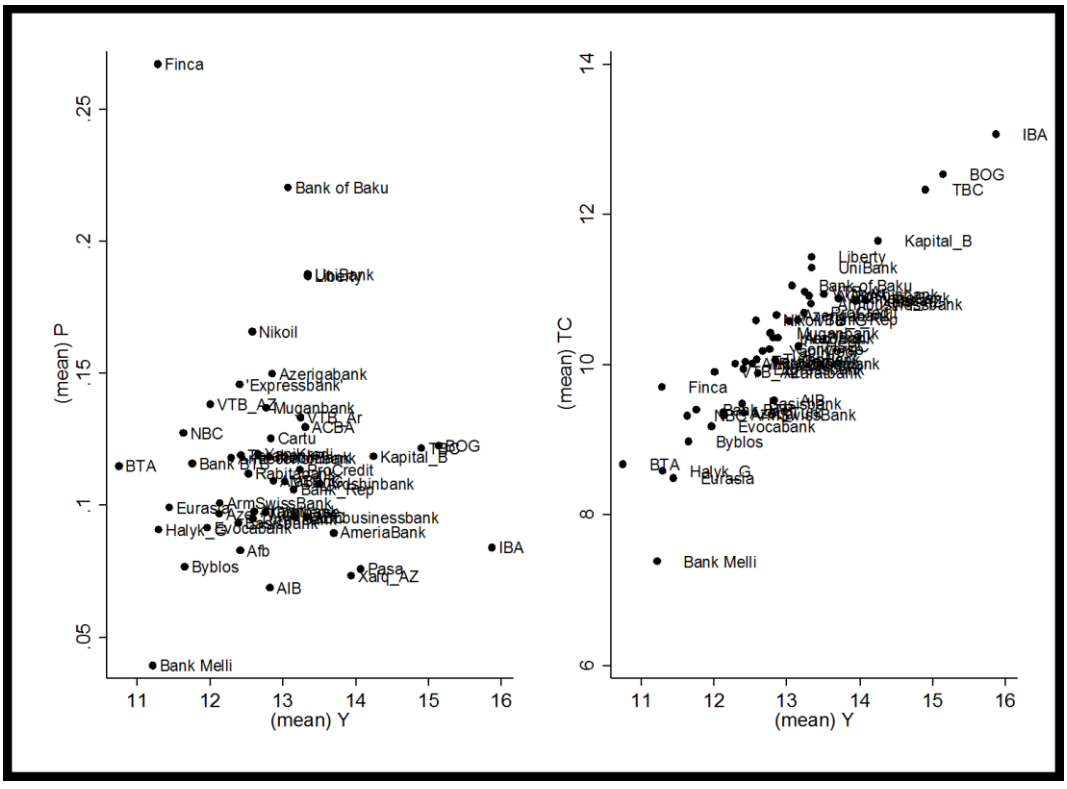
$$\sum_{j=1}^{3} \gamma_j = 0$$

These restrictions can be imposed by normalizing cots variables with one of the input prices (Kumbhakar SC. et al., 2012). After estimation of the total cost function, the marginal cost, we will be the derivative of normalized total cost function.

Scatterplots under Figure 3 compares banks according to price and total cost. The left-hand side graph shows banks according to mean log assets (Y) and mean Price (total revenue/total assets) combination, whereas right-hand side the combination of mean log assets (Y) and total costs (TC). Even though graphs do not allow asses this relationship across years, we can still draw some conclusions. Banks appear to be in quite close mean price range, but this does not mean that we should expect less variable market power as it depends on marginal cost. Nonetheless, some banks appear to have high price low asset combination, which might suggest that either their costs are significantly high and/or they lend to riskier borrowers. These banks might hinder the estimates of market power as risk is not considered in estimations (Coccoresse, 2014).

As for total cost and output relationship, it displays the expected picture. The higher output corresponds to higher total costs.

Figure 3: Scatterplot with price and total assets.



Note: First figure reports relationship between mean price (Y) and mean total assets (X). Second, mean total cost (Y) and mean total assets (X).

Figure 3 suggests that there might be some outliers in the data and even though dropping some of the banks will reduce the sample even more, it is necessary to ensure that the Lerner index estimates were close to real values. Initially, two banks were dropped due to missing data. After the calculation of prices, two banks were dropped that fall under 1 percentile and over 99 percentile of cost of funds.[19] **Table 5** reports the summary statistics of calculated Lerner index by country calculated by simple OLS (with the country and year dummies for control for these effects) and True Random Affects model for stochastic frontier estimation, with half-normal distribution.

[19] We do not include BTA Silk Road Bank due to almost zero share of loans and quite high costs.

Table 5: Mean Lerner Indexes from different methodologies by country

	Georgia			Armenia			Azerbaijan		
Variables	Obs	Mean	Std.Dev.	Obs	Mean	Std.Dev.	Obs	Mean	Std.Dev.
Lerner_LS	63	.272	.124	91	.201	.134	154	.237	.211
Lerner_SF	63	.271	.126	91	.195	.137	154	.235	.214

Note: Calculations are done using BankScope. Lerner_LS stands for least square estimates of Lerner index, and Lerner_SF stands for stochastic frontier estimates.

The estimates in terms of the mean and median are consistent with the study by Coccorese (2014) for Armenia and Azerbaijan. 20 As for standard deviations estimate is similar for Armenia but differs somewhat for Azerbaijan (estimate here is higher). Ariss (2010) finds significantly higher mean values, although as study period is the early 2000s, it would be difficult to compare.

Table 6 reports pairwise correlation measure for concentration and competition. As expected correlation between concentration measures is high and highly significant. Correlation between Lerner index and concentration measures is positive although not significant.

Table 6: Correlation Matrix of Concentration measure and Competition

Variables	(1)	(2)	(3)
(1) CR5	1.000		
(2) HHI	0.700*	1.000	
(3) Lerner_LS	0.102	0.139	1.000

* shows significance at the .01 level

[20] Georgia was not included in estimations.

4.2 Bank-lending Channel

4.2.1 Methodology

Considering the data limitations, discussed earlier, an empirical part similar to other studies focuses on showing that there is a cross-sectional difference in banks response to monetary policy changes. We follow to Ehrmann et al. (2001) to estimate the posed hypothesis. Ehrmann et al. (2001) derive a simple version of the model suggested by Bernanke and Blinder (1988), where authors impose the restriction that money (M) equals deposits (D) and both are a function of policy interest rate:

$$M = D = -\psi i + \chi$$

χ - represents here all other factors affecting the deposit demand other than policy rate (Fungáčová et al., 2014).

Market clearing loan demand and supply equations take the following form:

$$L_i^d = \phi_1 y + \phi_2 p - \phi_3 i_l$$

$$L_i^s = \mu_i D_1 + \phi_4 i_l - \phi_5 i$$

Where L_i^d stands for loan demand and L_i^s loan supply

y- real GDP

p- price level

i_l-the interest rate on loans

D_1-bank deposits

Model implicitly assumes varying degree of dependence of the banks on deposits linking it to bank-specific characteristics described with the equation: $\mu_1 = \mu_0 - \mu_1 x_1$. Underlying assumption of the model is that banks (regardless the bank characteristics) face identical loan demand to neutralize demand driven effects, which implies that customers of small and big banks react similarly to monetary policy. The assumption is reasonable, considering that the most customers have no short-term alternatives to bank loans, which is true for bank-based financial systems like in euro area (Ehrmann

et al., 2001; Fungáčová et al., 2014).[21] In the above specifications it, would suggest the same ϕ_3 across all banks. The underlying assumption is imperative for estimation validity as without this assumption identification of lending channel becomes impossible in suggested bank level data setting. The assumption might be relaxed if loan level data was available for the estimation Fungáčová et al. (2014).[22]

Clearing the market with the assistance of the above specifications Ehrmann et al. (2001) suggest below simplified and reduced model

$$L_i = ay + bp - c_0 i + c_1 i x_i + d x_i + const$$

Loans of bank i depend on GDP (y) price level (p) monetary policy indicator (i) and bank characteristics (x_i).

An empirical model based on above includes interaction terms of GDP and prices with bank-specific characteristics to allow symmetric responses of Bank Lending to macroeconomic variables.

The final empirical model is dynamic, which implies lagged variables and the first differences:

$$\begin{aligned}\Delta Log(L_{it}) = \; & a_i + \sum_{j}^{l} b_j \Delta \log(L_{it-j}) + \sum_{j=0}^{l} c_j \Delta r_{t-j} + \sum_{j=0}^{l} d_j \Delta \log(GDP_{t-j}) \\ & + \sum_{j=0}^{l} e_j infl_{t-j} + f x_{it-1} + \sum_{j=0}^{l} g_{1j} x_{it-1} \Delta r_{t-j} \\ & + \sum_{j=0}^{l} g_{2j}\, x_{it-1} \Delta \log(GDP_{t-j}) + \sum_{j=0}^{l} g_{3j} x_{it-1} infl_{t-j} + \varepsilon_{it}\end{aligned}$$

Where $i = 1, \dots, N$ denotes the N number of banks, $T = 1, \dots, T$ denotes the T number of years (or some other time variable depending on the data) and l that denotes

22 As discussed above in country overview, countries considered here have bank-based financial system as well.

[22] One can refer to Jimenez et al., (2012) for such an analysis.

the number of lags. Dynamic nature of the model is necessary to reflect the changes in the amount of newly issued loans. Variable L_{it} expresses stock of outstanding loans for a given bank, whereas the flow of the loans that is ultimately reduced in case of contractionary monetary policy can be approximated by first differences. Significant coefficients in front of interaction terms of bank characteristics and monetary policy is a common method to conclude that lending channel exists. Ehrmann et al. (2001) normalize bank characteristics according to the below method: [23]

$$Size_{it} = LogA_{it} - \frac{1}{N_t}\sum_i log\, A_{it},$$

$$Liquidity_{it} = \frac{L_{it}}{A_{it}} - \frac{1}{T}\sum_t(\frac{1}{N_t}\sum_i \frac{L_{it}}{A_{it}}),$$

$$Capitalization_{it} = \frac{C}{A_{it}} - \frac{1}{T}\sum_t(\frac{1}{N_t}\sum_i \frac{C_{it}}{A_{it}}).$$

The size is measured by the log of total assets and is normalized with respect to the mean over the whole sample period as well as with respect to every single period to remove the upward trend. The liquidity is defined by the share of liquid assets in total assets and is normalized with respect to its sample mean. The same method applies to the capitalization approximated by the ratio of the capital over total assets. Normalization is needed to ensure that the average interaction term is zero, and coefficients reflect the average monetary policy effect on loan supply.

In terms of the estimator, the literature varies between the simple methodologies like fixed effects and a dynamic GMM estimators. Simple fixed effects estimator might not be the best choice in cases where lagged dependent variable and not strictly exogenous[24] explanatory variables also enter in the model. Difference and system GMM estimators (Arellano and Bond, 1991; Arellano and Bover, 1995; Blundell and Bond, 1998) address the potential endogeneity, heteroscedasticity, and autocorrelation (within individuals, but not across them) issues in the model and is designed for panels with short period and many individuals. Usually, good instruments (correlated with

[23] Similar to Ehrmann Fungáčová et al. (2014) and Gambacorta (2005).

[24] Example of not strictly exogenous variables may be predetermined variables. Current error terms are uncorrelated with current regressors, but may influence future ones (Roodman, 2009). In other words variable that is correlated with past error term.

endogenous variables but not correlated with error terms) for endogenous variables is hard to obtain in practice. Difference GMM (transforms initial data by first differencing or uses forward orthogonal deviations)[25] and system GMM (uses both transformed and untransformed data) estimators employ lags of instrumented variables. Roodman (2009) covers both estimators along with Stata command Xtabond2 for practical implementation. Even though difference GMM performs quite well with balanced panels, system GMM is preferred in literature, considering that past levels of the variables may not be good instruments for future changes if the dependent variable is persistent. The approach has few drawbacks worth mentioning. It is quite sensitive to specifications and suffers from instrument proliferation problem (problem of too many instruments). Following the literature, we report the Hansen test for instrument validity check. Roodman (2009) suggest additional method for checking the model specification validity by assuming simple OLS and fixed effect (FE) estimators. As OLS (in similar cases) is thought to be upward biased and FE estimator is downward biased, the true estimate of lagged dependent variable should lie between these two estimates or not too far from it (Bond, 2002). As such, OLS and FE estimates can be thought as upper and lower bounds for consistent parameters.[26]

4.2.2 Findings

The initial model described earlier may vary depending on the region considered and data availability. The estimated model closely follows Ehrmann et al. (2001), although it does not include interaction terms of bank-level variables with GDP growth and inflation (similarly to Fungáčová et al., 2014 and Gambacorta, 2005). The main estimation includes normalized bank-specific variables, but for robustness check, we

[25] Instead of first differencing , it subtracts average of all available future observations of the variable :

$$w_{i,t+1}^{\perp} \equiv c_{it}(w_{it}) - \frac{1}{T_{it}} \sum_{s>t} w_{is}$$

The transformation reduces the data loss significantly (Roodman, 2009).

[26] Apart from Roodman, who technically describes this feature, one can refer to Bond (2002) for further explanation and guidance on this matter

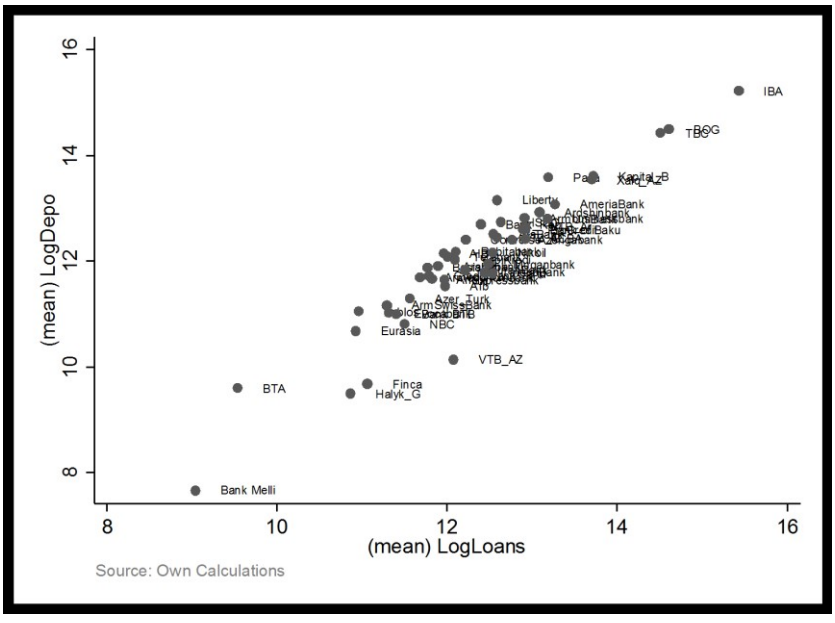
consider initial variables as well. Also, due to the scarcity of banks and hence observations as a whole, estimations are based on pooled data for all three countries.[27]

To better visualize the data, **Figure 4** displays mean lending (X) against mean term deposits (Y) for each bank in the sample. Despite a small number of banks, there seems to be significant variation in lending. Moreover, one might conclude that banks' main funding source comes from term deposits and that some of the banks are dominating the lending market. Using variables in logarithms enables the comparison between banks in different countries. One may spot banks that dominate the loan market. For example, three banks in the upper right corner with the highest loan-deposit combination banks (IBA, TBC, BOG) are the ones that have quite a significant share of the loan market in their respective countries. The banks in the lower-left corner have the lowest loan-deposit combination (Bank Melli, BTA) have smallest shares in market consequently. Banks from Armenia looks near to each other in terms of the loan origination, which suggests that the banking market is more homogenous in this sense. Although, due to collapsing the data in mean, extreme values for different years are undetectable in this setting. Thus single year outlier may have large influence on mean values.

We begin estimation with concentration measures. As discussed above, due to missing information and extreme values, some of the banks were dropped in the Lerner index calculation. As such, the lending channel existence is tested on a reduced sample in case of competition measure and we report it separately.

[27] Due to short number of banks methodologies applied by Kashyap and Stein (1995) and Kishan and Opiela (2000, 2006), which is deviding the sample by size, liquidity and capitalization is not feasible.

Figure 4: Logarithm of deposits and logarithm of loans



Note: Scatterplot reports the relationship between logarithm of deposits (Y) and logarithm of loans (X)

Table 7 reports the results from pooled OLS and FE regression with different concentration measures. Country and year dummies are also included in regression but not reported here.[28] First estimation results do not seem to support lending channel existence, as banks key characteristics with interaction to monetary policy are not significant at any conventional significance levels. Only the size, when entered separately, appears to be significant and negative at 1% level. The policy rate has expected negative sign, implying that contractionary monetary policy negatively affects banks' loan growth. Unlike bank-specific variables concentration measures appear to be significant and positive on all regressions only when it enters with monetary policy measure, suggesting that banks in concentrated markets are less affected by adverse monetary policy shock. As discussed in literature analysis the reason could be better access to finance and/or decrease in costs relevant for asymmetric information. First helps to mitigate the adverse shocks of monetary policy to banks funding, and second allows for economic agents move to other lenders with less costs. Macro variables such as GDP and Inflation are both significant with

[28] Appendix C reports full regression output.

expected signs. One can observe quite a similar picture in results with both concentration measures.

Above methodologies are simplistic and suffer from drawbacks. Due to dynamic nature of the model bias that is caused by correlation of lagged dependent variable with fixed effects in the error term makes OLS and the model with within transformation inconsistent estimators (Roodman, 2009). This bias would not be much issue if the considered timeframe were longer, which is not the case here. As mentioned above, endogeneity caused by lagged dependent variable in the model, biases the OLS estimate upward and FE downward, thus true estimate should be expected somewhere in between or not too far from it (Roodman, 2009; Bond, 2002).

Table 7: Pooled OLS with country and year dummies

VARIABLES	(1) OLS with CR5	(2) OLS with HHI	(3) FE with CR5	(4) FE with HHI
L.Loan GR.	**0.165****	**0.164****	-0.0696	-0.0717
	(0.0708)	(0.0707)	(0.0828)	(0.0833)
Policy Rate (PR)	**-0.690*****	**-0.214*****	**-0.682*****	**-0.193*****
	(0.202)	(0.0563)	(0.178)	(0.0502)
Concentration	0.0127	5.77e-05	0.0125*	0.000161
	(0.00774)	(0.000117)	(0.00677)	(0.000105)
PR*Concentration	**0.00952*****	**0.000117*****	**0.00934*****	**0.000104*****
	(0.00268)	(2.81e-05)	(0.00237)	(2.50e-05)
GDP Gr	**3.269****	**3.619****	**3.929*****	**3.416****
	(1.613)	(1.717)	(1.433)	(1.531)
LogDepo	**0.175*****	**0.172*****	**0.339*****	**0.339*****
	(0.0312)	(0.0313)	(0.0585)	(0.0589)
L.Inflation	**0.0250****	**0.0296*****	**0.0126**	**0.0194****
	(0.0101)	(0.0106)	(0.00920)	(0.00951)
Inflation	**-0.0208***	-0.0177	**-0.0207****	**-0.0184***
	(0.0112)	(0.0109)	(0.0103)	(0.0101)
L.Capitalization (N)	0.199	0.202	0.473	0.462
	(0.203)	(0.203)	(0.316)	(0.319)
L.Liquidity (N)	0.134	0.119	**0.423****	**0.414****
	(0.132)	(0.132)	(0.199)	(0.202)
L.Size (N)	**-0.519*****	**-0.507*****	**-1.277*****	**-1.275*****
	(0.0918)	(0.0924)	(0.193)	(0.200)
PR* L.Capitalization	0.0147	0.0127	-0.00226	-0.00161
	(0.0417)	(0.0417)	(0.0385)	(0.0387)
PR*L.Liquidity	-0.00221	-0.00128	-0.00241	-0.00346
	(0.0236)	(0.0235)	(0.0220)	(0.0220)
PR* L.Size	0.0152	0.0150	0.00977	0.00969
	(0.0117)	(0.0117)	(0.0108)	(0.0109)
Constant	**-2.813*****	**-2.104*****	**-4.820*****	**-4.246*****
	(0.645)	(0.395)	(0.863)	(0.730)
Observations	245	245	245	245
R-squared	0.473	0.472	0.597	0.593
Country Dummies	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes
Number of Bank Name			49	49

Note: Table reports pooled OLS and FE with all variables with different concentration measures. Dependent variable loan growth. (1), (3) Includes CR5 concentration index, and (2), (4) reports results from regression with HHI. Bank specific variables and concentration measures enter in estimation with interaction with the policy rate. Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Consequently, similar to many studies (See for example Ehrmann et al., 2001; Gambacorta, 2005; Khan et al., 2016)[29], we employ GMM methodology to obtain consistent estimates though Xtabond2 command designed by Roodman (2009). The syntax is quite complex, but it allows several features that are rather useful for better analysis. The command allows two types of instruments GMM (for endogenous and predetermined variables) and IV (for strictly exogenous variables) style instruments. The decision on including further lags or limit the quantity to some extent depends on the number of cross sectional units and time intervals considered in the research.

On the one hand, limiting the lags we may lose some explanatory power/information in the estimation and on the other hand, controlling the instrument proliferation issue. Although forgoing deeper lags might not be an issue as instrumenting power of immediate lag should be much greater than for example lag four, unless there is some specific economic reasoning behind it.[30] Even though this methodology is designed for panels with a short period and many individuals and performs better than most estimator (OLS, FE, 2SLS), two points need a closer look. First would be the small sample size that may lead to unstable GMM output, and the second is the instrument count to avoid proliferation issue.

Roodman (2009) discusses instrument proliferation issue and its implications. As per the paper, too many instruments can overfit the endogenous variables and result in inaccurate inferences even after the usual checks with Hansen p value for instrument validity. Rejecting the null hypothesis (P value more than 0.05) suggests that specified instruments are good for estimation, but as noted by Roodman (2009) too many instruments may inflate Hansen J statistics so that p value reaches extreme values for example 1 or close to it, which is in reality sign of a problem rather than good instruments. As such, one must consider limiting the number of instruments.

We start estimation with maximum instrument count that rule of thumbs allows, which is a number of individuals/groups in the panel data (Roodman, 2009). **Table 8**

[29] Although differ in specifications

[30] Further options specified in estimation include-*two-step* for two-step GMM, *orthogonal*, *robust* which triggers the Windmeijers' finite-sample correction for the two-step covariance matrix and *small* to report t statistics instead of z.

summarizes the results from the two-step system GMM with CR5 and HHI concentration measures, respectively. Model is the same as estimated via OLS and FE estimators to check if the lagged dependent variable is in the acceptable bounds. Coefficient estimates from GMM (0.111 and 0.128) are considerably below OLS estimates (0.165 and 0.164) and above FE estimates (-0.0696 and -0.0717) although unexpectedly insignificant, suggesting that lagged loan growth has no explanatory power for current loan growth.

As per **Table 8** interaction term of monetary policy and bank-specific characteristics are insignificant, thus not supporting the lending channel existence (at least usual characteristics do not seem to cause different responses of banks to monetary policy shocks (Erhmann et al., 2001). Nevertheless, the policy rate is still significant with expected minus sign implying that adverse monetary policy shock decreases the loan growth, but its' power is less stronger in more concentrated markets as interaction term of policy rate, and both concentration index is significant and positive. Hansen p value is above 0.1 but not close to perfect 1; thus we may conclude that instruments are valid. AR2 process, which generally is for checking if there is no second-order autocorrelation in data (in case of second-order correlation instrumenting in GMM estimation is more complex as second lags are also endogenous and one must consider deeper lags as instruments), is rejected in every estimated model. As such, we proceed without explicitly mentioning it although still reporting in respective tables.

Even though estimation looks valid from the standpoint of usual checks, there are two points worth mentioning- the count of instruments and omitted constant. The problem of "too many instruments" seems to be the most problematic feature of system GMM estimator. As for omitted constant, it might be the result of perfect multicollinearity between dummy variables and the constant as few year dummies seem to be omitted as well31. As dependent variable is the first difference of logarithm of loans and we further include its lag in estimation, dropping additional time dummies seems necessary to avoid dummy variable trap.

[31] For full version of the output please refer to the appendix C.

Table 8: System GMM with country and year dummies

VARIABLES	(1) GMM with CR5	(2) GMM with HHI
L.Loan GR.	0.111	0.128
	(0.195)	(0.175)
Policy Rate (PR)	**-0.699*** **	**-0.231*** **
	(0.215)	(0.0567)
Concentration	0.0108	-6.21e-05
	(0.00678)	(8.87e-05)
PR*Concentration	**0.00969*** **	**0.000125*** **
	(0.00287)	(2.76e-05)
GDP Gr.	**3.129***	**4.362*** **
	(1.610)	(1.505)
LogDepo	0.0929	0.0880
	(0.134)	(0.0857)
Inflation	**-0.0199***	-0.00859
	(0.0104)	(0.00940)
L.Inflation	**0.0273** **	**0.0243** **
	(0.0123)	(0.00972)
L.Capitalization (N)	0.334	0.0549
	(0.324)	(0.326)
L.Liquidity (N)	-0.204	-0.234
	(0.464)	(0.396)
L.Size (N)	-0.236	-0.236
	(0.410)	(0.248)
PR* L.Capitalization	0.0331	0.0390
	(0.0545)	(0.0634)
PR*L.Liquidity	0.0182	0.0185
	(0.0545)	(0.0450)
PR* L.Size	0.0242	0.0183
	(0.0153)	(0.0154)
Constant	0	0
	(0)	(0)
Observations	245	245
Number of Bank Name	49	49
Country Dummies	Yes	Yes
Year Dummies	Yes	Yes
# Instruments	49	49
Hansen P	0.191	0.449
AR2	0.790	0.797

Note: Table reports results from system GMM estimator. Dependent variable loan growth. (1) Includes CR5 concentration index and (2) reports results from regression with HHI. Bank specific variables and concentration measures enter in estimation with interaction with the policy rate. Lag dependent variable, along with bank-specific variables, are considered as GMM-type variables (with lags one to four). IV style instruments here macro variables, concentration measures, and dummies appear only in the *level* equation[32]. Furthermore, *collapse, nodiffsargan, two-step, orthogonal, robust, small*, options are specified. Standard errors in parentheses-*** p<0.01, ** p<0.05, * p<0.1

[32] Decision on exogeneity variables is based on approach in literature. See for example Gambacorta (2005) and Ehrmann et al., (2001)

First we address problem of too many instruments. Collapse and lag limit option are already specified in estimation above, the only way to reduce instrument count would be to introduce shorter limits to the lags considered as instruments and leaving out the insignificant variables from the estimation33.

Simply reducing the lags for instruments yields quite a similar picture in terms of significance and overall conclusions. We report the regression outputs Appendix B (**Table B1**), where with only one lag of GMM style instruments overall instrument reduces to 28.

As briefly mentioned above, specifications of system GMM rests with the idea to develop the estimator that will deal with the correlation between the explanatory variable or variables and the error term (due to time-invariant individual effects), which cannot be solved with within transformation of the data unless T is large enough (Bond, 2002). If we consider that country dummies as part of time-invariant individual effects, then we can drop them when using system GMM methodology as country fixed effects are not our variables of interest. Also, after relevant test of joint significance of logarithm of long-term deposits, capitalization and liquidity, variables do not seem to be significant at any conventional level:

```
(1)  LogDepo = 0
(2) L.Cap_Norm = 0
(3) L.Liq_Norm = 0
(4) c.PR#cL.Cap_Norm = 0
(5) c.PR#cL.Liq_Norm = 0
    F (5,    48) =    0.43
        Prob > F =    0.8282
```

Consequently, in the future analysis, we drop these variables as well, which allows us to reduce the instrument count even more but rely on detecting the lending channel existence on solely bank size characteristics (we leave size as only size characteristics was significant in initial OLS and FE estimations). Although one may remember that the size is most inconsistent in its importance according to the literature analysis above.

Table 9 reports the estimation from the remaining variables with a reduced number of lags. The coefficients on lagged dependent are in acceptable bounds (we do not

[33] Although Xtabond2 allows some of the variables to be left out of the instruments, which would in turn reduce the instrument count, but we include all variables in some form either in GMM style or IV style instruments according the advice by Roodman (2009)

report OLS and FE estimates here, but one may refer to it in enclosed files) and Hansen p-value suggest instrument validity. Furthermore, the value of Hansen p value is not too high as well.

Table 9: System GMM with and without size characteristics

VARIABLES	(1) GMM with CR5	(2) GMM with HHI	(3) GMM with CR5	(4) GMM with HHI
L.Loan Gr.	0.144	0.189	0.126	0.139
	(0.258)	(0.243)	(0.170)	(0.171)
L.Size (N)	0.0161	0.0204		
	(0.0938)	(0.0856)		
PR* L.Size (N)	0.0130	0.0120		
	(0.0167)	(0.0162)		
GDP Gr.	**3.276****	**4.432*****	**3.769*****	**4.996*****
	(1.575)	(1.445)	(1.225)	(1.198)
PR	**-0.670*****	**-0.202*****	**-0.672*****	**-0.190*****
	(0.170)	(0.0469)	(0.146)	(0.0397)
Concentration	0.00322	2.71e-05	0.00174	2.40e-05
	(0.00355)	(3.22e-05)	(0.00266)	(2.59e-05)
PR* Concentration	**0.00924*****	**0.000113*****	**0.00926*****	**0.000107*****
	(0.00221)	(2.19e-05)	(0.00190)	(1.87e-05)
Inflation	-0.0211	-0.0177	-0.0204*	-0.0189*
	(0.0129)	(0.0115)	(0.0104)	(0.0101)
L.Inflation	**0.0286*****	**0.0326*****	**0.0257*****	**0.0299*****
	(0.00999)	(0.0104)	(0.00832)	(0.00919)
Constant	-0.126	-0.0269	-0.140	-0.201***
	(0.236)	(0.0675)	(0.208)	(0.0706)
Observations	245	245	245	245
Number of BankName	49	49	49	49
Country Dummies	NO	NO	NO	NO
Year Dummies	Yes	Yes	Yes	Yes
# Instruments	20	20	14	14
Hansen P	0.111	0.178	0.336	0.336
AR2	0.861	0.898	0.757	0.788

Note: Table reports the output from system GMM only with size characteristics and further without any characteristics. (1) Includes CR5 concentration index (2) reports results from regression with HHI. Bank size and concentration measures enter in estimation with interaction with the policy rate. Lag dependent variable along with bank-specific variable, is considered as GMM-type variables. Two lags of these variables are employed as instruments. IV style instruments appear in Level equation only. Furthermore *collapse, two-step, orthogonal, robust, small* options are specified. Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Overall results do not differ drastically from the results above in **Table 8** with a full set of time and country dummies. The Lag loan growth is still insignificant even at the 10% significance level, but with expected sign. GDP growth is significant and positive at 1% significance level. One percentage point increase in GDP increases loan growth

by about 3.2 percentage points ceteris paribus in the short run. Furthermore, policy rate variable is significant and negative, which suggest that contractionary monetary policy reduces the loan growth by 0.7 percentage points, but it is less negative in more concentrated markets.

Above finding somewhat supports overall credit channel existence - banks reduce the lending in response to adverse monetary policy change. Nevertheless, Olivero et al. (2011) find the negative sign on policy rate to be satisfactory evidence of lending channel after demand (by including GDP and inflation in the model), and supply-side effects are isolated. Although, we cannot take comfort in this evidence as authors also find two bank characteristics (capitalization and liquidity) to be significant and assume different methodologies in terms of the model and estimator.

Even after the reduction of instrument count, the last remaining bank characteristic do not seem to be significant at any conventional significance levels, which is confirmed in below test output as well:

```
(1)  L.Size_N = 0
(2) PR*Size_N = 0
     F( 2,    48) =    0.31
        Prob > F =    0.7384
```

The estimations show that the usual bank characteristics do not affect the reaction of banks to monetary policy changes, which in turn implies that a bank lending channel does not play a significant role in monetary policy transmission. The reason for less accentuated lending channel may lie in financial and banking market characteristics in studied countries as well as data and its source considered here. As Bank scope data is biased towards the larger banks, more or less homogenous dataset in terms of size may render it as an insignificant factor in explaining the loan growth. Furthermore, as the effect of contractionary monetary policy is stronger in smaller banks (Kashyap and Stein, 1995), the response of banks in this setting may be less detectable due to a low number of small banks in the economy and due to their insignificant market shares. The bias may not be the only factor. As discussed in literature analysis the advantage of bigger banks over small banks lies in lower transaction costs and better ability to

raise funds if needed (Olivero et al., 2011)34 and as a result, may be less susceptible to higher interest rates. Other two bank characteristics are never relevant in any of the above regressions. This finding is more unexpected than insignificance of the bank size. Although due to the limited functionality of financial sectors, banks may hold sizable liquidity buffers for unexpected adverse shocks (as it was the case for Azerbaijan). Juurikkala et al. (2011) point out this on the example of the Russian banking market. The results from different concentration measures are quite robust and similar in signs and significance.

The insignificance of the size characteristics allows us to drop this variable from the estimation further. Regressions (4) and (5) report the output. Not surprisingly, both regressions are robust to dropping the bank size characteristic from the model.

We can start estimations with the Lerner index. It is based on smaller sample due to data cleaning for competition measure estimation (5 banks were dropped, which is 35 observations in total). We do not estimate the model with maximum instruments as a discussion of too many instruments applies here as well. Instead, we skip to the model with a reduced number of instruments, but with all bank characteristics. **Table 10** reports the results. To make it more comparable we do not change specifications and instrument treatment from previous estimations. The first part includes all bank characteristics, whereas the last three columns report the result with no bank characteristics. The results are somewhat different from concentration measures. The most notable is that the policy rate that was robustly significant and negative previously is positive and insignificant. Unlike previous results, lagged dependent variable is significant and positive35. One might now observe small evidence (by usual measures) of the lending channel as a coefficient in front of interaction term of policy rate and capitalization is significant at 10% significance level and is positive (similar to Jamilov et al.,2013 and Jamilov, 2013). Considering that policy rate is positive in this case, ceteris paribus, results suggest that in case of contractionary monetary policy loan growth of banks, with strong capital positions, is increasing even more. Positive

[34] Olivero et al (2011) in turn quotes Peltzman (1969).

[35] Although its significance is not robust and it is out of bounds of OLS estimate, but difference is not too high.

coefficient in front of monetary policy stance is quite uncommon in the literature. Furthermore, banks with weak capital positions may be constrained by capital requirements more than banks with better capital positions (Gambacorta, 2005). The increase in monetary policy stance would adversely affect their ability to extend credits to the economy. As a result freed up demand for loans would be met by increased supply from the banks with better capital positions. Although this requires for better capitalized banks to be able to fully shield their portfolios from to adverse monetary policy shock and be able to extend more loans to economy.[36] However, later we will see that monetary policy rate is negative when we control for the dollarization, which is more supported by the literature than positive coefficient of policy rate. The coefficient in front of monetary policy rate and Lerner Index is negative but insignificant at any conventional level of significance. In case of its significance, we would come to the same conclusion as Yang et al. (2016) and Jamilov et al. (2013) that increased competition in the banking market reduces effectiveness of monetary policy. GDP growth and lag inflation are robustly positive and significant here as well.

[36] [36] Moreover, firms should be able to with insignificant costs change the lenders. In other words no "lock in" feature.

Table 10: Estimation with Lerner Index

VARIABLES	(1) Pooled OLS with Lerner Index	(2) FE with Lerner Index	(3) System GMM with Lerner Index	(4) Pooled OLS with Lerner Index	(5) FE with Lerner Index	(6) System GMM with Lerner Index
Loan Gr.	**0.140****	0.117	**0.153***	**0.139***	-0.0518	0.109
	(0.0643)	(0.0729)	(0.0780)	(0.0757)	(0.0467)	(0.148)
Policy Rate (PR)	**0.0255****	**0.0270****	0.0239	0.0147	0.0134	0.0143
	(0.0113)	(0.0105)	(0.0159)	(0.0126)	(0.0115)	(0.0118)
Lerner_LS	-0.000376	-0.146	-0.121	-0.0753	-0.238	-0.0855
	(0.120)	(0.229)	(0.190)	(0.0910)	(0.197)	(0.0861)
PR*Lerner_LS	-0.0201	**-0.0316***	-0.0152	0.00765	0.000381	0.0151
	(0.0197)	(0.0182)	(0.0283)	(0.0153)	(0.0183)	(0.0144)
GDP Gr.	**3.854*****	**4.080*****	**3.440*****	**4.040*****	**3.548*****	**4.372*****
	(1.215)	(1.283)	(1.086)	(1.118)	(1.156)	(1.131)
Inflation	**-0.0283****	**-0.0318*****	**-0.0215***	**-0.0232***	**-0.0292****	-0.0192
	(0.0116)	(0.0113)	(0.0118)	(0.0137)	(0.0129)	(0.0120)
Lag Inflation	**0.0232*****	**0.0198****	**0.0226****	**0.0232*****	**0.0239*****	**0.0219****
	(0.00791)	(0.00831)	(0.00896)	(0.00885)	(0.00828)	(0.00919)
L. Capitalization	-0.0210	0.336	0.358			
	(0.213)	(0.324)	(0.401)			
L. Liquidity	0.0930	0.426	0.0526			
	(0.118)	(0.322)	(0.306)			
L. Size	**-0.139****	**-0.729****	-0.0181			
	(0.0706)	(0.281)	(0.0936)			
PR* L. Capitalization	**0.114***	**0.125****	**0.141***			
	(0.0645)	(0.0530)	(0.0811)			
PR* L. Liquidity	0.0397	**0.0521***	0.0381			
	(0.0276)	(0.0294)	(0.0341)			
PR* L. Size	**0.0205****	**0.0175****	0.0179			
	(0.00840)	(0.00693)	(0.0134)			
Constant	0.119	**0.207****	0.117	-0.00723	0.0774	0.00992
	(0.0739)	(0.0940)	(0.0779)	(0.0952)	(0.102)	(0.0441)
Observations	220	220	220	220	220	220
R-squared		0.546			0.460	
Number of BankName	44	44	44	44	44	44
Country Dummies	NO	NO	NO	NO	NO	NO
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
# Instruments			32			14
Hansen P			0.372			0.353
AR2			0.971			0.796

Note: Table reports results from estimations with the Lerner Index. Bank size and concentration measures enter in estimation with interaction with the policy rate. Lag dependent variable along with bank-specific variables, are considered as GMM-type. Lag one and two are employed as instruments. IV style instruments appear only in Level equation. Furthermore, *collapse, two-step, orthogonal, robust, small* options are specified. Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

5 Robustness Checks

We were not able to find strong evidence of lending channel from above findings. It somewhat contradicts the results from (studies about Azerbaijan, Georgia, and Armenia). Although as these studies are based on different methodologies and period, our findings are not entirely surprising. To check the robustness of the results we consider first, dollarization as additional explanatory variable second, initial non-normalized bank characteristics, and third, non-dynamic model (similar to Fungáčová et al., 2014 and Olivero et al., 2011).

Table 11 reports regression outputs with dollarization. There is little guidance from the literature how one should include dollarization in bank level data setting and with GMM estimator. The model includes both lag of dollarization and its interaction with monetary policy rate. Dependent variable is the growth rate of loans that includes overall loans not just domestic ones. As such, to avoid endogeneity issue we include lag rather than current estimates of dollarization. We include interaction term to capture its effect on monetary policy effectiveness. Below table reports that the dollarization has positive sign implying that positive change in dollarization increases the loan growth ceteris paribus. The coefficient in front of interaction term is negative and significant when CR5 is considered and is insignificant in other cases (HHI and Lerner Index). This finding implies that in case of adverse shock in domestic monetary policy, loan supply is reduced more in highly dollarized economies. In other words, high dollarization enables domestic monetary policy. This finding is quite in contrast with finding by Mora (2013), who concludes that banks with a higher share of foreign currency in Mexico are less affected by the domestic monetary policy shocks and more responsive to U.S. policy shocks. The monetary policy rate is still significant and with a negative sign (except in estimation with Lerner Index). GDP growth still suggests correct relationship and is significant at least 5% level. The interaction term of concentration and monetary policy seems to be robust here as well.

Regression results are quite similar for both concentration measures, which again supports the assumption that changes in concentration is less affected by the smaller bank shares and the shares of banks in CR5 pool define its magnitude.

Table 11: System GMM with dollarization

VARIABLES	(1) GMM with CR5	(2) GMM with HHI	(3) GMM with Lerner
L.Loan Gr.	0.115	0.110	0.118
	(0.149)	(0.149)	(0.157)
GDP Growth	**5.542*** **	**5.139*** **	**2.684** **
	(1.413)	(1.378)	(1.254)
Policy Rate (PR)	**-0.719*** **	**-0.154* **	-0.0391
	(0.160)	(0.0834)	(0.0794)
Concent./Comp	**0.00669*** **	**8.38e-05*** **	-0.0729
	(0.00204)	(2.66e-05)	(0.0907)
PR*Concent/Comp.	**0.0124*** **	**0.000118*** **	0.0135
	(0.00230)	(2.11e-05)	(0.0146)
Inflation	-0.0207	-0.0170	-0.0145
	(0.0135)	(0.0122)	(0.0111)
L.Inflation	**0.0350** **	**0.0317** **	0.0136
	(0.0139)	(0.0129)	(0.0102)
PR*L.Dollarization	**-0.389** **	-0.120	0.111
	(0.174)	(0.155)	(0.162)
L.Dollarization	0.0541	**0.271* **	**0.327** **
	(0.143)	(0.147)	(0.128)
Constant	**-0.496*** **	**-0.269** **	-0.00825
	(0.147)	(0.101)	(0.0749)
Observations	220	220	220
Number of BankName	44	44	44
Country Dummies	NO	NO	NO
Year Dummies	Yes	Yes	Yes
# of Instruments	16	16	16
Hansen P	0.550	0.552	0.256
AR2	0.780	0.821	0.709

Note: (1) includes CR5 concentration index (2) reports results from regression with HHI and (3) from Lerner Index. Bank specific variables and concentration measures enter in estimation with interaction with the policy rate. Lag dependent variable, along with bank-specific variables, are considered as GMM-type variables. Lag one and two is specified as instruments. IV style instruments appear only in the level equation. Furthermore, collapse, nodiffsargan, two-step orthogonal robust small options are specified. Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Further, we check if the results are robust to using initial bank characteristics. Normalization served two purposes: (1) interpretation and (2) removing the likely trend in size characteristics. We report regression output in Appendix C. Regression output includes the first model with a maximum number of instruments and model with the only size as even in this setting, capitalization and liquidity do not seem to affect the bank loan growth.37 Results are quite robust in the sense of the variable signs and significance. Lagged dependent variable is positive but not significant, which again

[37] In this setting Hansen p value statistics indicate that suggested instruments are not particularly good, which may be due to too many instruments and

suggests that lagged loan growth has no explanatory power in current growth. This particular finding is partly the reason to apply the model with no lagged dependent variable, but a static model. Fungáčová et al. (2014) also find that without normalization, findings are quite robust in terms of the significance. Excluding the capitalization and liquidity from the model (2 and 4 regressions in **Table 12**) the results remain roughly the same.

Almost all GMM model specifications above indicate that the lagged dependent variable has no explanatory power in current loan growth. As such, we proceed with simple FE estimation similar to Fungáčová et al., (2014) and Olivero et al. (2011). Since lagged dependent variable is not included, we can proceed with usual panel estimators as long as bank characteristics enter with lags to avoid potential endogeneity (Olivero et al., 2011). Both models are quite similar to one estimated using GMM:

$$\Delta \log(L_{i,t}) = \alpha_i + \beta_1 PR_t + \beta_2 * Concent. + \beta_3 PR_t * Concent. + \beta_4 X_{i,t-1} + \beta_5 X_{i,t-1} * PR_t + \beta_6\, GDP_t + \varepsilon_{it}$$

The dependent variable is still loan growth, but it is explained by the policy change, concentration, their interaction, bank characteristics, and their interaction with the policy rate. In addition to GDP, we include lag of dollarization in separate estimations for robust check the results. Model includes time and country dummies as well similar to Olivero et al. (2011). The results in **Table 12** are more favorable for lending channel existence. Policy rate has expected sign in almost all specifications and is statistically significant (except specification (5) but sign is still negative). Estimations suggest that the contractionary monetary policy adversely affects loan growth, but affect is smaller for big better capitalized banks. This finding is consistent with paper by Jamilov (2013). As author covers period of 2005 to 2010 (monthly bank-level data) our results (from FE estimation) reaffirm the findings for different period and methodology. It is worth mentioning that unlike results from FE estimation here, paper found monetary policy rate to be positive and significant, which is not consistent with the literature (but not impossible). Author suggests endogeneity of policy rate as one of the reasons of

puzzling result. It might to some extent explain puzzling positive coefficient in above estimations with Lerner Index, although we find it not to be robust. As such we further follow Ehrmann et al., in thinking that PR is exogenous. Our finding from FE estimation is more in line with literature in this sense. Policy rate is negative and significant in almost all cases. Although our dataset is yearly and covers later period. Also, it includes banks from Georgia and Armenia in addition to banks from Azerbaijan, thus comparison would be difficult.

Estimates from FE results for other variables seem to be quite robust and more in line with the economic rationale. Policy rate is negative and significant (except estimation (5)). We reaffirm that high concentration reduces the effectiveness of monetary policy. Competition is still insignificant but robustly negative. GDP growth is significant and positive in all specifications. It is noteworthy that we find somewhat different picture here with dollarization. The lag of dollarization is still with positive sign implying that high dollarization is linked with higher growth rate of loans in economy. Even though policy-makers are trying to facilitate economy de-dollarization, literature suggests that it is gradual process. As such turmoil affecting the local currency (for example devaluation)[38] may adversely affect the trust in domestic currency and increase demand for foreign currency loans. In this case loans extended to economy would be dominated by foreign currency loans and growth of loans would reflect growth of the loans in foreign currency. It may explain positive sign in front of lag of dollarization. In the context, where dollarization is higher in the economy, domestic monetary policy change likely has lesser effect on loan growth. Thus positive coefficient in front of interaction term of dollarization and policy rate seems economically more intuitive. In this sense FE estimation seems to suggest correct relationship, where interaction term of dollarization and monetary policy rate is positive and significant (except with CR5 but sign is still positive). This result is in line with findings by Mora (2013) as well.

[38] In December 2015 central bank left the dollar peg and moved to floating exchange regime. Resulted in rising demand for foreign currency and devaluation.

Table 12 Static FE estimations

VARIABLES	(1) FE with CR5	(2) FE with CR5	(3) FE with HHI	(4) FE with HHI	(5) FE with Lerner Index	(6) FE with Lerner Index
PR	**-0.983*** **	**-1.113*** **	**-0.233*** **	**-0.442*** **	-0.00497	**-0.194*** **
	(0.124)	(0.146)	(0.0352)	(0.0649)	(0.00660)	(0.0626)
Concent./Comp	0.00283	0.00241	**0.000200*** **	**0.000283*** **	-0.0573	-0.140
	(0.00493)	(0.00476)	(6.02e-05)	(5.82e-05)	(0.220)	(0.233)
PR*Concent/Comp.	**0.0131*** **	**0.0145*** **	**0.000118*** **	**0.000122*** **	-0.0157	-0.0139
	(0.00167)	(0.00224)	(1.82e-05)	(1.89e-05)	(0.0178)	(0.0174)
GDP Gr.	**4.074*** **	**5.658*** **	**3.838*** **	**5.241*** **	**3.715*** **	**3.902*** **
	(1.016)	(1.332)	(0.779)	(1.196)	(0.891)	(1.291)
L.Capitalization	**0.414* **	**0.641* **	0.343	**0.708** **	**0.458* **	**0.657* **
	(0.233)	(0.331)	(0.245)	(0.318)	(0.265)	(0.349)
L.Liquidity	**0.527** **	0.427	**0.613** **	**0.521** **	**0.456* **	0.413
	(0.245)	(0.266)	(0.232)	(0.251)	(0.250)	(0.263)
L.Size	**-0.653*** **	-0.477	**-0.682*** **	**-0.515* **	**-0.541** **	-0.500
	(0.170)	(0.285)	(0.181)	(0.270)	(0.209)	(0.301)
PR* L.Capitalization	**0.0715** **	**0.0663* **	**0.0861** **	**0.0669* **	**0.109** **	**0.0921** **
	(0.0338)	(0.0357)	(0.0388)	(0.0356)	(0.0507)	(0.0445)
PR* L.Liquidity	0.0353	0.0377	0.0256	0.0339	0.0306	0.0408
	(0.0253)	(0.0248)	(0.0274)	(0.0254)	(0.0282)	(0.0268)
PR* L.Size	**0.0177* **	0.0169	**0.0202** **	0.0169	**0.0219*** **	**0.0178*** **
	(0.0103)	(0.0104)	(0.00910)	(0.0104)	(0.00615)	(0.00555)
L.Dollarization		1.465		**2.136** **		0.741
		(0.993)		(0.984)		(1.006)
PR* Dollarization		0.066		**0.436*** *		**0.409*** **
		(0.141)		(0.123)		(0.137)
Constant	-0.0933	-0.882	**-0.258** **	**-1.543** **	0.0909	-0.260
	(0.360)	(0.678)	(0.111)	(0.582)	(0.0681)	(0.565)
Observations	264	264	264	264	264	264
R-squared	0.550	0.560	0.545	0.574	0.474	0.494
Number of BankName	44	44	44	44	44	44
Country Dummies	NO	NO	NO	NO	NO	NO
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes

Note: Table reports estimations using Fixed Effects estimator. Estimations include three concentration/competition measures. It also reports estimations with dollarization separately.
Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

6 Summary and Conclusion

In this work we analyzed bank lending channel in Georgia, Armenia, and Azerbaijan. The literature on the subject is extensive since its introduction by Bernanke and Blinder (1988) in usual IS-LM framework. Nevertheless, there is still significant room for contribution, when concentrating on less advanced countries. Despite large number of studies based on euro area and US banking sector, literature is not entirely conclusive on strength of this channel or factors affecting it. Earlier papers focused on aggregate data to detect the bank lending behavior after changes in monetary policy stance. Aggregate data methodologies generally fail to distinguish supply side shock from demand side one, as such providing debatable evidence of the lending channel (see, for example, Romer and Romer, 1990). Alternative approach suggested by Kashyap and Stein (1995) suggests to use disaggregate bank balance sheet data for analysis. Bank-level-data based studies identify lending channel by observing the reactions of different (depending on size, capitalization, and liquidity) banks on changes of policy stance. Methodologies still quite differ in empirical work (see, for example, Egert and MacDonald, (2009) for literature analysis on methodology). Literature analysis suggest that one solution cannot be applied to all countries and even to different periods of time. Furthermore, existence of the lending channel and ability to affect real economy largely depends on development of the economy and financial market characteristics such as contract maturity, financial market depth, concentration, dollarization, bank networks, number of bank dependent firms in the economy, state ownership of banks, and financial stability among others.

As similar analysis is quite scarce for Georgia, Armenia, and Azerbaijan (especially for the recent years) we decided to contribute to this direction. Focusing on less advanced countries entails few challenges in estimation: data coverage, quality of the data and data sources. We combine bank scope and individual bank balance sheets to base our estimations and test hypothesis- first that there is lending channel; second that it is less potent when markets are highly concentrated; and third that results depend on concentration/competition measures used. Moreover, we analyze effects of dollarization on lending channel. For estimations, we employ two econometric approaches. First, Generalized Method of Moments (GMM) for initial estimations and

further we proceed with simple Fixed Effect (FE) framework. We proxy competition and concentration with CR, HHI, and Lerner index.

Initial GMM estimation framework does not support the existence of lending channel. At least usual bank characteristics (size, liquidity, and capitalization) do not seem to differentiate the way banks react to monetary policy change. Although findings are somewhat different when we apply FE model. In later case, regressions show that bigger better capitalized banks reduce loan supply to lesser extent than smaller banks with lower capital ratios.

In line with previous literature we find that concentration weakens monetary policy. This finding is robust in all specifications and with both models. We do not find evidence that banks' pricing power has any significance on loan supply or monetary policy transmission in any above specifications. Although, we further support the suggestion in literature to incorporate more than one measure of concentration/competition in analysis to ensure that inferences are accurate. To study effects of dollarization on overall results we include the lag of dollarization in estimations along with concentration measures. We still draw similar conclusions. Although, the results are somewhat different in estimations with Lerner Index. After controlling for the dollarization only GDP growth remains significant apart from lag dollarization itself. GMM estimations suggest puzzling results in terms of dollarization. Negative coefficient in front interaction term of dollarization and monetary policy suggests that foreign currency denomination actually enables the domestic monetary policy. As this finding is inconsistent with existing literature and economic rationale, we further robust check our results by applying simple FE model. The results, apart from suggesting lending channel existence, shows more reasonable picture regarding the dollarization. Its interaction term with monetary policy is now positive implying that domestic monetary policy is weaker in case of high dollarization. Other variable (policy rate, GDP growth) have expected signs.

The policy implications of above findings would be to consider negative impact of consolidation on monetary policy transmission when assessing the structural changes in banking sector and/or effects of monetary policy shocks. Future research would benefit from overcoming few limitations present in this work. As per the literature review above, the results might be different to some extent if countries are considered

individually. As such, future research might concentrate on overcoming the data limitations and focus on each country individually, for example through loan level data. Moreover, it would be interesting to consider effect of non-domestic monetary policy and the effect of foreign capital share in banks total capital on lending channel of monetary policy transmission.

Bibliography

Bernanke, B.S. and Blinder, A.S., 1988. Credit, money, and aggregate demand. *The American Economic Review Papers and Proceedings,* Vol. 78, No. 2, pp.435-439

Christina D. Romer & David H. Romer, 1990. "New Evidence on the Monetary Transmission Mechanism," *Brookings Papers on Economic Activity, Economic Studies Program, The Brookings Institution*, vol. 21(1), pages 149-214..

Kashyap, A.K. and Stein, J.C., 1994. Monetary policy and bank lending. In *Monetary policy* (pp. 221-261). *The University of Chicago Press*.

Taylor, J.B. 1995. "The Monetary Transmission Mechanism: An Empirical Framework." *Journal of Economic Perspectives-Volume 9, Number 4-Fall 11-26.*

Bernanke, B.S. and Gertler, M., 1995. Inside the black box: the credit channel of monetary policy transmission. *Journal of Economic perspectives*, *9*(4), pp.27-48.

Mishkin, F.S., 1995. Symposium on the monetary transmission mechanism. *Journal of Economic perspectives*, *9*(4), pp.3-10.

Kashyap, A.K. and Stein, J.C., 1995, June. The impact of monetary policy on bank balance sheets. In *Carnegie-Rochester Conference Series on Public Policy* (Vol. 42, pp. 151-195). North-Holland.

Peek, J. and Rosengren, E.S., 1995, June. Bank lending and the transmission of monetary policy. In *Conference series-federal reserve bank of boston* (Vol. 39, pp. 47-68). Federal Reserve Bank of Boston.

Mishkin, F. S. 1996. "The Channels of Monetary Transmission: Lessons for Monetary Policy." *Working Paper 5464, NBER*.

Kishan, Ruby P., and Timothy P. Opiela. "Bank size, bank capital, and the bank lending channel." *Journal of Money, Credit and Banking* (2000): 121-141.

Stein, J.C. and Kashyap, A.K., 2000. What do a million observations on banks say about the transmission of monetary policy?.*American Economic Review*, *90*(3), pp.407-428.

Ehrmann, M., Gambacrota, L., Martinez-Pages, J., Sevestre, P. and Worms, A., 2001. *Financial systems and the role of banks in monetary policy transmission in the Euro area, European Central Bank*. Working Paper 105.

Mishkin F.S. 2001. "The Transmission Mechanism and The Role of Asset Prices in Monetary Policy." *working Paper 8617, NBER,*.

Altunbaş, Y., Fazylov, O. and Molyneux, P., 2002. Evidence on the bank lending channel in Europe. *Journal of Banking & Finance*, *26*(11), pp.2093-2110.

Keller, P.M., Richardson, T., 2003. *"Nominal Anchors in the CIS"*. IMF working paper. WP/03/179

Bikker, J. A., & Haaf, K. (2002). Competition, concentration and their relationship: An empirical analysis of the banking industry. *Journal of banking & finance*, *26*(11), 2191-2214.

Calvo, G. A., Reinhart, C.,. 2002. "Fear of Floating." *The Quarterly Journal of Economics, Vol. CXVII, Issue 2.*

De Bondt, Gabe, Retail Bank Interest Rate Pass-Through: New Evidence at the Euro Area Level (April 2002). *ECB Working Paper No. 136*. Available at SSRN: https://ssrn.com/abstract=357380

Bikker, J.A. and Haaf, K., 2002. Measures of competition and concentration in the banking industry: a review of the literature. *Economic & Financial Modelling*, *9*(2), pp.53-98.

Bond, S.R., 2002. Dynamic panel data models: a guide to micro data methods and practice. *Portuguese economic journal*, *1*(2), pp.141-162.

Carol Ann Northcott, 2004. "Competition in Banking: A Review of the Literature," *Staff Working Papers 04-24, Bank of Canada.*

Adams, R.M. and Amel, D.F., 2005. The effects of local banking market structure on the bank-lending channel of monetary policy.

Gambacorta, L., 2005. Inside the bank lending channel. *European Economic Review*, *49*(7), pp.1737-1759.

Dabla-Norris, E., Floerkemeier, H.,. 2006. "Transmission Mechanisms of Monetary Policy in Armenia: Evidence from VAR Analysis." *IMF Working Paper WP/06/248*, IMF,.

Egert,B.,MaCdonald,R.,. 2006. "Monetary Transmission Mechanism in Transition Economies: Surveying the Surveyable." *CESifo Working Paper No.1739, NBER,.*

Beck, T., Kunt, A.D., 2006 Small and medium-sized enterprises: Access to finance as a growth constraint*, Journal of Banking & Finance, Volume 30, Issue 11, November 2006, Pages 2931-2943.*

Bernanke, B.S., 2007. *The financial accelerator and the credit channel* (No. 296).

Samkharadze, B., 2008. Monetary transmission mechanism in Georgia: analyzing pass-through of different channels. *National Bank of Georgia Working Paper, 2, p.2008.*

Matousek, R., & Sarantis, N. (2009). The bank lending channel and monetary transmission in Central and Eastern European countries. *Journal of Comparative Economics*,37, 321–334.

Roodman, D., 2009. How to do xtabond2: An introduction to difference and system GMM in Stata. *The Stata Journal*, *9*(1), pp.86-136.

Roodman, D. 2009, A Note on the Theme of Too Many Instruments*. *Oxford Bulletin of Economics and Statistics, 71: 135-158*.

Berger, A.N., Klapper, L.F. and Turk-Ariss, R., 2009. Bank competition and financial stability. *Journal of Financial Services Research*, *35*(2), pp.99-118.

Egert, B. and MacDonald, R., 2009. Monetary transmission mechanism in Central and Eastern Europe: Surveying the surveyable. *Journal of Economic Surveys, 23(2), pp.277-327.*

Carbó, S., Humphrey, D., Maudos, J. and Molyneux, P., 2009. Cross-country comparisons of competition and pricing power in European banking. *Journal of International Money and Finance*, *28*(1), pp.115-134.

Demirguc-Kunt, Asli & Martinez Peria, Maria. (2010). A Framework for Analyzing Competition in the Banking Sector: An Application to the Case of Jordan.

Ariss, R.T., 2010. On the implications of market power in banking: Evidence from developing countries. *Journal of banking & Finance*, *34*(4), pp.765-775.

Olivero, M.P., Li, Y. and Jeon, B.N., 2011. Consolidation in banking and the lending channel of monetary transmission: Evidence from Asia and Latin America. *Journal of International Money and Finance, 30(6), pp.1034-1054.*

Olivero, M. P., Li, Y., & Jeon, B. N. (2011). Competition in banking and the lending channel: Evidence from bank-level data in Asia and Latin America. *Journal of Banking & Finance, 35(3), 560-571.*

Disyatat, P., 2011. The bank lending channel revisited. *Journal of money, Credit and Banking*, *43*(4), pp.711-734..

Juurikkala, T., Karas, A. and Solanko, L., 2011. The role of banks in monetary policy transmission: Empirical evidence from Russia. *Review of international economics*, *19*(1), pp.109-121.

Koetter, M., Kolari, J.W. and Spierdijk, L., 2012. Enjoying the quiet life under deregulation? Evidence from adjusted Lerner indices for US banks. *Review of Economics and Statistics*, *94*(2), pp.462-480.

Jimenez, G., Ongena, S., Peydro, J., Saurina, J., 2012. Credit supply and monetary policy: identifying the bank balance-sheet channel with loan applications. American Economic Review 102, 2301–2326.

Kumbhakar, S.C., Baardsen, S. and Lien, G., 2012. A new method for estimating market power with an application to Norwegian sawmilling. *Review of Industrial Organization*, *40*(2), pp.109-129.

Mora, N., 2013. The bank lending channel in a partially dollarized economy. *Journal of Applied Economics*, *16*(1), pp.121-151

Beck, T., De Jonghe, O. and Schepens, G., 2013. Bank competition and stability: Cross-country heterogeneity. *Journal of financial Intermediation*, *22*(2), pp.218-244.

Jamilov, R., 2013. Under the Damocles sword: The bank lending channel in a transition economy. *Available at SSRN 2208425*

Huseynov, F., Jamilov, R. and Zhang, W., 2013. Bank Competition and the Lending Channel in Transition Countries.

Coccorese, P., 2014. Estimating the Lerner index for the banking industry: a stochastic frontier approach. *Applied Financial Economics*, *24*(2), pp.73-88.

Leroy, A., 2014. Competition and the bank lending channel in Eurozone. *Journal of International Financial Markets, Institutions and Money*, *31*, pp.296-314.

Fungáčová, Z., Solanko, L. and Weill, L., 2014. Does competition influence the bank lending channel in the euro area?. *Journal of Banking & Finance*, *49*, pp.356-366.

Leon, F., 2015. Measuring competition in banking: A critical review of methods.

Ben Naceur, S., Hosny, A., and Hadjian, G. (2015). How to De-Dollarize Financial Systems in the Caucasus and Central Asia? *USA: INTERNATIONAL MONETARY FUND. Available From: ASEAN - Association of Southeast Asian*.

Kasman, S. and Kasman, A., 2015. Bank competition, concentration and financial stability in the Turkish banking industry. *Economic Systems*, *39*(3), pp.502-517.

Khan, H.H., Ahmad, R.B. and Gee, C.S., 2016. Bank competition and monetary policy transmission through the bank lending channel: Evidence from ASEAN. *International Review of Economics & Finance*, *44*, pp.19-39.

Yang, J. and Shao, H., 2016. Impact of bank competition on the bank lending channel of monetary transmission: Evidence from China. *International Review of Economics & Finance*, *43*, pp.468-481.

Appendices

A. Banks covered in the thesis

BANK	COUNTRY OF ORIGIN
OJSC "IBA"	AZE
JSC TBC Bank	GEO
JSC Bank of Georgia	GEO
PASHA Bank OJSC	AZE
Kapital Bank	AZE
Ameriabank CJSC	ARM
Ardshinbank CJSC	ARM
Armbusinessbank cjsc	ARM
Xalq Bank OJSC	AZE
Liberty Bank JSC	GEO
ACBA-Credit Agricole Bank CJSC	ARM
JSC VTB Bank (Georgia)	GEO
InecoBank CJSC	ARM
Azerbaijan Industrial Bank	AZE
Cartu Bank	GEO
Converse Bank Corporation CJSC	ARM
Open Joint Stock Company Bank Respublica	AZE?
Basisbank JSC	GEO
VTB Bank (Armenia)	ARM
Araratbank OJSC	ARM
Rabitabank Open-Joint Stock Company	AZE
Armeconombank-Armenian Economy Development Bank	ARM
AtaBank OJSC	AZE
UniBank Commercial Bank	AZE
ArmSwissBank CJSC	ARM
JSC Terabank	GEO
Afb Bank Ojsc	AZE
'Muganbank' Open Joint Stock Company	AZE
TuranBank Open Joint Stock Company	AZE
Anelik Bank CJSC	ARM
YapiKredi Bank Azerbaijan	AZE

Azerigabank Joint0Stock Investment Bank-AGBANK	AZE
OJSCB Bank of Baku	AZE
Investment Commercial Bank Nikoil OJSC	AZE
Evocabank Closed Joint0Stock Company	ARM
Azer_Turk Bank Open Joint0Stock Company	AZE
'Expressbank' Open Joint Stock Company	AZE
Bank BTB Open Joint Stock Company	AZE
Byblos Bank Armenia CJSC	*ARM*
NBC Bank Open Joint Stock Company	*AZE*
Finca Bank Georgia Joint Stock Company	*GEO*
OJSC VTB Bank (Azerbaijan)	*AZE*
Bank Eurasia OJSC	*AZE*
BTA Silk Road Bank JSC	*GEO*
Bank Melli Iran Baku Branch	*AZE*
HSBC Bank Armenia CJSC	*ARM*
JSC ProCredit Bank, Georgia	*GEO*

B Additional regression outputs

Table B1: System GMM with country and year dummies

VARIABLES	(1) GMM with CR5 and Lag up to 3	(2) GMM with HHI and Lag up to 3	(3) GMM with CR5 and Lag up to 2	(4) GMM with HHI and Lag up to 2	(5) GMM with CR5 and Lag up to 1	(6) GMM with HHI and Lag up to 1
L.Loan GR.	0.0642	0.141	0.0777	0.110	0.101	0.0774
	(0.191)	(0.206)	(0.233)	(0.219)	(0.237)	(0.208)
Policy Rate (PR)	**-0.681*** **	**-0.216*** **	**-0.655*** **	**-0.217*** **	**-0.836*** **	**-0.243*** **
	(0.160)	(0.0558)	(0.169)	(0.0521)	(0.179)	(0.0462)
Concentration	0.00737	-7.77e-05	0.00669	-0.000139	0.00591	-6.63e-05
	(0.00766)	(0.000127)	(0.00842)	(0.000141)	(0.00715)	(0.000138)
PR*Concentration	**0.00942*** **	**0.000119*** **	**0.00907*** **	**0.000119*** **	**0.0115*** **	**0.000132*** **
	(0.00210)	(2.66e-05)	(0.00223)	(2.52e-05)	(0.00243)	(2.48e-05)
GDP Gr	2.575	**4.496** **	2.671	**5.053** **	**3.498** **	**5.536** **
	(1.730)	(1.754)	(1.863)	(2.121)	(1.520)	(2.246)
LogDepo	0.0357	0.0345	0.0280	0.0229	0.0633	0.0663
	(0.147)	(0.170)	(0.196)	(0.212)	(0.299)	(0.257)
Inflation	-0.0201	-0.0105	-0.0219	-0.0110	**-0.0234* **	-0.0183
	(0.0127)	(0.00992)	(0.0132)	(0.0103)	(0.0119)	(0.0110)
L.Inflation	**0.0290** **	**0.0277** **	**0.0293** **	**0.0259** **	0.0266	**0.0267* **
	(0.0122)	(0.0111)	(0.0133)	(0.0119)	(0.0165)	(0.0138)
L.Capitalization (N)	0.257	0.0228	0.214	0.00376	0.00686	-0.246
	(0.396)	(0.351)	(0.395)	(0.329)	(0.639)	(0.541)
L.Liquidity (N)	-0.179	-0.154	-0.132	-0.222	0.388	0.127
	(0.406)	(0.468)	(0.423)	(0.458)	(0.370)	(0.400)
L.Size (N)	-0.0701	-0.0735	-0.0587	-0.0515	-0.216	-0.285
	(0.403)	(0.469)	(0.547)	(0.602)	(1.014)	(0.828)
PR* L.Capitalization	0.0538	0.0591	0.0571	0.0606	0.0594	0.0671
	(0.0721)	(0.0655)	(0.0738)	(0.0743)	(0.0449)	(0.0419)
PR*L.Liquidity	0.0316	0.0251	0.0311	0.0424	0.0319	0.0379
	(0.0372)	(0.0407)	(0.0400)	(0.0419)	(0.0389)	(0.0411)
PR* L.Size	0.0250	0.0189	0.0258	0.0212	0.0315	0.0282
	(0.0158)	(0.0176)	(0.0238)	(0.0231)	(0.0218)	(0.0186)
2012.Year	0	0	0	0	0	0
	(0)	(0)	(0)	(0)	(0)	(0)
2013.Year	0	0.168	0	0.138	-1.039	**0.404*** **
	(0)	(0.121)	(0)	(0.134)	(3.772)	(0.0632)
2014.Year	**-0.120** **	0.128	**-0.120** **	0.0966	-1.117	**0.417*** **
	(0.0535)	(0.126)	(0.0527)	(0.127)	(3.762)	(0.0638)
2015.Year	**-0.491*** **	**-0.270** **	**-0.486*** **	**-0.279** **	-1.534	0
	(0.0790)	(0.110)	(0.0834)	(0.124)	(3.760)	(0)
2016.Year	**-0.203*** **	0	**-0.199** **	0	-1.189	**0.242** **
	(0.0744)	(0)	(0.0875)	(0)	(3.810)	(0.0933)
2017.Year	**-0.193** **	-0.0248	**-0.182** **	-0.0421	-1.255	**0.189** **
	(0.0736)	(0.0883)	(0.0851)	(0.102)	(3.831)	(0.0737)
2.Country	-0.0741	0.129	-0.0691	0.219	-0.0130	0.192
	(0.0545)	(0.174)	(0.0552)	(0.191)	(0.0726)	(0.179)
3.Country	-0.0808	0.213	-0.0589	0.311	0.0168	0.267
	(0.197)	(0.240)	(0.205)	(0.244)	(0.186)	(0.213)
Constant	-0.754	-0.559	-0.619	-0.359	0	-1.222
	(2.005)	(2.145)	(2.598)	(2.656)	(0)	(3.117)
Observations	245	245	245	245	245	245

Number of BankName	49	49	49	49	49	49
Country Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
# Instruments	42	42	35	35	28	28
Hansen P	0.383	0.327	0.070	0.099	0.100	0.147
AR2	0.713	0.781	0.751	0.741	0.787	0.835

Note: Table reports initial estimation results with decreasing number of lags for each concentration Index. Bank specific variables and concentration measures enters in estimation with interaction with policy rate. Lag dependent variable along with bank specific variables is considered as GMM-type variables. IV style instruments are macro variables and appear only in Level equation. Furthermore collapse *nodiffsargan, twostep orthogonal*, *robust*, *small* options have been specified Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table B2: System GMM with non-normalized bank characteristics

VARIABLES	(1) GMM with CR5	(2) GMM with CR5	(3) GMM with HHI	(4) GMM with HHI
Loan Gr.	0.159	0.125	0.177	0.134
	(0.200)	(0.157)	(0.231)	(0.161)
Policy Rate (PR)	**-0.750*** **	**-0.780*** **	**-0.304** **	**-0.286*** **
	(0.207)	(0.162)	(0.141)	(0.0686)
Concentration	0.00820	0.00209	2.34e-05	2.91e-05
	(0.00904)	(0.00281)	(0.000125)	(2.93e-05)
PR*Concentration	**0.00921*** **	**0.00949*** **	**0.000112*** **	**0.000110*** **
	(0.00220)	(0.00190)	(2.93e-05)	(1.86e-05)
GDP Gr.	2.035	**3.905*** **	**3.495* **	**5.176*** **
	(1.576)	(1.159)	(1.988)	(1.135)
LogDepo	0.149		0.123	
	(0.142)		(0.144)	
Inflation	**-0.0215** **	**-0.0196* **	-0.0182	-0.0183*
	(0.00931)	(0.0105)	(0.0109)	(0.0103)
L.Inflation	**0.0258** **	**0.0250*** **	**0.0314** **	**0.0294*** **
	(0.00992)	(0.00825)	(0.0148)	(0.00900)
L.Capitalization	0.159		0.120	
	(0.360)		(0.380)	
L.Liquidity	-0.0286		-0.0248	
	(0.530)		(0.600)	
L.Size	-0.184	-0.0183	-0.150	-0.0191
	(0.196)	(0.0301)	(0.209)	(0.0308)
PR*L.Capitalization	0.0104		0.0125	
	(0.0560)		(0.0669)	
PR*L.Liquidity	-0.0121		-0.0101	
	(0.0513)		(0.0553)	
PR*L.Size	0.00643	0.00706	0.00793	**0.00702* **
	(0.00773)	(0.00423)	(0.00842)	(0.00412)
Constant	0	-0.0285	0.366	0.160
	(0)	(0.320)	(1.149)	(0.396)
Observations	245	245	245	245
Number of BankName	49	49	49	49
Country Dummies	Yes	NO	Yes	NO
Year Dummies	Yes	Yes	Yes	Yes
# Instruments	49	16	49	16
Hansen P	0.042	0.352	0.029	0.355
AR2	0.913	0.717	0.848	0.744

(1) Reports initial estimation with all variables, non-normalized variables, and CR5. (2) Reports estimation with non-normalized size variable and CR5 (3) and (4) reports as above respectively, but

with HHI. Bank specific variables and concentration measures enter in estimation with interaction with the policy rate. Lag dependent variable, along with bank-specific variables are considered as GMM-type variables. IV style instruments appear only in the level equation. Furthermore, collapse, nodiffsargan, two-step, orthogonal, robust, small options have been specified. Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table B3: Estimation with concentration measures on reduced sample

VARIABLES	(1) Pooled OLS with CR5	(2) FE with CR5	(3) System GMM with CR5	(4) Pooled OLS with HHI	(5) FE with HHI	(6) System GMM with HHI
L.Loan Gr	0.100	0.0717	0.120	0.109	0.0705	0.118
	(0.0652)	(0.0973)	(0.0758)	(0.0668)	(0.102)	(0.0833)
Policy Rate (PR)	**-0.730*** **	**-0.776*** **	**-0.696*** **	**-0.214*** **	**-0.213*** **	**-0.212*** **
	(0.146)	(0.139)	(0.142)	(0.0386)	(0.0424)	(0.0410)
Concentration	**0.00625*** **	**0.00882** **	**0.00663** **	**6.86e-05*** **	4.88e-05	4.25e-05
	(0.00166)	(0.00424)	(0.00272)	(1.86e-05)	(9.21e-05)	(3.41e-05)
PR*Concentration	**0.0101*** **	**0.0106*** **	**0.00967*** **	**0.000119*** **	**0.000116*** **	**0.000120*** **
	(0.00194)	(0.00184)	(0.00189)	(1.94e-05)	(2.08e-05)	(2.04e-05)
GDP Gr.	**4.539*** **	**5.567*** **	**4.417*** **	**5.716*** **	**6.061*** **	**5.389*** **
	(1.172)	(1.269)	(1.215)	(1.118)	(1.448)	(1.258)
Inflation	**-0.0205** **	**-0.0184* **	**-0.0223* **	**-0.0183* **	-0.0169	-0.0167
	(0.0102)	(0.0110)	(0.0118)	(0.00977)	(0.0107)	(0.0114)
L.Inflation	**0.0233*** **	**0.0158* **	**0.0319*** **	**0.0284*** **	**0.0209** **	**0.0314*** **
	(0.00828)	(0.00786)	(0.0100)	(0.00876)	(0.00819)	(0.0109)
L.Capitalization	-0.0188	0.423	0.414	-0.00875	0.353	0.310
	(0.178)	(0.304)	(0.321)	(0.181)	(0.315)	(0.353)
L.Liquidity	0.136	0.453	0.228	0.100	0.386	0.143
	(0.121)	(0.338)	(0.372)	(0.117)	(0.358)	(0.366)
L.Size	**-0.148** **	**-0.781*** **	-0.0584	**-0.139** **	**-0.722** **	-0.00671
	(0.0645)	(0.265)	(0.0828)	(0.0700)	(0.309)	(0.100)
PR* L.Capitalization	0.0777	**0.0697* **	0.0774	0.0789	**0.0721* **	0.0731
	(0.0476)	(0.0382)	(0.0522)	(0.0492)	(0.0397)	(0.0595)
PR* L.Liquidity	0.0353	0.0404	**0.0573* **	0.0358	0.0409	**0.0680** **
	(0.0268)	(0.0279)	(0.0300)	(0.0271)	(0.0276)	(0.0302)
PR* L.Size	0.0186	0.0171	0.0104	0.0185	0.0175	0.0106
	(0.0121)	(0.0143)	(0.0198)	(0.0121)	(0.0139)	(0.0188)
Constant	-0.348**	-0.516	-0.390*	-0.110	-0.0384	-0.0797
	(0.138)	(0.314)	(0.196)	(0.0721)	(0.137)	(0.0844)
Observations	220	220	220	220	220	220
R-squared		0.585			0.581	
Number of BankName	44	44	44	44	44	44
Country Dummies	NO	NO	NO	NO	NO	NO
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
# Instruments			32			32
Hansen P			0.598			0.244
AR2			0.950			0.758

Note: Table Reports similar Specifications as in Table 10 but with concentration rather than Competition. Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

D. Descriptive statistics and other.

Table D1: Descriptive Statistics of normalized and initial bank characteristics.

Variable	Obs	Mean	Std.Dev.	Min	Max
EQTA	343	.189	.106	0	.661
LATA	343	.243	.161	.008	.875
size	343	12.772	1.051	10.025	16.277
Capitalization (N)	343	0	.106	-.189	.472
Liquidity (N)	343	0	.161	-.235	.632
Size (N)	343	0	.45	-1.24	1.423

Figure D1: Mean Capital and Liquidity over the years by country