Essays on Banking Sector Performance in the CISs

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Abstract

This thesis consists of essays on the financial performance of the Commonwealth of Independent States' (CIS) banking systems.

Chapter 2 presents a historical overview of the financial sectors development in transition countries and the CISs in particular. It shed light on key issues of the massive changes in the financial systems of the former soviet bloc countries and their influence on the countries' banking system landscape nowadays. This chapter aims to contribute to the better understanding of the transition processes from momobank system to two-tier banking system in the CIS countries by providing theoretical background and empirical evidence of transition processes. After more than 20 years of transition the financial systems in the CIS countries have features to different extents, which are the legacy of the former system of finance. Nevertheless, overall the banks in the CISs were transferred into commercial banks and adopted the concept of conventional banking though to different degrees across countries. One of the most important transformations in the CIS banking sectors is the ownership of banks, which were fully state-owned during the soviet times; and privatisation and liberalisation completely reshaped the ownership structure in the CISs. Moreover, the changes in regulation and supervision have critically transformed banks' risk-taking behaviour, which is also one of the major concerns of our study.

Chapter 3 examines bank performance in terms of technical efficiency with particular attention to the impact of bank ownership and risk-taking behaviour and addressing environmental effects on banks technical efficiency in the CISs. Our findings provide empirical evidence that ownership structure matters for the CIS banks efficiency. Using state-owned banks as a

benchmark we found that while private banks are less technically efficient than state-owned banks in the CIS countries as well as banks with foreign majority ownership, the CIS-owned banks are more efficient than other banks in the region. Risks-taking behaviour has different impact on performance in the CIS countries. This research has found positive association between capital, credit and market risk and performance, while negative association between liquidity risks and bank performance in the CISs.

Chapter 4 examines cost and profit efficiency incorporating important variables, which are considered critical for differences in efficiency, as in Chapter 3. We include ownership type, risk-taking behaviour and different environmental factors to estimate reliable cost and profit efficiency measures. Different concepts of efficiency introduced in this study extend our analysis of bank efficiency, and offer a comprehensive study of the CIS banks performance. We found that privately owned banks are less cost efficient than state-owned banks. Although foreign banks are more profitable than state-owned banks, they are as cost efficient as state-owned banks. The CIS-owned foreign banks are less cost efficient than other banks in the CIS countries. There are different impacts of risk-taking behaviour on bank cost and profit efficiency in the CIS countries. Banks with lower capital risk are more cost efficient. Higher credit risk taking is associated with lower profitability of banks. While banks with lower liquidity risk are more profit efficient, they are less cost efficient. Higher market risk is associated with less cost efficiency. Finally, there is a convergence in cost and profit efficiency scores of banks across the CIS countries indicating a process of re-integration among CIS financial systems.

Chapter 5 explores the impact of competition on the stability of banks in the CIS countries. We found that competition is good for stability and verified the competition-stability nexus for the

CIS countries. This study also concluded that the improvement of legal rights of borrowers and lenders and bank supervision in the CISs would contribute to banking system stability.

Our concluding policy recommendation is that policymakers need to design regulations that would ensure stability and market discipline without impeding competition and efficiency of banks in the CISs.

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Dedication

May Allah accept this work and let it serve for the good

To my mother and father

CISs map


Commonwealth of Independent States
Scale 1:20,700,000
Lambert Conformal Conic Projection, standard parallels 47°N and 62°N
300 Kilometers
300 Miles
Boundary representation is not necessarily authoritative.
RUSSIA
KAZAKHSTAN
UKRAINE
BELARUS
UZBEKISTAN
TURKMENISTAN
KYRGYZSTAN
TAJIKISTAN
GEORGIA
ARMENIA
AZERBAIJAN
TURKEY
IRAN
IRAQ
AFGHANISTAN
SYRIA
CHINA
INDIA
PAK.
SWEDEN
FINLAND
POLAND
ROMANIA
MOLDOVA
BULG.
Moscow
Kiev
Minsk
Astana (Akmola)
Tashkent
Bishkek
Dushanbe
Ashgabat
Baku
Yerevan
Tbilisi
Ankara
Tehrān
Baghdad
Kabul
Islāmābād
Black Sea
Caspian Sea
Aral Sea
Mediterranean Sea
802592 (R02110) 6-98

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Chapter 1

Introduction

This thesis consists of essays on the performance of the Commonwealth of Independent States' (CISs) banking systems. In the 1990s with the collapse of the Soviet Union, economists started using the term 'transition economy' to label the economic systems of the former Soviet Union and other post-communist countries, which were transforming their plan-based economies to market oriented ones (Megginson, 2005). We follow this terminology and refer to all countries that have undertaken these transformations as transition countries/economies.

Despite the growing literature on transition countries, and the interest of policy makers and practitioners, there is currently a dearth of literature and of empirical studies specifically addressing financial sector performance in the CISs. The banking sector is the most important form of financial intermediation in the CIS countries as capital markets are underdeveloped or non-existent (Berglof and Bolton, 2002; De Nicolo et al., 2003). Comparatively developed organised capital markets are in Russia and Kazakhstan. Banking in the CISs has been experiencing drastic changes over the past two decades. It has undergone complicated processes of privatisation, liberalisation and deregulation as well as many financial crises. In this regard, a number of issues in the banking sectors of the CISs are worth of investigating for both academics and policy makers. Particularly, the main concern of this study is to analyse efficiency, competition and stability of banking sector in the CIS countries.

Chapter 2 presents a historical overview of the financial sectors development in transition countries and the CISs. The objective is to shed light on key issues of the massive changes in the financial systems of the former soviet bloc countries and on the way in which the changes have

affected the present banking system landscape in these countries. The Chapter aims to contribute to the better understanding of the transition processes from monobak system to two-tire banking system in the post-soviet countries by providing theoretical background and empirical evidence of transition processes in these countries. It is also crucial for understanding of financial system functioning in the CIS economies nowadays. Despite the long period passed since the transition started, the financial systems in most of the transition countries have features, which are the legacy of the centrally planned economy.

One of the most important changes in the CISs banking sectors is the ownership of banks. Banks were fully state owned during the soviet times, and were subject of privatisation later on from the early 1990s, which completely reshaped the ownership of banks in the CISs. The CIS countries chose different ownership structures according to their economic situation, the availability of funds in the countries and institutional development. State capital prevails in the Russia, Belorussian, Turkmenistan and Uzbekistan banking systems. Russia has developed more advanced market mechanisms, while Belorussian, Uzbekistan and Turkmen banking sector mostly replicates the finance of soviet times. Domestic private banking dominates in Kazakhstan, Azerbaijan, Tajikistan and Ukraine. Countries, such as Armenia, Kyrgyzstan and Moldova, are lack of domestic finance and have chosen the strategy of attracting foreign capital. While the state ownership share decreased in Azerbaijan, Belarus and Moldova for the period 2005-2013 and Armenia totally privatised former state-owned banks (Banks of the CISs, 2008-2014), after the world financial crisis 2007-2009 there was an increase in state ownership both on a country level as in Russia, Kazakhstan and Tajikistan, and on a regional level.

The world financial crisis caused the banking sector's growth rate to slow down all over the region. Banks experienced a liquidity crunch as they couldn't refinance borrowing from

international markets (Mitra et al 2010). There was an overall decline in financial intermediation after the crisis in all the regional countries involving a decrease in lending to households and enterprises, an increase in interest rates and a deterioration of banks' portfolios.

There is a trend of financial reintegration among the CIS countries. Because the banking sector is the most developed sector of the financial system, the most intensive integration within the CISs is in the banking sector. According to many experts, financial cooperation among the CIS countries was very weak for many years (Petrov, 2011). The increased integration process started in the pre-crisis period of 2007-2009. It was due to economic growth in the CIS countries and to legislation to liberalise finance, which eased the access of foreign financial institutions to the markets in many CIS countries. The other reason was to promote economic and political influence in the region by Russia.

Overall, the banks in the CISs were transferred into commercial banks and adopted the concept of conventional banking though to different degrees across countries. There were achievements of the banking sectors in the CISs. Banking sectors were the most dynamic sectors in the CISs, and had very high growth rates, which exceeded GDP growth before the world financial crisis of 2007-2009. The banking sectors slowly recovered after the crisis. The other positive achievements were introduction of International standards of financial statements, Basel standards in the most of the CIS countries, and liberalisation of the banking sectors, which allowed foreign banks entry to the markets and increased competition and services quality and diversification.

Chapter 3 examines bank performance in terms of technical efficiency in the CISs with particular attention to the impact of bank ownership and risk-taking behaviour and addressing

environmental effects on technical efficiency. It seeks to answer specific questions including: How do bank ownership characteristics affect bank technical efficiency? How does bank risk-taking behaviour affect bank efficiency in the CISs? While focusing on these issues, this study also controls for the effects of other environmental factors, such as the 2007-2009 global financial crisis, GDP growth, and entrance into the customs union agreement.

The CIS countries appeared to provide fertile testing grounds for the analysis of the impact of ownership on efficiency because of the presence of sufficiently large numbers of each type of bank such as state, private and foreign banks. The changes in regulation and supervision have critically transformed banks' risk-taking behaviour, which is another concern of our study. We investigate the influence of different bank level factors such as capital, credit, liquidity and market risks on bank technical efficiency. We also include other bank level and environmental variables into the model to account for cross-country differences and to mitigate the bias in efficiency scores estimation (Kumbhakar and Lovell, 2000).

The objectives of Chapter 3 are three-fold. The first is to estimate consistent technical efficiency measures for the CIS banks under the influence of different bank level and environmental factors. The second is to investigate the links between bank performance and internal bank level factors such as capital, credit, liquidity and market risks, which are likely to influence the differences in efficiency. The third is to provide information and insights for financial sector authorities and practitioners on banks' ownership structure, which influences performance in the CISs; analysing risk-taking behaviour, which places banks closer to or farther from the best-practice performer, would shed light on managers' strategies and help them to correct business policies and to improve their own performance.

This Chapter contributes to the debates on financial sector performance in transition countries, particularly the CIS banking sector. It also contributes to literature by investigating the impact of CISs ownership in the region on bank efficiency. The CIS banking sector technical efficiency measures are derived from a common stochastic frontier for the CIS countries, which to our knowledge has not been done before. Secondly, it measures the impact of different ownership structures (state, private domestic, and foreign ownership and ownership based in other CIS countries) on technical efficiency. The changes in regulation and supervision have critically transformed banks' risk-taking behaviour, therefore this Chapter also considers the influence of capital risk, credit, liquidity and market risks on technical efficiency. The impact of environmental factors such as the 2007-2009 global financial crisis, GDP growth, and custom union entrance on technical efficiency is also measured. Methodologically this chapter estimates technical efficiency employing a hyperbolic distance function offered by Cuesta and Orea (2002), which assumes simultaneous change in input and output, and which is modified by estimating time-varying hyperbolic technical efficiency in our study.

Chapter 4 examines the cost and profit efficiency of the CIS banks and investigates the impact of banking sector ownership and risk-taking behaviour on bank cost and profit efficiency. Different concepts of efficiency introduced in this study extend the analysis of bank efficiency, and offer a comprehensive study of the CISs banking performance. The cost and profit concepts are based on economic optimisation as a reaction of bank management to market prices and competition (Berger and Mester, 1997). The estimation of cost and profit efficiency allows us to further extend the analysis and investigate the process of integration in the banking sector of the CISs by testing for convergence in bank cost and profit efficiency.

This Chapter specifies research questions as follows: How do bank ownership characteristics and risk-taking affect banks cost/profit efficiency? To what extent has financial integration taken place in the banking sectors in the CIS countries in terms of cost/profit efficiency scores convergence?

Thus the objectives of this Chapter are: first, to extend the analysis of the CISs banking and implement a different concept of efficiency namely cost/profit efficiency for a comprehensive analysis of banks performance; second, to analyse the influence of different types of ownership and risk-taking behaviour on banks cost/profit efficiency; third, to assess the integration of banks among the CISs by measuring the convergence in cost and profit efficiency scores convergence; finally, to provide information for policy makers and/or financial sector authorities in the CIS countries on the banking sector policies in terms of better services and financial reintegration of their banking sectors.

This Chapter contributes to the literature by estimating cost and profit efficiency of the CISs banks with cost-minimisation and profit-maximisation behavioural settings by incorporating relative prices, which represents a more demanding criterion than technical efficiency on its own. Cost and profit efficiency indicates the ability of managers to respond effectively to changes in the relative prices (Kumbhakar and Lovell, 2000). Secondly, in the same way as in Chapter 3, estimates are derived taking into account the impact on cost and profit efficiency important variables, such as ownership type, risk-taking behaviour and different environmental factors. Thirdly, following the specification for panel data analysis by Canova and Marcet (1995), this Chapter proceeds to the estimation of β- and σ-convergence of cost and profit efficiency scores, and further analyses integration processes in banking sectors of the CISs.

Chapter 5 investigates the impact of competition on the stability of banks in the CIS transition countries. There is no clear consensus in the literature on possible impacts of competition on stability. Some literature argues that competition makes for financial stability (Beck et al., 2004; and Allen and Gale, 2004), while other literature conjectures that there is a trade-off between competition and stability (Carletti and Hartmann, 2002; Beck et al., 2013). In this regard, the research questions that this Chapter addresses are: Is there a trade-off between increasing competition and stability in the CIS banking systems? Do we need to promote competitive dynamics to improve financial stability? What forms of regulation enhance financial stability?

The objectives of the Chapter are first to explore relationship between stability and competition in the CIS countries; second is to analyse the influence of environmental factors such as legal rights and supervision on financial stability in the CISs; finally to provide information for policy makers and financial sector authorities on whether the CIS countries need to encourage competition to maintain financial stability.

Chapter 5 contributes to the literature on competition and stability by explicitly concentrating on the competition and stability nexus in transition countries. Our research attempts to revisit these two competing views and empirically investigates whether competition is good or bad for stability. Moreover, this Chapter examines the influence of regulation and supervision practices on stability in the CISs countries and elaborates further on related policy issues. For our analysis, we combine data on bank and country levels to explore the factors of banking sector policies that influence banks' stability outcomes. Further our research benefits from dynamic panel data analysis, which provides comparisons across-country and across-time.

Chapter 6 concludes this thesis with a review of the main findings discussed throughout the thesis and a discussion of policy implications.

Chapter 2

Banking in Transition Economies: Historical Survey

Preamble

This chapter is a literature survey and historical overview of the financial sectors development in transition countries including the CISs[1]. It starts with the analysis of the state of the finance in the soviet era with monobank financial system, covers processes of creation of two-tier banking system and financial liberalisation in the post-soviet countries with an overview of transition theories, and proceeds with a discussion of banking sectors in the CIS countries. The present study aims to contribute to the better understanding of the transition processes in the post-soviet countries by providing empirical evidence of banking sector development in the post-soviet countries.

2.1. Introduction

The purpose of this Chapter is to introduce some of the major issues related to banking in transition countries and chronicle the massive changes in the transition countries and their influence on the financial systems landscape in those countries nowadays. Market reforms in the CISs resulted in the creation of two-tear banking systems out of monobank systems and the reforms were enshrined in legislation concerning central bank and commercial credit institutions.

[1]The CIS countries are the former Soviet Union Republics, which included as of 2013 Armenia, Azerbaijan, Belorussia, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine and Uzbekistan.

We examine the development of transition countries in several stages. Section 2.2 sets the stage by providing an overview of historical development of banking in the former Soviet Union and creation of monobank financial system, which is included here for the following reason. It is crucial for understanding of financial system functioning in the former Soviet Union economies nowadays. The historical analysis of the financial system developments provides the basis to understand the main features of banking in transition. Despite the long period of reformation the financial systems in most of the transition countries (particularly in the former Soviet Union countries) have features, which are the legacy of the centrally planned economy. The section is complemented with a historical overview of banking in other ex-soviet countries where necessary.

Section 2.3 gives a retrospective analysis of financial reforms and transition of the monobank system to two-tier banking system in the former Soviet Union with a short review of the reforms in other ex-soviet countries. We start with the literature survey of theoretical grounds for financial sector reforms by providing key theories on the relationship between liberalisation of the financial sector and economic growth. However, the main emphasis is on the transformation of one-tire banking system to two-tier banking system in the period before and after the change of political regimes.

Section 2.4 reviews the banking sectors of the CIS countries after the completion of main banking reforms (2005) to the present in figures. Financial systems in the CIS countries reflect various economic and political paths, yet share common properties. The banking sector is the key form of financial intermediation in the CIS countries as fledgling capital markets are underdeveloped or non-existent. Comparatively developed organised capital markets exist in Russia and Kazakhstan. The divergence in the development of financial sectors of the CIS

countries after the demise of the Soviet Union is rooted in the innate differences of the economic and real sector development in particular countries. Banking in the CISs can be distinguished as most developed, medium developed and underdeveloped based on assets per person and assets to GDP criteria[2]. The banking sectors even in the countries with the most developed banking sectors remain underdeveloped. The indicators of financial intermediation are still lower than in developed countries. For example, the regional unweighted average of total assets to GDP ratio is about 56% and the bank credits to GDP ratio is about 36%. In most developed economies, assets and loans exceed 100% of GDP.

The CIS countries differ in their ownership structure. State-owned banks dominated the banking sectors of Belarus, Russia, Turkmenistan, and Uzbekistan in 2013, and while there was a net increase in state ownership between 2005-2013 in Russia, Kazakhstan and Tajikistan, there was a reduction in state ownership in Azerbaijan, Belarus and Moldova, whereas Armenia totally privatised its banking sector. Armenian, Moldovan and Kyrgyz banking sectors are dominated by foreign capital from the CISs region and from outside of the region.

From the other side, there are big achievements of the banking sectors in the CISs. The banking sector was the most dynamic sector in the CIS countries, and had very high growth rates of its assets and credits to the economy before the world financial crisis 2007-2009 and slowly recovered after that. Liberalisation of the banking sectors allowed foreign banks entry to the markets, which increased competition and the quality of services, and diversified banking services. Most of the CIS countries introduced international standards of financial statements,

[2] The first group consists of Russian, Kazakhstan, Belarus, and Ukraine banking systems, the second group includes Azerbaijan, Armenia, Moldova, and the last group is represented Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan.

which contributed to transparency and a better monitoring of risks. Introduction of Basel standards had a positive impact on capitalisation of banking sectors of the CISs (Kazakov, 2007).

Section 6 examines re-integration of finance in the CISs. The on-going processes of financial integration among the CIS countries, mostly initiated by the private sector, were enhanced by economic growth in the pre-crisis period of 2007-2009; and financial liberalisation facilitated further integration among the CIS countries. Later, financial integration was politically supported in understanding of financial institutions' role in re-integration in the region, and the official programmes were signed. Documents support the creation of a common financial market for the CISs within the Eurasian Economic Community (2007-2010) and aim at currency and financial cooperation as a priority within the strategy of economic development till 2020. Integration in the banking sector is the most intensive as this segment of the financial system is the most developed one in the CIS countries. Section 7 concludes the chapter.

The discussion is supported by statistics and an analysis of banking sector performance in each country to compare the CIS countries banking systems development. The data includes the banking sectors of Armenia, Azerbaijan, Belarus, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Ukraine and Uzbekistan. The main data source for this chapter is the websites of Financial and Banking Council of the CISs[3], World Bank Financial Indicators and websites of some commercial banks. The data are also available at National banks of Azerbaijan, Belarus, Kazakhstan, Moldova, Ukraine, Central banks of Armenia and Russia's websites. The data are not representative for Uzbekistan though the main indicators are available on a yearly basis. The data used in this chapter are different from the Bankscope database we used for empirical studies

[3] The website available in Russian: http://www.fbc-cis.ru/

in two ways. On one hand, they are stronger in terms of whole banking sector coverage, while the Bankscope presents only banks, whose data were provided to it. On the other hand, the data represent only key banking sector indicators, though with more precision but aggregate at the country level: such as assets, capital, credits, non-banking sector funding, and number of banks in each country, while the Banksope database provides data at a bank level in each county. However, for our comparative analysis of banking sector development in the CIS countries, the more precise aggregate data are preferable.

2.2. Finance in the former soviet bloc countries

This section adopts a historical perspective to analyse financial system developments in the CIS countries. It looks at earlier periods of formation of the financial systems under the soviet rule in the USSR, discusses the main principles of the monobank financial system in the USSR and because of the similar features, it only touches main financial developments in other soviet bloc countries where relevant.

2.2.1. Establishment of the Soviet financial system

The financial system of the USSR was the totality of the various subsystems of financial relations in which funds of monetary resources were formed and utilised in a planned way. This general summary of the financial system in the USSR was given by the professor of Moscow Financial Institute Allakhverdyan (1966).

Although the creation of a new financial system in the beginning of the USSR was characterised by lack of theoretical background and was a result of trial and error method, there were two main features of financial policy and system in that period. The first is that the financial system should cope with inflation. Second, it should supply the real economy with finance after the physical output was planned. This was because of the prioritisation of the physical output over financial variables (Gregory and Tikhonov, 2000).

The systemic review of the finance in the USSR is facilitated by the textbook "Finance and Credit of the USSR" by Lavrov (1972). The textbook provides a historical overview of the creation of the financial and credit system since 1917 and new principles in organisation of the finance-credit activities in the USSR in the late 1960s.

The principles of the new financial credit system of the USSR were grounded in the documents of the Communist party and reflected the fundamentals of collectivist policies. The first measures in the financial sector of the Soviet power in 1917 were the takeover of the central bank – Gosudarstvennyi Bank (later Gosbank), nationalisation of private banks and creation of single Narodnyi Bank (People's bank).

During the establishment of the Soviet state and transition from capitalism to socialism, besides nationalisation of the banking system other measures, allowing accumulation of savings, were undertaken. These were the expropriation of private property such as plants, factories and land, a state monopoly on trade and the nullification of all external and internal governmental debts of the Tzarist times. As in the Tzarist times Russia was mostly an agricultural country, the accumulation and centralisation of finance and savings was crucial for the industrialisation plans of the Soviet state (Lavrov 1972).

1920s. There is a substantial literature describing money and credit in the period of the New Economic Policy (NEP) of 1921-1928. This literature was reviewed by Davies in his work "Short-Term Credit in the USSR: Some Post-War Problems" (1953). The main characteristic of that period was that before 1928 the USSR adopted the relatively loose New Economic Policy. While agriculture, retail trade, service sector, food and light industry were in private property, the government retained control over the heavy industry, transport and banking sectors, wholesale and international trade. The NEP was withdrawn in 1928 with the introduction of the First Five-Year Plan 1928-1933. The Plan's first aim was to accumulate resources to improve the industrialisation of the USSR, where heavy industries lagged behind the other industrialised countries, and there was the need for the defence industry to be built.

Although the central emission and control of money and credit was an official policy from the beginning of the Soviet state, in practice money and credit were increasing faster than was planned by the officials. Quite the opposite, the centralised control in the 1920s was characterised as "dictatorship of finance" and not as a regime in which finance followed planned physical output. Enterprises were involved in issuing commercial credits to one another which led to soft budget constraints for insolvent enterprises, and commercial banks could monetise those credits if Gosbank refused to do so (Gregory and Tikhonov, 2000).

The achievement of the NEP was that economic activity increased during that period after the civil war and foreign intervention. Financial policy and creation of new cooperative, communal municipal banks and specialised banks such as the Central Agricultural Bank, the Bank of Long-term Credit to Industry, during the period of the NEP improved finance of enterprises by reestablishment and development of long-term banking credits for capital formation (Lavrov, 1972).

The centralised soviet financial system included all Soviet Socialist Republics after their status was established by about 1922. The centralised budget of the USSR consisted of union budgets of the Soviet Republics and each Republic was given some part of resources for socio-cultural needs (Lavrov, 1972). This redistribution was in favour of the centre, while in other republics reigned starvation and poverty.

1930s. However, the credit reforms of 1930-1932 led by the Stalinist wing of the communist party banned commercial credit and established direct banking transactions on the basis of principles of urgency, payback and purposive character of a credit; the transactions among enterprises were required on a cashless basis or in accounting money (Gregory and Tikhonov,

2000). The credit reforms were conducted during the First Five-Year Plan 1928- 1933 and were one component of it[4].

The reforms aimed to restrict credit expansion by making Gosbank the sole bank of issue. Gosbank had functions of an administrative-command centre to impose hard budget constraints to prevent the abuses by enterprises during the previous period, when they could easily get credit for their sales without control including mutual settlements[5]. There had to be financial planning for credit as for physical output. Although, the aim of the reform was to control excessive expansion of credit on free basis by enterprises themselves and by banks other than the Gosbank, the big scale of credit issues to finance the planned industrialisation in the country by the Gosbank led to inflation and increased prices in the USSR during the reforms.

Also the credit reforms had to ensure that credit covered the physical output and that enterprises were efficient. In practice the reforms didn't solve the problems. The financial indiscipline remained, although illegally, after the reforms were introduced (Gregory and Tikhonov, 2000).

2.2.2. The role of finance in the planned economy: the monobank system

Here we discuss the main features and principles of the banking system in the Soviet Union and because they were mostly similar in all soviet bloc countries, we will refer to differences only where relevant. Regarding financial reforms in transition counties, we distinguish between

[4] The First Five-Year Plan October 1928 - October 1933 was accomplished pre-schedule before January 1933. The nest Five-Year Plan was developed for 1933-1937 years and approve by the All-Union Communist Party of Bolsheviks in 1934.

[5] Payments between enterprises for goods they purchase from each other issuing notes that should be cashed later with the central bank.

banking system developments in the CEE countries and the former Soviet Union countries due to their great differences both geographically and in the level of transition[6].

The subordinate role of the financial system to planned physical output was instigated during the first five-year plan in the 1930s in the USSR and from the end of the 1940s in the Eastern European countries. It was passive banking with two types of money developed under the system: money for accounting and cash money for exchange. The passive banking means that the finance was following physical planning. Accounting money served as the unit of account for transactions between enterprises and government and among enterprises themselves for mutual clearance. Money, which was used by the population for purchases of goods and services and salary payments, had within certain limits the functions of store of value and medium of exchange. Separation of c*ash money and accounting money* helped to control *planning* as consumers' spending decisions could not influence production. The role of banks in such a system was channelling credits from the central bank to enterprises.

Credits for enterprises were planned by the central government. Interest rates for the loans were not determined by the credit and capital markets in the context of central bank policy as in the western market economies but were also set by the authorities (Barisitz, 2008). Enterprises had to open their bank accounts in the regional branches where they were located. All transactions between enterprises and the state and among enterprises themselves had to be carried out through these accounts in credit and debit form (cashless) and all enterprises' cash revenues had to be deposited in these accounts. Thus, when the credit was given to an enterprise by the central government, it was given as an order to produce and it was mostly cashless. When an enterprise

[6] The division has its roots in the EU influence on economic development and the EU membership perspective for the CEE countries, while the CIS countries financial system development remains specific for these countries' situations (Barisitz, 2008; Mitra et al., 2010).

produced its ordered output, the output was again centrally collected and redistributed among regions (Republics in case of the USSR), and it was usual for this redistribution to be disproportional in favour of the centre. This is important for understanding of the central government 'credits' to the Republics in the former Soviet Union, which were not money but orders to produce and cashless.

The monobank financial system in the soviet bloc countries took the form of interdependent functional financial units. This was a one-tier banking system because all the financial activities were vertically dependent. There were four main functional units. The central bank was responsible for overall control of the financial system and also was a provider of all loans to enterprises. Depending on the country, the state banks other than central banks could perform the function of a loan provider to enterprises[7]. The bank for foreign trade was engaged in foreign exchange transactions under strict rules, facilitating of foreign trade, and managing foreign debt. Foreign trade itself was the monopoly of the state. The other financial unit of the system was banks dealing with peoples savings.

The shortcomings of planned economy

There were shortcomings of the planned economy and monobank system. Within the monobank system banks could totally control all the transactions and had a role of supervision of the performance of enterprises in accordance with the central plan. The control of the enterprises resulted in disciplinary measures, rather than bankruptcy, against those enterprises which did not meet the planned output or credit plan. Though these disciplinary measures resulted in administrative sanctions, in the end enterprises were provided with new credits under the strong condition to fulfil the plan, which led to a soft budget constraint.

[7] In the USSR the specialised banks were created on the bases of the central bank divisions to credit enterprises.

Inefficiency of enterprise control resulted in systemic violations of planned output. The real amount of output was concealed from authorities as well as needed supplies available in storage. The biased information provided by the enterprises to the authorities led to imbalances in the planning. Premiums received by the enterprises for their plan fulfilment, which did not match the real production output, were spent for goods and services. According to Hayek (1990), the biased information between enterprises and central planners and lack of incentives to reveal information was the most important cause of underperformance of the planned socialist economies compared to the market economies. In turn, Manove (1973) argues that the problem of information in planned economies could be seen as delays of information to be incorporated into the central planning. For example, the current production may reveal the shortage of a particular input good in production of the final good. However, the information of the shortage could be collected and updated only for the next production period plan. These imbalances in the planning and non-price rationing of intermediate goods production led to shortages and delays in the Soviet economies.

2.3. Reforms of the monobank financial systems

This part continues a discussion of the financial system developments in the post-soviet countries. We review the relationship between liberalisation of the financial sector and economic growth. Further we reflect early reforms in transition countries such as beginning of creation of two-tier banking systems and proceed with reforms of the financial system after the change of political regime.

2.3.1. Financial sector liberalisation literature survey

The ultimate goal of financial system reforms is economic development and growth. Theories and empirical works advocate positive relationship between financial development and economic growth (Levine, 1997). Financial development in turn has a positive association with financial liberalisation. Liberalised and deregulated financial system with positive real interest rates would stimulate savings and thus there would be more funds for investment, which in turn enhances economic growth (McKinnon, 1973), and the growth of industries that relies on external finance (Rajan and Zingales, 1998).

Liberalisation strategy that leads to financial deepening and thus advances economic welfare is important (Shaw, 1973). Although the positive corollary between financial development and long-run growth exists, the critical issues such as financial panics and recessions occur (Levine, 1997). Measures for strengthening regulation of the banking system to prevent boom-bust cycles are also advocated in the mainstream economics (Goodhart, 2007). Stiglitz et al (1993) supported government intervention in the financial markets in the form of regulatory interventions, financial repression, and direct credits. This attitude comes from the point of view of market failures.

There is no doubt that financial liberalisation in the post-soviet counties needed to be done; the challenge is the sequence and the limits of the liberalisation of financial sector. Since, if the financial sector remains inadequately supervised, it can become unstable and lead to financial crisis. This has never been more apparent than during the recent financial crisis of 2007-2009.

Banking sector is one of the most important financial intermediation in the world. From Schumpeter's (1912) point of view, the banking system has the function of credit creation, which makes the banking system the engine of the economy, and by that credit creation function the banking system makes the economic growth possible (1912). The Schumpeterian model is a pure bank model. His theory of instability is a business cycle theory, so that there will always be a downturn. When new investments come on stream, the production of new products starts and old industries stop producing. This is a creative destruction process, which is good for development. This business cycle can be associated with financial crisis. Thus, his position is that the financial crisis is a result of the business cycle. Therefore, with a good policy of state intervention and regulation and economic performance there will be no crisis but only an economic downturn.

Liberalisation of *banking markets* should increase the supply and improve the allocation of funds for investment. The impact of financial liberalisation on the supply of funds is theoretically ambiguous (Leaven, 2003). On the macro level McKinnon (1973) and Shaw (1973) analyse the influence of interet rate liberalisation, which is the key component of financial reforms, on household savings. They state that under the repressed finance artificially low interest rates would increase after liberalisation. Increased interest rates on deposits would raise household savings providing more funds available for investment. On the other hand, Van Wijnberger (1983) argues that, if time deposits are closer substitutes for existent informal market's loans

than for cash, the impact of an increased deposit rate on the amount of loanable funds should be negative given that banks are subject to reverse requirements. Devereux and Smith (1994) demonstrate that precautionary savings may decrease due to improved international risk sharing as a result of financial liberalisation. Consequently, overall funds available for investments are reduced.

The allocation of funds for investment after financial liberalisation is also theoretically ambiguous (Leaven, 2003). Financial reforms should improve the allocative efficiency of savings. Interest rate ceilings under the repressed financial systems lead to distortion of credit allocation and to underinvestment in risky yet high expected return projects (McKinnon, 1973; Shaw, 1973). The liberalisation also alters directed credit programs and thus leads to an increase in the pool of funds allocated to risky investment projects because of risk sharing improvement (Obsfeld, 1994). Financial liberalisation leads to efficiency gains because financial intermediation is increased by the formal financial sector. Banks and capital markets are better in allocation of investment funds as a result of economies of scale in information gathering and monitoring, which should lead to a reduction of cost of capital (Leaven, 2003). At the same time Gertler and Rose (1994) argue that a general rise in interest rates in a number of countries due to financial liberalisation led to an increase in the cost of capital for borrowers, reducing efficiency. Leaven (2003) empirically found that financial liberalisation in developing countries have been inconclusive showing that financial liberalisation increases financial constraints for large firms but small firms gains form financial liberalisation. However, a positive correlation between financial liberalisation and improvements in allocative efficiency of investment was found by (Galindo et al., 2002), although not for all countries.

Financial reforms for *the whole financial sector* advocated by the mainstream economics include liberalisation of domestic finance and trade, and liberalisation of capital account and exchange rates. However, there is no consensus about capital account liberalisation. The sequencing approach propagates deliberate and gradual liberalisation of capital account after domestic financial sector is restructured and made "sound". On the other hand, further capital controls have many proponents such as Stiglitz (1993), Rodrik and Subramanyan (2009), and Eichengreen and Adalet (2005).

Potential benefits of capital controls are as follows. Capital controls can dampen boom-bust-cycles of capital flows, prevent financial crises, support intermediate exchange rate regime with stable but adjustable exchange rate, enable more monetary policy autonomy, and lower country risk premium. Capital controls can protect weak financial sector, buy time for gradual improvements, which is characterised as 'third line' of financial sector defence, while the first protection line is when banks protect themselves, and the second line is prudential supervision and regulation (Priewe and Herr, 2005). According to Priewe and Herr (2005) other policies such as prudential regulation and supervision of financial sector such as full hedging of external debt, rapid financial sector reforms especially quick cleaning of balance sheets, or foreign exchange reserves to safeguard exchange rate stability are unable to substitute for capital controls. Although there are potential disadvantages of capital controls, nevertheless macro level benefits offset downsides. They offer a scheme of sequencing of capital controls and capital account liberalisation. There should be in place preconditions for full capital account liberalisation such as macroeconomic stability, trade liberalisation, full convertibility of currency, *domestic financial liberalisation*, 'sound banking' (which includes capital adequacy requirements, prudent

supervision and regulation, disposal of bad loans, good auditing standards, etc.), privatisation of majority of banks and international taxation agreements.

The McKinnon (1973) and Shaw (1973) gave start for theoretical and empirical works on financial liberalisation by their seminal work. According to Fry (1989) several developing countries adopted the McKinnon-Show approach of financial liberalisation. The lessons of reforms showed that the theoretical frame is lack of important prerequisites for successful financial liberalisation such as macroeconomic stability and adequate prudential regulation and supervision of the banks. It is admitted by McKinnon (1986) that successful liberalisation is not simply a question of removing all regulations. Fry (1989) concluded that price stability, fiscal discipline and policy credibility were the key factors that led to Asian successes in financial liberalisation; at least four prerequisites should be in place for success: "macroeconomic stability, fiscal discipline, improved legal, accounting and regulatory systems for the financial sector, and a tax system that does not discriminate excessively against finance".

2.3.2. Early reforms in transition countries: creation of two-tier banking systems

2.3.2.1. Reforms in the CEE countries

The awareness of existing problems in Soviet economies led to a number of reforms of finance in the soviet bloc countries. Barisitz (2008) gives an overview of reforms in different post-soviet countries, which we incorporate into our theme. Reforms were introduced in East Germany in 1963 following reform recommendations by Liberman Y. The reforms of 1967-68 in Czechoslovakia were stopped by invasion of armed forces of the Warsaw Pact in August 1968. Economic reforms in Hungary known as the "New Economic Mechanism" were introduced in

1968. All these reforms were partial and some of them were cancelled in the late 1970s. The only banking system which differed from other planned economies was the Hungarian system. Banks could select their clients though based on the central government planned goals. Another country which differed by its quasi-market orientation was Yugoslavia, which diverted from planned economy in the 1950s. However, the central government had different means to exercise control over enterprises and banks in exchange for protection from bankruptcy and competition. Further reforms attempting to decentralise the banking system were undertaken in the 1980s. Hungary decentralised its banking system in 1987 and Poland did so in 1989.

The main feature of the reforms was creation of a two-tier banking system**.** This process took the form of changes in legislation of the central bank and the financial sector regulation. It permitted the separation of commercial banking from the central monetary authorities and brought commercial banks under the jurisdiction of special financial institutions still owned by the state. The central banks continued to be in charge of the planned financing in some of the soviet countries while in others the central banks mainly became responsible for monetary policy and supervision of the banking sector.

2.3.2.2. Reforms of the financial sector of the USSR

The financial system, which was formed in the beginning of the Soviet state, remained as a "standard system" for the further existence of the Soviet Union (Garvy, 1977)[8] although some reforms were undertaken in the period before the collapse of the Soviet Union.

[8] George Garvy was a vice president and senior adviser of the Federal Reserve Bank of New York. He produced the scientific analysis of the Soviet financial system. His work "Money, financial flows, and credit in the Soviet Union" of 1977 represents the Soviet credit and banking system of the USSR and is based mainly on the sources from the Soviet Union.

In 1965 reforms of the financial system in the Soviet Union were led by Alexei Kosygin – the Prime Minister of the USSR. Central financial planning was not completely removed but enterprises were given more freedom in managing their finance and working capital. The banking system was not changed but its role in channelling finances to the enterprises was increased (Garvy, 1977). However, the stagnation of the economy in the Soviet Union continued and partial reforms could not resolve all the problems. This led to the next wave of reforms in the Soviet Union's financial system.

The Soviet Union started reforms of the banking system during 'perestroika' led by M. Gorbachev in 1987. By the Decree of July 17th 1987[9], the government of the USSR started reformation of the banking system in order to improve the economic situation in the country. The USSR financial system was represented by three nation-wide state owned banks: Gosbank of the USSR (the State Bank of the USSR), Vneshtorgbank (Foreign trade bank) and Stroybank (Construction bank) of the USSR. The main goal of the banking system reforms were transformation of banks onto a commercial basis and creation of a two-tier banking system**.**

Six banks as specialized institutions were formed on the basis of the three state owned banks. Gosbank of the USSR – State Bank of the USSR – was still responsible for overall control of the financial system. Promstroibank of the USSR – Industrial Construction Bank of the USSR was giving credits to industries, construction, communications and transport sector. Vnesheconombank of the USSR – the Bank of Foreign Economic Activity of the USSR, which was formed out of the Vneshtorgbank, served transactions in foreign currency and was given more functions later on. Agroprombank of the USSR – Agricultural Industry Bank of the USSR

[9]The Decree Number 821 of July 17th 1987 "On development of the banking system in the country and strengthening of their influence on the increasing of the economic effectiveness"

was specialised in giving loans to the agricultural sector, including collective farms (kolkhoz) and soviet farms (sovkhoz). Zhilstroibank of the USSR – Housing Construction Bank of the USSR gave credits to the housebuilding sector, trade and light industry. Sberbank of the USSR – Saving Bank of the USSR was formed out of the people's savings, which were put in the state saving branches all over the country (Barisitz, 2008). But still those banks served mainly as channels for distribution of direct credits.

An element of the market relations introduced in the mechanism of the banking system of the soviet countries was the permission to open private banks. Many smaller commercial banks were created, which represented the elements of market economy in the financial system of the USSR. One of the examples was the first of its kind cooperative bank in the USSR founded in Chimkent city (South Kazakhstan) in 1988. The reformation of the financial system led to an increase in the number of banks and their specialisation.

2.3.3. Reforms of the financial system after the change of political regime

Transition of the financial sector in the CIS and CEE countries after changes of the political regimes was swift and incisive, taking into account dramatic changes in socio-economic structures in those countries. The transition of the banking system took place in an environment of economic turmoil. The recession of the transition period and breaking of trade ties both within the post-soviet bloc among member-countries of the Council for Mutual Economic Assistance and among former Soviet Republics of the USSR, badly influenced banking as well.

According to Baristitz (2008), there were *two main reform stages* in the CEE and CIS countries during the first decade of transition in the 1990s. The first reform wave was characterised by

restructuring banking systems from the soviet monobank system to a two-tier banking system, from planned credits and price control to price liberalisation and market based selection of banks' clients.

The banking sector in the CEE and CIS countries followed a more or less similar path till the mid-1990s. The structural reforms of the economic institutions did not achieve the critical mass needed for macro stabilisation except in Hungary and Poland. The financial sectors were still underdeveloped.

In the beginning of 1990s, banking sectors also inherited poor performing loans to enterprises, which were not viable or solvent, and could not trade their products and did not pay their debts. This in turn exacerbated solvency problem of incumbent banking firms. Although, there were no longer centrally determined credit plans that banks had to follow, banks had no expertise and no experience in market-oriented skills and corporate governance. Banking regulation was very loose and underdeveloped, even didn't exist in some areas. This regulatory environment allowed the easy creation of private banks, which increased considerably in number during this period. Moreover, the underdeveloped legal framework for the financial sector increased opportunities for corruption, fraud and insider lending in the financial sector (Heffernan, 2005) .In fact, financial institutions in transition countries did not perform the functions of banks as they do in a market economy, but functioned as "pocket banks" or "agent banks" for their owners or firms. Banks were managing and making transactions with their owners' wealth. They were mostly small, sometimes owned by the state-owned enterprises, state agencies or by specialised banks (Tompson, 2004). Thus, the financial systems of the soviet countries during the late 1980s and early 1990s, represented a mixture of the state commercial banks under weak regulation, private

banks pursuing their own goals, and central banks in some cases still responsible for central planning transactions.

However, the measures of the first wave did not get rid of all the features of the soviet financial system such as refinancing of state owned enterprises, favoured projects or the government interference (Barisitz, 2008). These features are characterised as soft budget constraints in economic literature (See Kornai, 1979, 1980, 1986).

High inflationary pressure, slow structural transformation and accumulation of bad loans in these countries together with external shocks because of broken links between countries during the first transition period, resulted in financial crises in some of the countries and in the permanent threat of financial breakdown in the others. This led to the *second wave* of financial sector reforms in these countries. Many small banks went bankrupt first, but at least one large financial institution went bankrupt in each of the countries. The reduction of the number of the financial institutions increased confidence in the sector as it showed that the times of 'wild capitalism' in the financial sector had gone. This was the main period in which privatisation of the local banks in the Eastern Europe took place, with foreign banks taking big stakes. It changed banking in those countries and linked them to the Western European banks in the EU.

The following consolidation of financial institutions in the end of 1990s, which had increased in numbers because of the high profit opportunities, by tightening of monetary policy and introduction of rules for banks, did not lead to the abolition of directed credits or state owned banks, which dominated the financial sector.

The triggers to the banking reforms of the second wave in Russia and Bulgaria were the financial crises of 1998 and 1996-1997 respectively, which were the most severe among the post-soviet

countries. Other countries such as Belarus, Croatia, the Czech Republic, Romania, Slovakia and Ukraine also had financial crises though less severe. The main consequences of the crises were that financial sectors were more strictly supervised, although financial institutions began to hold a larger proportion of their assets in safe government securities and as deposits with the monetary authorities. This is not true for Belarus as the command regime and directed credits remained in this country. It is also not fully true for Russia. The crisis of 1998 in Russia was due to the state's default on its debt to its creditors including banks.

The two reform waves are common to most of the post-soviet countries except Poland and Kazakhstan, where the changes and reforms were continuous; and the Federal Republic of Yugoslavia[10] where the reforms started to take place later in the 2000s after a series of wars and when more pro-reform governments came to power.

Among CEE countries Hungary, Poland, Czech Republic and Slovak republic were the leaders in economic and financial reforms. The acceptance of the Central European countries into the EU accelerated their reforms in the financial sector. The acceptance of the former USSR Baltic states into the EU also accelerated the financial sector integration; the countries experienced both the good and bad sides of this integration.

To sum up the above, those countries which were closer to Western Europe and started their reforms of the financial sector prior to the transition of political regimes, that is the CEE countries, were earlier and to some extent more successful in their financial institutions

[10] The Federal Republic of Yugoslavia was formed in February 1992 in the place of former Socialist Federal Republic of Yugoslavia. The FRY consisted of Serbia (including Kosovo and Vojvodino) and Montenegro. The FRY was transformed to the more loose state union of Serbia and Montenegro in 2003. After referendum on independence of Montenegro on May 21, 2006, its independence was recognised internationally by Serbia, EU members, and United Nations Security Council.

transformation than the CIS countries (Barisitz , 2008). But the financial crisis of 2007-2009 covered all the transition countries because of almost similar causes although on different scales. The developments in the CISs banking sectors, which represent two-tire banking systems, are analysed in the following section.

2.4. The CISs' banking sectors

2.4.1. General developments in the CISs banking systems

During the transition the CISs national financial systems were recreated. The banking system in the Soviet Union was not only segmented functionally as was described above, moreover it was centralised in Moscow. After the break down of the single system, financial systems of the CISs were created from scratch. In this regard the financial systems of the CISs have structural similarities but also have some differences in terms of the scale and maturity of the key segments.

The divergence in the development of financial sectors of the CIS countries started after the demise of the Soviet Union. Although the financial system was the same in all the CIS countries, the starting points in terms of economic development for each country were not similar. Because financial sector development depends on a sound real sector in transition countries (Barisitz, 2008) the different economic situation of the real sector in particular countries led to a considerable divergence in financial developments.

The banking sectors of the financial systems of the CIS represent the centre of their financial systems as capital markets are underdeveloped or non-existent (Berglof and Bolton, 2002; De Nicolo et al., 2003). This is the legacy of the planned economy and the undeveloped institutional infrastructure for capital markets.

Based on the criteria of assets per capita the banking sectors of the CIS counties can be split into *three groups*. Developed banking sectors have 2500 and more US$ per capita on average over the period 2007-2014. Banking sectors with medium level of development have between 500 and

2500 US$ per capita and less developed banking sectors have no more than 500 US$ per capita (Table 2.1).

Table 2.1: Banking system assets per person, US$, 2007-2014

Country/Year	2007	2008	2009	2010	2011	2012	2013	1st half 2014	Average by country
Russia	5774.4	6679.2	6815.1	7764.8	9043.7	11383.2	12252.4	12611.6	9040.6
Kazakhstan	6272.1	6277.9	4840.7	5005.6	5218.5	5479.0	5911.3	5477.4	5560.3
Belarus	2091.1	3023.6	3099.5	4607.9	3253.8	3922.6	4361.5	4467.3	3603.4
Ukraine	2552.0	2732.5	2392.9	2579.0	2888.0	3092.6	3515.1	2169.2	2740.1
Azerbaijan	927.2	1463.6	1623.4	1839.7	1976.4	2417.9	2759.4	2862.9	1983.8
Armenia	826.1	1121.4	1182.2	1448.3	1807.3	2061.9	2438.0	2401.8	1660.9
Moldova	789.8	1053.7	910.1	977.2	1143.8	1357.8	1639.6	1602.7	1184.4
Uzbekistan	267.6	316.8	373.6	442.7	513.2	605.1	659.1	674.1	481.5
Kyrgyzstan	224.9	261.9	100.7	228.3	260.4	303.0	392.5	404.9	272.1
Tajikistan	229.9	245.4	150.5	203.5	244.7	276.0	322.9	303.0	247.0
Average by year	4049.1	4617.8	4528.3	5125.3	5815.8	7130.2	7706.6	7635.3	

Source: World Bank- Total Population (in number of people), Banks of the CISs (2008 - 2014), in Russian, own calculation

The most developed banking systems based on the above criteria are in Russia, Kazakhstan, Ukraine and Belorussia. The banking systems of these countries share some common features. Firstly, development of assets and volume in the banking systems make it possible to service large national clients. Second, there is diversified retail banking for domestic consumers. Thirdly, the main part in these countries is played by state or foreign banks, although there are large non-state national banks as well.

The banking sectors with a medium level of development are in Azerbaijan, Armenia, Moldova and Uzbekistan. Banking sectors in these countries are quite developed in spite of the size of the economies. Azerbaijan's banking system benefits from the high trust placed in the banking sector by the population and the high GDP growth that can increase the position of Azerbaijani banking sector among the CIS countries. The Armenian banking sector lacks domestic resources and will

not grow much, remaining an importer of capital. The banking system of Moldova benefits from the trust of the population and the introduction of international standards. The banking sector of Uzbekistan has similarities with the Belorussian banking sector, where the direct influence of the government on the banking sector persists.

And the weakest banking sectors in the CIS are in Tajikistan and Kyrgyzstan. The small population and economic size as well as low trust in the banking sectors will leave these countries' banking sectors with little growth.

2.4.2. Financial crisis of 2007-2009

As is well-known, the financial crisis of 2007-2009 started as the subprime crisis in the US, which stopped investors' capital inflow and threatened a collapse of the dollar (Eichengreen, 2009; Wolf, 2009). The financial crises in the USA became a global financial crisis and touched financial sectors of transition countries as well. The crisis from developed economies was transmitted to transition countries through the channels of exclusion from international financial markets resources, external debt due for payment and decrease of trade volumes and remittances.

The transition countries became financially integrated into the world finance and this made it possible for banks to borrow abroad and caused credit booms domestically, which were characterised as extensive credit growth (Mitra et al 2010). The credit growth was also possible due to insufficient regulation and supervision in the transition countries. The credit growth was of two kinds: wholesale finance on the world markets and western banks credits. For Kazakhstan, Russia and Ukraine the source was wholesale funding for banks as credits raised on world markets.

Before the crises the CISs banking sectors experienced a high rate of growth. The annual growth of total assets in banking sectors from 2006 to 2007, calculated as total assets of ten largest banks in each country, was more than 50% and credits grew by 72%[11]. The credit growth was possible because there was both demand and supply for it. The demand side for the transition countries depended on increased consumption by households to catch up with the Western standards. The source of supply was different in different countries. Supply of credits in the CIS countries had its growth rate peak in 2006 (88.6%).

The crisis caused the banking sector's growth slowdown or even negative growth rates in some of the countries. The crisis caused the most severe damage to the banking sectors of Russia (12.1% of reduction of banking sector's assets growth), Kazakhstan (21%), Ukraine (12.8%) and Moldova (13.7%). Banks experienced a liquidity crunch as they couldn't refinance borrowing from international markets. The after crisis consequences were a decrease in lending to households and enterprises by the banking sector, an increase in interest rates and a deterioration of banks' portfolios as bad loans increased by two to three times (in Russia, Kazakhstan, Moldova and Ukraine) (Mitra et al., 2010). However, resource rich countries such as Kazakhstan and Russia had more space for rescuing the banking systems due to stabilisation funds formed in those countries.

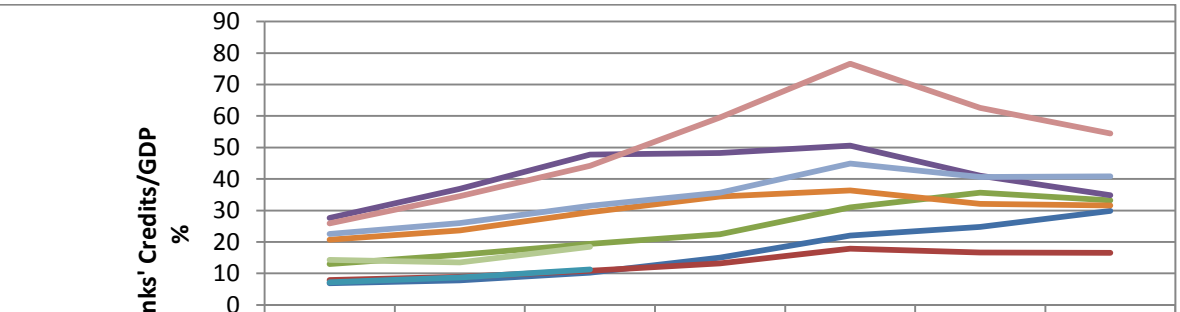
Thus, for the CIS countries, in order to limit the risks of crisis transfer from the world financial markets, measures such as capital account control and prudential regulation, would promote the strength of financial institutions and should lessen the risk of crisis transmission through appropriate monetary and fiscal policy (Mitra et al 2010).

[11] Please, see Appendix A, Table A.1

2.4.3. CISs' banking sectors in figures, 2005-2014

As was mentioned above, before the 2007-2009 world financial crisis the banking sectors of the CISs had a very rapid growth (2005-2007). The banking credits as a share of GDP significantly increased in all the countries. The growth rates of the banking sectors of the CISs were higher than the GDP growths of those countries (Figure 2.1and 2.2). Though the crisis led to the decline of this ratio, the general progress is still obvious.

Figure 2.1: Banks' credits to GDP, 2005-2011 (%)



	2005	2006	2007	2008	2009	2010	2011
Armenia	6.92	7.76	10.28	15.05	22.06	24.73	29.9
Azerbaijan	7.9	8.88	10.87	13.18	17.87	16.67	16.5
Belarus	13.03	15.98	19.4	22.44	30.97	35.69	33.19
Kazakhstan	27.58	36.85	47.71	48.26	50.6	41.05	34.87
Kyrgyz Republic	7.24	8.74	11.28				
Moldova	20.76	23.66	29.46	34.47	36.32	32.12	31.59
Russian Federation	22.55	26	31.49	35.7	44.94	40.66	40.8
Ukraine	25.91	34.52	44.19	59.57	76.66	62.62	54.46
Tajikistan	14.32	13.46	18.48				

Source: World Bank, Financial Development and Structure Dataset (updated Nov. 2013)

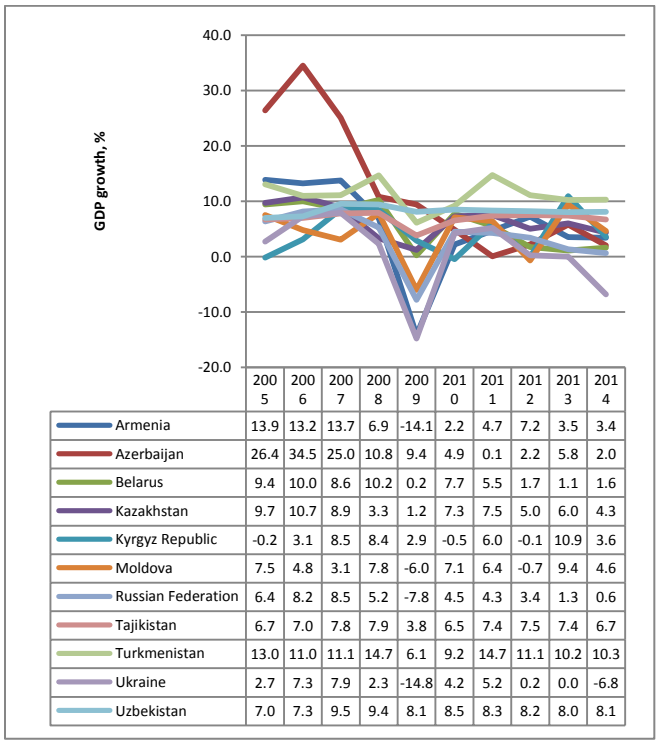
Azerbaijan's banking sector had the highest growth rate among the CIS countries. The absolute growth of bank credit was fastest in Azerbaijan, if we take into account the GDP growth rate, which grew faster than in other CIS countries (the annual growth rate of GDP was 34% in 2007, Figure). The Ukrainian banking sector was growing fast against moderate GDP growth and placed itself among the leaders of the banking sectors of the CISs by the banks' credits to GDP

indicator. The banks credit to GDP ratio was 44.19%, which was the second for the CISs after Kazakhstan for the period 2005-2007. After the economic growth slow down, this indicator was 76.66% not least because of the GDP growth drop in Ukraine.

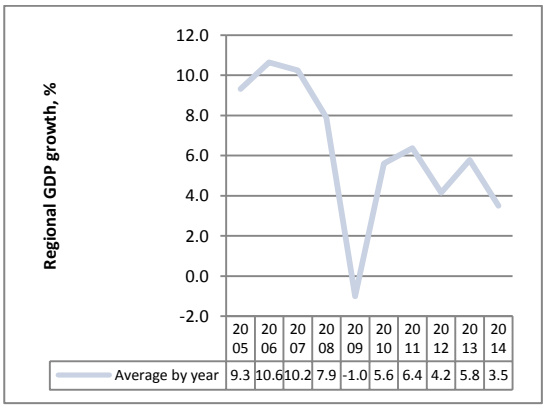
The indicator was the highest before the crisis for Kazakhstan and peaked at 47.71% in 2007. The indicator increased to 48.26% and 50.6% in 2008-2009 respectively, mainly because of the decrease in the GDP. Although the financial crisis led to the decrease in the credit share of GDP indicator, this ratio stays high comparative to other countries' indicators.

The world financial crisis 2007-2009 caused a decline in banking sector growth in the CISs. Moldova, Kazakhstan and Ukraine were the most vulnerable to the crisis among relatively

Figure 2.2: GDP growth by country (left) and regional average by year (right), %



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Armenia	13.9	13.2	13.7	6.9	-14.1	2.2	4.7	7.2	3.5	3.4
Azerbaijan	26.4	34.5	25.0	10.8	9.4	4.9	0.1	2.2	5.8	2.0
Belarus	9.4	10.0	8.6	10.2	0.2	7.7	5.5	1.7	1.1	1.6
Kazakhstan	9.7	10.7	8.9	3.3	1.2	7.3	7.5	5.0	6.0	4.3
Kyrgyz Republic	-0.2	3.1	8.5	8.4	2.9	-0.5	6.0	-0.1	10.9	3.6
Moldova	7.5	4.8	3.1	7.8	-6.0	7.1	6.4	-0.7	9.4	4.6
Russian Federation	6.4	8.2	8.5	5.2	-7.8	4.5	4.3	3.4	1.3	0.6
Tajikistan	6.7	7.0	7.8	7.9	3.8	6.5	7.4	7.5	7.4	6.7
Turkmenistan	13.0	11.0	11.1	14.7	6.1	9.2	14.7	11.1	10.2	10.3
Ukraine	2.7	7.3	7.9	2.3	-14.8	4.2	5.2	0.2	0.0	-6.8
Uzbekistan	7.0	7.3	9.5	9.4	8.1	8.5	8.3	8.2	8.0	8.1



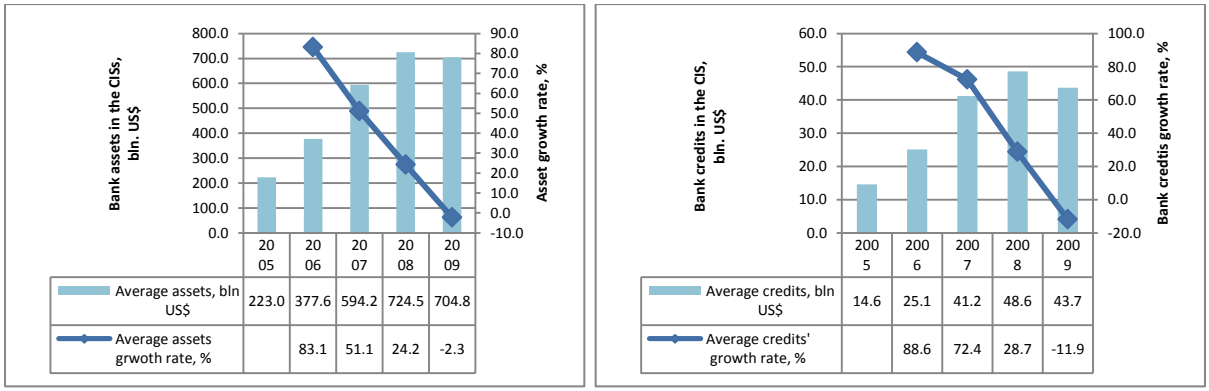
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Average by year	9.3	10.6	10.2	7.9	-1.0	5.6	6.4	4.2	5.8	3.5

Source: World Bank, Financial Development and Structure Dataset (updated 01/07/2015)

developed banking systems in the CISs, where banks assets decreased substantially by 9.8%, 22.7% and 6.5% in 2009 respectively[12]. Crisis caused a decrease in loan issues to enterprises and individuals and a deterioration of portfolio quality. Average for the CISs countries total assets and credits and their growth rates of 10 largest banks in each country are presented in Figure 2.3; this shows a dramatic drop in assets' and credit growth rates in the region during the crisis. However, CISs banks were not participating in trading 'toxic' bonds, which led to less losses compared to the Western financial institutions.

After the crisis 2007-2009 the CISs banking sectors slowly turned to a recovery trajectory. Nevertheless, the growth rates of the banking sectors are much lower than before the crisis, as is shown in the Figure 2.4 for the 2007-2014 period; a sharp decline in assets and equity growth during the crisis reversed in 2010, though the growth was unstable. While Uzbekistan's assets

Figure 2.3: Average assets and credits, bln. US$ (left) and their growth rate (right), 2005-2009



Source: Informational and analytical bulletin: Banking systems of the Commonwealth 2005-2009, Financial and banking council of the CISs, 2010. In Russian, own calculations

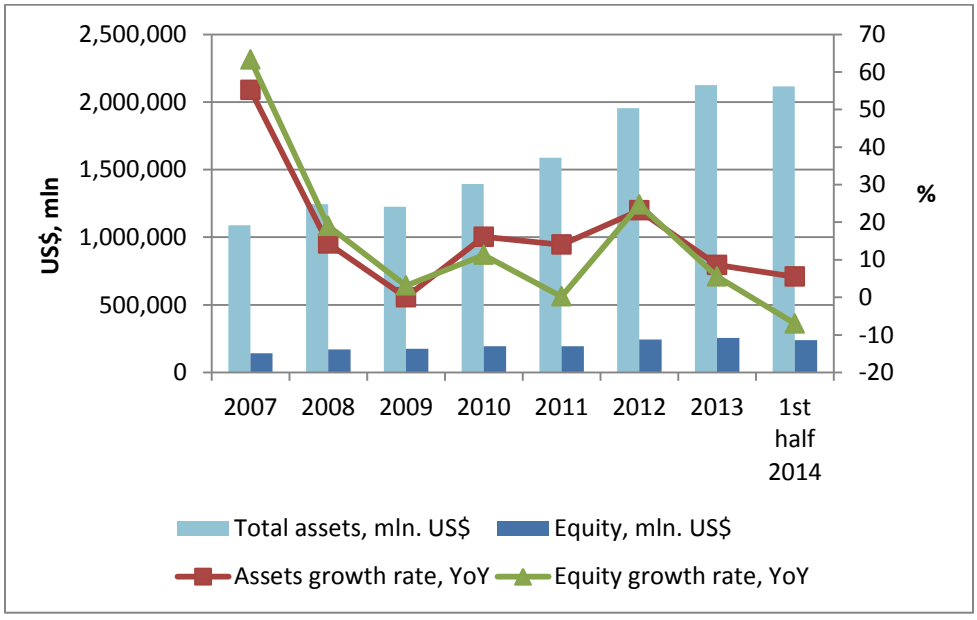
and equity growths (to previous year) stayed almost unchanged during the crisis years and immediately after that, assets and equity growths remained negative in 2010 and in 2011

[12] For data tables for the period before crisis from 2005-2009 by country see Appendix A, Table A1, Panel C.

respectively for Kazakhstan and Belarus. The regional asset growth slowed down after the crisis but stayed in positive numbers. However, the equity growth remained unstable after the crisis, althogh the growth went to positive numbers for most of the countries in 2012-2013. While the growth returned negative in the first half of the year 2014, these are not data for the whole year (See tables with breakdown of assets and equity and their growth rates by country in Appendix A, Table A2).

Overall, although the growth rates of total assets and equity slowed down, they continued to increase in absolute terms. However, the data indicate that in some countries national markets almost exhausted their extensive growth opportunities for national banks. Banks started to look for other markets to grow. Kazakh and Russian banks began their expansion into the CIS countries from about mid-2000s and 2010 respectively. We will discuss intraregional integration of the CISs banking systems later in this chapter.

Figure 2.4: Total assets and equity in the region: amount in mln. (left), growth rate % (right)



Source: Banks of the CISs (2008 - 2014), in Russian, own calculations

Financial intermediation

The banking sectors even in the countries with the most developed banking sectors of the CIS remain underdeveloped. Table 2.2 summarises the financial intermediation indicators of the CIS countries at the beginning of 2014, which permits comparisons of financial development and depth of financial intermediation across countries. The ratio of total assets of the banking sector to GDP is still less than in the developed market economies. On regional average it is about 56% of GDP. While the ratio is about 91% of GDP in Ukraine (mostly due to the drop in Ukrainian GDP) and 84% in Russia, which have more advanced banking sectors than the rest of the CIS, this ratio is slightly more than 30% in less developed banking sectors of the CISs. Next to Ukraine and Russia the highest assets to GDP ratio are in Moldova (75.5%) and Armenia (67.4%) and the lowest in the region belongs to Tajikistan (31.2%). Taking into account that the

Table 2.2: Financial intermediation indicators by country, as of 01.01.2014

Countries	GDP, mln US$	Assets/GDP	Credits/GDP	Deposits/GDP	Capital/GDP
Russia	2,194,346.1	86.0	48.6	48.4	10.6
Kazakhstan	223,234.2	45.7	38.4	28.1	6.0
Ukraine	175,000.0	91.4	65.1	47.8	13.8
Azerbaijan	79,008.8	32.9	22.9	14.3	5.5
Belarus	71,214.0	58.0	39.0	32.7	8.1
Uzbekistan	41,238.9	48.3	29.2	28.7	7.2
Armenia	10,764.0	67.4	41.1	35.7	10.4
Tajikistan	8,488.4	31.2	17.0	65.0	30.5
Moldova	7,725.5	75.5	40.7	47.2	11.3
Kyrgyzstan	7,115.8	31.5	15.5	19.2	5.3
Average for the region	281,813.6	56.8	35.7	36.7	10.9

Source: *Banks of the CISs (2014), in Russian, own calculations*

GDP of Armenia and Ukraine dropped by more than 14% in 2009 and the GDP growth was slow after the crisis 2007-2009; the next countries, which have higher ratio, are Uzbekistan (48.3%) and Kazakhstan (45.7%). Nevertheless, the indicator is significantly lower than for developed countries, where it is over 100%. The other indicator of the financial depth of the banking sector

is the bank credits to GDP ratio, which is about 36% for the region. The banking sector credits relative to GDP ratio was higher in Ukraine (65.1%), Russia (48.6%), Armenia (41.1%) and Moldova (40.7%). However, again because of the drop in the GDP of Ukraine and Armenia, these places are taken by Belarus (39%) and Kazakhstan (38.4%). The deposits to GDP ratio is 37% for the region. The highest ratio is in Tajikistan (65%), which is a surprise as the country is one of the poorest among the CISs, and lowest ratio is in Azerbaijan (14.3%). This indicator is relatively high in Russia (48.4%), Ukraine (47.8%) and Moldova (47.2%). In developed and rich countries the deposits usually exceed 100% of GDP. The last illustrative ratio used here is the share of total banking capital in GDP. Regional average number is 10.9%. Again the highest indicator is for Tajikistan (30.5%), next are Ukraine (13.8%), Moldova (11.3%) and Russia (10.6%). The lowest ratio has Kyrgyzstan (5.3%). Overall, the indicators of financial intermediation are still lower than in developed countries.

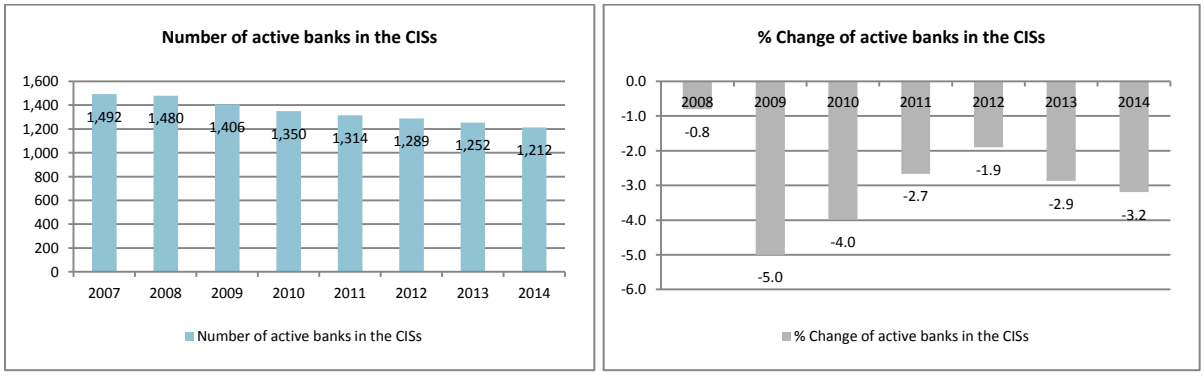
The sustainable growth of banking sector and its intermediation functions are curtailed for reasons, which are common to many of the CIS countries. To name the main factors, there are the lack of domestic funds, insufficient regulation and supervision and inefficient management of banks. At the same time access to the world finance may be associated with the risks of financial crisis like the recent one; regulation and supervision of banking sector should be tuned so as not to suffocate competition and growth, and to enhance efficiency of banks. The development of the banking systems in the CISs depends on how the above mentioned problems will be addressed by financial system authorities and policy makers in these countries.

Number of commercial banks in the CIS region

On 01 January 2014 there were 1,212 commercial banks active in the CIS countries, compared with 1,252 on 01 January 2013, a net decrease of 40 units (-3.2%). In relative terms, the decrease was noticeable in Russia (-4.1%), Ukraine (-3.9%) and Uzbekistan (-3.7%). In absolute terms, Russia (-35) and Ukraine (-7) contributed to the net decrease, while there has been an increase in the number of banks in Tajikistan by 1 bank (6.3%) and Kyrgyzstan by 2 banks (9.1%) (Figure 2.5 and Table 2.3, Panel A, B, C), which shows the growing capacity of the financial systems in these countries.

Considerable reduction in the number of banks in the CISs took place during the crisis years 2009 (-74) and 2010 (-56) over the region. The total number of financial institutions in the CISs continued declining after the crisis 2007-2009 and the reduction reached -194 in absolute terms or -13.8% in 2014 compared with the number of banks in 2009.

Figure 2.5: Number and percentage changes of banks in the CISs



Source: Banks of the CISs (2008 - 2014), in Russian, own calculations

Compared with the situation on 01 January 2007 before the world financial crisis, when there were 1,492 banks in the CISs, there has been a net decrease of 280 banks (-18.8%) by 2014, despite some additions of banks during the period (15 banks) in the region. In relative terms, the

Table 2.3: Banks in the CISs: 2007-2014

Panel A: Number of active banks

	2007	2008	2009	2010	2011	2012	2013	2014
Russia	1,092	1,058	1,007	955	922	897	859	824
Ukraine	173	184	182	176	176	176	180	173
Kazakhstan	35	37	38	39	38	38	38	38
Belarus	27	31	31	31	31	32	31	31
Azerbaijan	46	46	46	45	44	43	43	43
Uzbekistan	29	30	30	32	30	29	27	26
Moldova	16	16	15	15	15	14	14	14
Armenia	22	22	22	21	21	22	22	22
Tajikistan	11	12	13	14	15	16	16	17
Kyrgyzstan	22	22	22	22	22	22	22	24
Total by year	1,492	1,480	1,406	1,350	1,314	1,289	1,252	1,212

Panel B: Change in units of banks

	Year to year							Over the period	Before the crisis	After the crisis
	2008	2009	2010	2011	2012	2013	2014	2007-2014	2007-2009	2009-2014
Russia	-34	-51	-52	-33	-25	-38	-35	-268	-85	-183
Ukraine	11	-2	-6	0	0	4	-7	0	9	-9
Kazakhstan	2	1	1	-1	0	0	0	3	3	0
Belarus	4	0	0	0	1	-1	0	4	4	0
Azerbaijan	0	0	-1	-1	-1	0	0	-3	0	-3
Uzbekistan	1	0	2	-2	-1	-2	-1	-3	1	-4
Moldova	0	-1	0	0	-1	0	0	-2	-1	-1
Armenia	0	0	-1	0	1	0	0	0	0	0
Tajikistan	1	1	1	1	1	0	1	6	2	4
Kyrgyzstan	0	0	0	0	0	0	2	2	0	2
Total by year	-12	-74	-56	-36	-25	-37	-40	-280	-86	-194

Panel A: Percentage change in number of banks, %

	Year to year							Over the period	Before the crisis	After the crisis
	2008	2009	2010	2011	2012	2013	2014	2007-2014	2007-2009	2009-2014
Russia	-3.1	-4.8	-5.2	-3.5	-2.7	-4.2	-4.1	-24.5	-7.8	-18.2
Ukraine	6.4	-1.1	-3.3	0	0	2.3	-3.9	0	5.2	-4.9
Kazakhstan	5.7	2.7	2.6	-2.6	0	0	0	8.6	8.6	0
Belarus	14.8	0	0	0	3.2	-3.1	0	14.8	14.8	0
Azerbaijan	0	0	-2.2	-2.2	-2.3	0	0	-6.5	0	-6.5
Uzbekistan	3.4	0	6.7	-6.3	-3.3	-6.9	-3.7	-10.3	3.4	-13.3
Moldova	0	-6.3	0	0	-6.7	0	0	-12.5	-6.3	-6.7
Armenia	0	0	-4.5	0	4.8	0	0	0	0	0
Tajikistan	9.1	8.3	7.7	7.1	6.7	0	6.3	54.5	18.2	30.8
Kyrgyzstan	0	0	0	0	0	0	9.1	9.1	0	9.1
Change in the CISs	-0.8	-5	-4	-2.7	-1.9	-2.9	-3.2	-18.8	-5.8	-13.8

Source: Banks of the CISs (2008 - 2014), in Russian

number of banks has decreased mostly in Russia (-24.5%), Moldova (-12.5%) and Uzbekistan (10.3%) over the whole period. In absolute terms, Russia (-268), Azerbaijan (-3) and Uzbekistan (-3) contributed to the net decrease, while there has been an increase in Tajikistan (6) and Belarus (3).

Overall, there is a tendency to banking sector consolidation in the region via mergers and acquisitions or reorganisation of some banks into other monetary financial institutions. This tendency is supported by financial authorities in some countries such as Azerbaijan, Kazakhstan and Russia.

Foreign banks

On 01 January 2014 there were 134 units of non-domestic banks with the foreign ownership share more than 50% resident in the CIS countries including banks originating in other CIS countries. These banks accounted for 11.1% of all CIS countries banks. 75 of these banks (28.9%) were located in Russia. Armenia, Tajikistan and Belarus had the largest number of foreign banks as a proportion of the total number of banks, at 68.2%, 29.4% and 25.8% respectively. For these three countries, the head offices of the majority of foreign banks were located in another CIS country.

Overall, the number of foreign banks with >50% ownership has declined after the crisis from 139 units in 2010 to 134 units in 2014 (Table 2.4, Panel A; Figure 2.6) although their share increased from 10.3% to 11.1% (Table 2.4, Panel C). The same tendency is seen for all banks with foreign ownership participation regardless of their share in capital (Table 2.4, Panel B; Figure 2.6). This

Table 2.4: Foreign banks in the CISs, including banks from other CISs countries

Panel A: Number of foreign banks

	2008		2009		2010		2011		2012		2013		1st half of 2014	
	All	>50%	All	>50%	All	>50%	All	>50%	All	>50%	All	>50%	All	>50%
Russia	221	76	226	82	220	80	230	77	244	73	251	76	238	75
Ukraine	53	17	51	18	55	20	53	22	53	22	49	19	51	19
Kazakhstan	18	…	18	…	18	…	18	…	19	…	17	…	17	
Belarus	20	14	22	14	23	14	23	14	23	8	22	8	22	8
Azerbaijan	23	7	23	7	23	7	23	7	22	6	22	7	22	7
Uzbekistan	5	1	5	1	5	1	5	1	5	…	4	…	5	…
Moldova	…	…	…	…	…	…	…	…	…	…	…	…	…	…
Armenia	21	…	20	13	21	13	21	13	20	15	20	15	19	15
Tajikistan	…	…	12	3	13	4	13	5	14	6	14	5	13	5
Kyrgyzstan	…	…	…	…	…	…	…	…	10	5	10	5	10	5
Total	361	115	377	138	378	139	386	139	410	135	409	135	397	134

Panel B: Share of total amount of foreign banks in banking sectors of the CISs, %

	2008	2009	2010	2011	2012	2013	2014
Russia	20.9	22.4	23.0	24.9	27.2	29.2	28.9
Ukraine	28.8	28.0	31.3	30.1	30.1	27.2	29.5
Kazakhstan	48.6	47.4	46.2	47.4	50.0	44.7	44.7
Belarus	64.5	71.0	74.2	74.2	71.9	71.0	71.0
Azerbaijan	50.0	50.0	51.1	52.3	51.2	51.2	51.2
Uzbekistan	16.7	16.7	15.6	16.7	17.2	14.8	19.2
Moldova	...	...	...	...	...	...	...
Armenia	95.5	90.9	100.0	100.0	90.9	90.9	86.4
Tajikistan	...	92.3	92.9	86.7	87.5	87.5	76.5
Kyrgyzstan	...	...	...	...	45.5	45.5	41.7
Total in the CISs	24.4	26.8	28.0	29.4	31.8	32.7	32.8

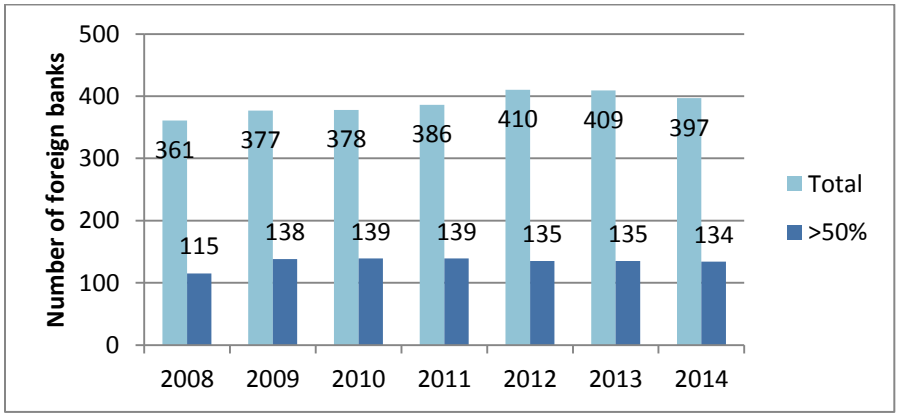
Panel B: Share of foreign banks with >50% ownership in banking sectors of the CISs, %

	2008	2009	2010	2011	2012	2013	2014
Russia	7.2	8.1	8.4	8.4	8.1	8.8	9.1
Ukraine	9.2	9.9	11.4	12.5	12.5	10.6	11.0
Kazakhstan	...	...	...	...	...	...	0.0
Belarus	45.2	45.2	45.2	45.2	25.0	25.8	25.8
Azerbaijan	15.2	15.2	15.6	15.9	14.0	16.3	16.3
Uzbekistan	3.3	3.3	3.1	3.3	...	...	...
Moldova	...	...	...	...	...	...	...
Armenia	...	59.1	61.9	61.9	68.2	68.2	68.2
Tajikistan	...	23.1	28.6	33.3	37.5	31.3	29.4
Kyrgyzstan	...	...	...	...	22.7	22.7	20.8
Total in the CISs	7.8	9.8	10.3	10.6	10.5	10.8	11.1

Source: Banks of the CISs (2008 - 2014), in Russian, own calculations

tendency is due to the pace of domestic financial institutions consolidation, which exceeds changes in foreign ownership.

Figure 2.6: Number of foreign banks in the CISs



Source: Banks of the CISs (2008 - 2014), in Russian, own calculations

Ownership

There are considerable differences in the *ownership* structure among the banking sectors of the CIS countries. The analysis is based on the share of foreign assets in the banking systems of the CISs countries, which were presented in the analytical bulletin 'Banking systems of the CISs-2012' (2012) issued in Russian. For some countries the data on foreign banks' share in the total banking capital are presented over the period 2009-2014 where available in Table 2.5. The highest share of foreign capital as an average over the period 2009-2014 is in Armenia (75.09%) and Moldova (74.41%).

Table 2.5: Share of foreign capital in the banking systems of the CISs, %

	2009	2010	2011	2012	2013	2014	Average by country
Ukraine	36.7	35.8	40.6	41.9	39.5	34	38.08
Belarus	16.96	27.25	24.22	14.54	19.61	19.56	20.36
Moldova	74.05	77.6	76.96	73.96	71.7	72.2	74.41
Armenia	70	71.4	78.9	80	75.68	74.6	75.09
Tajikistan	…	30.8	…	…	28.6	34.4	31.27
Kyrgyzstan	…		…		36.1	36.5	36.30
Average by year	49.4	48.6	55.2	52.6	45.2	45.2	

Source: Banks of the CISs (2008 - 2014), in Russian

Kazakhstan and Azerbaijan due to oil export revenues could create large national banking holdings private and state respectively. However, while Kazakh banks are among leaders of the CIS banks, the banks of Azerbaijan do have not enough access to the financial resources, which have accumulated in the State Oil Fund of Azerbaijan. The only state bank of Azerbaijan accounts for 36% of capital of the banking system (Banking systems of the CISs -2012, 2012).

Ukraine's banking system is dominated by foreign and private national banks. After the inflow of the foreign capital into Ukraine in 2005-2008, the process of outflow of foreign capital started after the crisis 2008-2010. It was being replaced by Russian and other CIS countries' capital still before the outbreak of the armed conflict in 2014 (Table 2.5).

Armenia and Moldova choose to put emphasis on attracting foreign capital into the banking systems due to limited domestic resources. Foreign capital in the Armenian banking system amounts to 75.1% and in the Moldovan system 74% (Table 2.5). However, taking into account the limits of banking systems funding, the level of the financial intermediation is quite good considering credit to GDP ratio, which was 41.1% (Armenia) and 40.7% (Moldova) in 2014, which is higher than regional average (See Table 2.2). This also shows a correct choice of development strategy for the banking systems in these countries.

The weakest banking sectors are in Tajikistan and Kyrgyzstan. Foreign capital dominates in the Kyrgyz banking sector, mainly from Kazakhstan (60%), while in Tajikistan the private domestic banks play the main role in the banking sector and foreign capital amounted to 30% in 2012.

The state banks dominate banking systems in Belarus, Russia, Turkmenistan and Uzbekistan. In 2013 state-owned banks had quite significant market shares in Turkmenistan (97%), Uzbekistan (96%), Belarus (63%) and Russia (55%) (Table 2.6). Russia gave its banks more freedom that

helped them to build a strong banking sector. However, market mechanisms have not prevailed in other countries in the same way as in Russia. Thus, the role of government is much higher in Belorussia, Turkmenistan and Uzbekistan where banks play the role of agents of the government (especially in Turkmenistan).

Table 2.6: State ownership share in the CISs banking sector, %

Country	2005	2006	2007	2008	2009	2010	2011	2012	2013	Change in pp 2005-2013
Armenia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Azerbaijan	58.3	58.3	42.0	42.0	42.0	42.0	34.0	34.0	34.0	-24.3
Belarus	74.0	74.0	75.2	75.2	79.0	71.0	67.0	65.0	63.0	-11.0
Kazakhstan	0.5	0.5	0.2	6.0	14.6	18.8	23.1	23.1	20.0	19.5
Kyrgyzstan	16.0	16.0	4.8	4.8	10.2	10.3	20.3	20.3	20.3	4.3
Moldova	13.6	13.6	0.0	2.4	2.4	7.4	12.5	12.5	12.5	-1.1
Russia	46.4	44.7	45.4	46.4	54.6	46.0	52.0	53.0	55.0	8.6
Tajikistan	4.6	4.6	9.7	10.8	11.9	12.9	14.0	14.0	14.0	9.4
Turkmenistan	97.1	97.1	97.1	97.1	97.1	97.1	97.1	97.1	97.1	0.0
Ukraine	12.0	12.0	12.0	12.0	17.0	17.0	17.0	18.0	18.0	6.0
Uzbekistan	94.3	94.4	94.5	94.6	80.1	94.9	95.5	95.7	95.9	1.6
Average by year	37.9	37.7	35.4	35.6	37.2	37.9	39.3	39.3	39.1	1.2

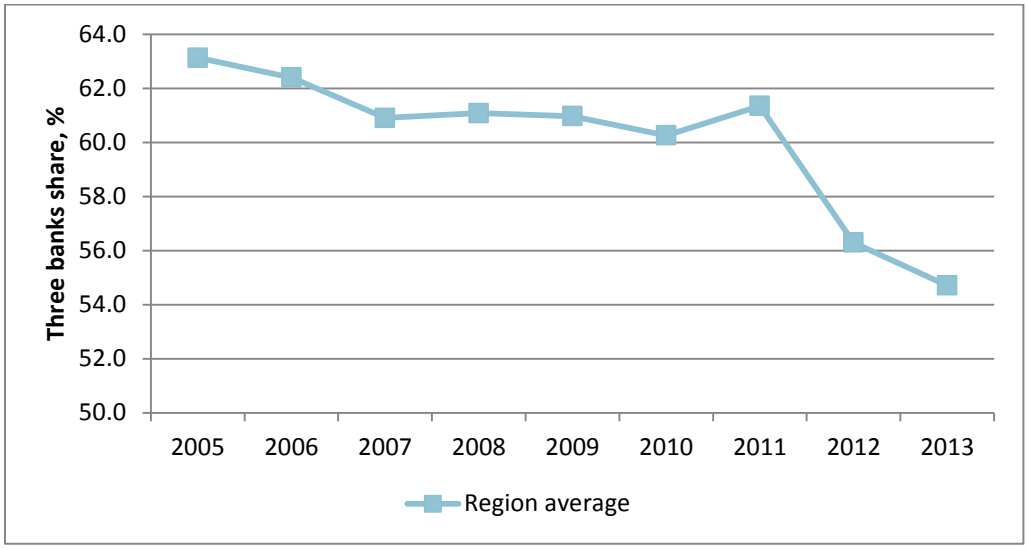
Source: Barth et al. (2007, 2009, 2013), Banks of the CISs (2010), in Russian

Among the CISs only Armenia totally privatised formerly state-owned banks and has no state ownership in its banking sector. There was a net increase in averaged regional level of state ownership from 37.9% in 2005 to 39.1% in 2013 (Table 2.6). While there was a net increase in state ownership in Kazakhstan (19.5pp), Tajikistan (9.4pp) and Russia (8.6pp), the state ownership share decreased in Azerbaijan (-24.3pp), Belarus (-11.0pp) and Moldova (-1.1pp) for the period 2005-2013 (Table 2.6; see also Appendix A, Table A3 for percentage change).

Concentration

As for the concentration ratio of the banking sectors in the CISs over the period from 2005 to 2013, measured as the share of the total assets of the three largest banks in a country's banking sector, the regional tendency is towards a reduction in this indicator too (Figure 2.7). Over the period 2005-2013, concentration ratio dropped by 13.3% for the region. The main contributors to this drop were Ukraine (-49.9%), Uzbekistan (-27.4%) and Kazakhstan (-25.9%). There was a net increase in concentration in Russia (81.4%) and Tajikistan (0.8%) (See Appendix A, Table A4).

Figure 2.7: Bank concentration ratio, average for the region, 2005-2013, %



Source: World Bank Financial Indicators (August 2014), Bankscope (2015).

Table 2.7 has the indicator breakdown by country and its averages by year and by country. The highest concentration averaged over the period has been in Tajikistan (86.4%), Kyrgyzstan (78.9%), Belarus (77.9%) and Uzbekistan (73.9%). The least bank concentration has been in Russia (29.9%), Azerbaijan (46.9%) and Moldova (48.1%). The decline in concentration against

consolidation process suggests that consolidation has not involved many mergers among very large banks.

Table 2. 7: Three banks concentration ratio by country and year

Countries/Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	Average by country
Armenia	68.5	63.1	57.0	47.8	42.5	42.5	40.1	42.5	56.0	51.1
Azerbaijan	42.3	40.8	44.7	39.14	39.9	43.6	64.4	57.5	50.0	46.9
Belarus	84.5	73.5	86.3	81.8	81.9	78.3	78.7	67.9	68.0	77.9
Kyrgyzstan	80.2	86.3	79.5	83.1	86.3	86.3	70.5	69.3	69.3	78.9
Kazakhstan	60.7	66.6	62.7	58.0	62.3	58.8	52.6	52.0	45.0	57.6
Moldova	51.6	51.4	42.2	45.1	46.8	48.0	52.2	52.0	44.0	48.1
Russia	25.1	22.9	22.2	28.9	29.4	27.7	31.7	34.9	45.7	29.9
Tajikistan	86.3	86.3	86.3	86.3	86.3	86.3	86.3	86.3	87.0	86.4
Ukraine	60.1	56.6	51.2	54.2	51.9	55.6	58.0	35.5	30.1	50.4
Uzbekistan	71.6	76.5	77.2	86.3	82.4	75.7	78.8	65.3	52.0	73.9
Average by year	63.1	62.4	60.9	61.08	60.9	60.3	61.3	56.3	54.7	60.1

Source: World Bank Financial Indicators, Bankscope (own calculations). Note: The list of banks by country and their ranks by total assets for the beginning of 2014 is in Appendix A, Table A5.

2.5. Financial integration in the CISs

2.5.1. Collapse of the common finance in the CISs

2.5.1.1. Crisis of the rouble zone

Before looking at the reintegration processes of finance in the CISs it is useful to consider the processes that led to a collapse of the common finance in the region. After the collapse of the Soviet Union in 1991 there was a considerable deterioration of economic links among agents that previously operated under the single planned system. The collapse of the Soviet Union led to the economic and financial disintegration of the rouble zone, of credit and financial relations, and of payment and price formation mechanisms among the former Soviet Union countries.

The Gosbank of the USSR was the sole bank of issue of currency on the territory of the USSR. The rouble was the currency of all republics of the USSR. It was 10% in the form of cash other money was in the form of correspondent accounts of the enterprises all over the USSR (Krotov, 2011). The collapse of the Soviet Union led to the disintegration of the rouble zone[13].

However, the disintegration of the rouble zone started in 1990, even before the collapse of the Soviet Union (Dabrowski, 1995a; 1995b).

The Declaration on independence of Russian Federation of 12 June 1990 signed by the Russian Parliament became the main crack in the disintegration of the USSR. Although it didn't influence the fiscal and monetary policy, it pushed other republics to sign similar declarations of independence. That was the first stage of the rouble zone disintegration.

[13] For more details on the rouble zone disintegration see Dabrowski (1993, 1995a, 1995b), Hernandez-Cata (1993), Granville and Lushin (1993), IMF (1994).

The newly established Central Bank of the Russian Soviet Federated Socialist Republic (CBRF) in December 1990 started to take administrative control over all regional branches of the Gosbank of the USSR[14] in all regions of the Russian Federation. The CBRF offered more liberal licensing for commercial banks then the Gosbank of the USSR. That led most of the commercial banks to reregister with the CBRF. The CBRF's autonomous credit emissions for enterprises did not follow the instructions of the Gosbank of the USSR. That was a very expansionary monetary policy. Similar independent actions took place in fiscal policy, where the Russian Federation stopped transfer taxes to the Soviet budget, which started to have huge deficit. The Gosbank increased emission of money to finance the deficit, which led to an uncontrolled money supply.

In November 1990 the CBRF took over the functions of the Gosbank of the USSR including emission and exchange rate policy. In between there were political events such as August Coup (19–21 August 1991). In September 1991 during the meeting of all republic heads of central banks (republics, whish were former members of the USSR) there was an understanding that the Gosbank of the USSR should be changed but the meeting led to no agreement on how the system should operate.

However, in November 1991 unilaterally the CBRF was prescribed to take over all the functions of the Gosbank of the USSR on running and managing the material and technical base and other resources of the Gosbank of the USSR, the network offices, enterprises and organisations till January 1st 1992 bypassing the interests of other former republics of the USSR (Krotov, 2011).

On December 8th, 1991 the agreements of the Belavezha Accords signed by Belorussia, Russia and Ukraine concerned the dissolution of the USSR and the creation of the CIS. The provision of

[14] The governor of the Gosbank of the USSR and then of the CBRF was V. Geraschenko in 1989-1991 and 1992-1994.

the Presidium of the Supreme Soviet of the Russian Federated Republic of 20th December 1991 ordered to create a commission on liquidation of the Gosbank in twenty four hours and on December 20th 1991 the Gosbank of the USSR ceased to be. The second stage of the rouble zone collapse started.

The monopoly of Russia on money issue, which started in the first half of 1992 led to money shortage and surrogates in other CIS members. Ukraine, Latvia, Lithuania, and Azerbaijan avoided the restrictions and constraints by issuing surrogates.

The accrued credit imbalances in favour of the Russian Federation during soviet times from the common USSR budget allowed the Russian Federated Republic to build a superior production. An adjustment of the accrued imbalances began through increased imports from Russia. The 'technical credits' for importing goods from Russia were given by the CBRF to the national central banks of the CISs, which transferred those credits to domestic enterprises to finance their imports. This system was preserved as it was profitable for Russian export enterprises and also because Russia wanted to retain its influence in the now independent countries.

In July 1992 the CBRF set limits for 'technical credits' and introduced the requirement of daily monitoring of the national banks' correspondence accounts with the CBRF. The result was to import from Russia using accounting money. In case of a deficit in correspondent accounts, the accounts were balanced by exports from the newly independent states to Russia, in this case the delivery brought no payment to the enterprise concerned. At the same time, if technical credit limits were exceeded, Russian exports to the countries concerned were refused. The surpluses on bilateral accounts between Russia and the national central banks were not allowed to be used for trading with third parties.

Rationing of cash delivery to the states led to the big shortage of cash and money surrogates. The shortage of cash was increased due to cash payments for imports from Russia under the conditions of limited 'technical credits'.

The collapse of the Soviet Union and the financial policy of Russia, described above led to the second stage of the collapse of the rouble zone in the mid 1992 and then to the final collapse in 1993.

In July 1993 the final crash of the rouble zone occurred when Russia started creation of a new rouble zone. There were no statements about what was new about it. Old banknotes had to be exchanged for new ones and the use of earlier issued notes was prohibited. This was the culmination of the money supply deficit in the national states.

Russia was transferring a certain amount of the new banknotes to other states. Dabrowski states that "in essence the leadership of the CBRF wanted to throw the other states of the CIS on their knees in order to make them more willing to submit to re-join the rouble area (with new banknotes) on the conditions set by the CBRF" (Dabrowski, 1995b). One of the requirements was Russia's demand to deposit 50% of reserves (gold or foreign currency) of the states with the Russian central bank. That demand was refused (Rashid, 1994).

The only remedy left was the introduction of national currencies.

2.5.1.2. Introduction of national currencies

The national currencies were introduced by the states spontaneously to overcome the increased problems between 1992 and 1993. The countries introduced their currencies on an urgent basis in many cases with little understanding of how to do it and experienced hyperinflation, deficits, economic slumps, exchange rate turbulence, and huge economic shocks (Bartholdy and Szegvari, 1993, Rashid, 1994). Here we consider the case of Kazakhstan, where a national currency was

introduced in 1993, as an example. There are some studies that covered the topic. Bartholdy and Szegvari analysed economic developments in the CIS countries including the currency introduction (Bartholdy and Szegvari, 1993).

The introduction of currencies in Kazakhstan, Turkmenistan and Uzbekistan was 'at breakneck speed, when the Central Asian countries were squeezed out of the rouble zone' (Rashid, 1994). Uzbekistan left the rouble zone and introduced its own currency, the som, in July 1994.

The national currency tenge was introduced in the autumn of 1993 in Kazakhstan. The period before the introduction of the national currency 1992-1993 led to a liquidity crisis in Kazakhstan and introduction of the national currency in 1993 led to further financial crises. There was a hyperinflation in the following years. These crises led to even deeper recession in the Kazakh economy (Appendix D, Table D2).

The Decree number 1399 signed by the President 'On introduction of national currency in the Republic of Kazakhstan' of 12th November 1993 held that the national currency – the tenge – should be introduced into circulation on 15th November 1993 at 08.00 of local time. Since 18th November 1993 the tenge should be the only legal means of payment. The tenge must be accepted in all types of payments by all natural persons and legal entities disregarding the form of ownership as well as by banks for deposits and accounts without any restrictions. The Decree came into force upon signature.

The Resolution of the Governmental Committee of the Republic of Kazakhstan on introduction of the national currency number 2 'On plenipotentiary representatives of the Government Commission of the Republic of Kazakhstan for introduction of the national currency' was adopted on 12th November 1993. It specified imposing fines:

- In case of mismatches of price scales expressed in the national currency and rouble banknotes issued in1961-1992 at the exchange rate of 1 tenge for 500 roubles during the period of parallel circulation of the tenge and rouble banknotes issued in1961-1992;

-In case of rejection to sell goods for the tenge;

- In case of selling goods for foreign currency, including roubles of the Russian Federation issued in 1993, by organisations that do not have licenses for foreign currency transactions.

- In case of wilful suspension of work of the retail trade, paid services sector, transportation and communication services as well as in case of changes in their scheduled work.

The currency was pegged to dollar at 1.5 tenge per dollar initially. It was allowed to float unlike in other Central Asian countries, where their new currencies had a fixed exchange rate. On 10th February 1994 the official exchange rate was 8 tenge per dollar though the exchange rate was 12 tenge per dollar in the black market (Rushid, 1994).

After introduction of the national currency, improvements of legislation on currency regulation and currency control were undertaken in order to support sustainability of the national currency.

There was substantial deficit of foreign reserves at the beginning of national currency introduction. In order to form a liquid currency market in Kazakhstan and support the national currency convertibility, the Decree 'On urgent measures for currency market development in the Republic of Kazakhstan' was signed by the president of Kazakhstan. The Decree specified that starting from 1st January 1994 the export-import tariffs should be paid in the national currency by legal entities. The new regulation required to surrender 50% of enterprises' revenues from their exports excluding enterprises with foreign capital already established by that time. The revenues

in foreign currency were transferred through the banks registered on the Kazakh Interbank Currency Exchange[15].

The transfer of customs charges from foreign currency to the national currency, changes in the order of selling of foreign currency and retail trade in foreign currency had increased the liquidity of the exchange market and demand for the tenge (NBK, 2005).

To promote a wide use of the national currency in international clearance and payments the following measures were undertaken. In February 1994, the restrictions on exports of goods bought for the tenge in Kazakhstan by legal entities were cancelled; domestic enterprises were allowed to export freely their products with an exception for goods subject to licensing or assigned to quotas and products of national heritage.

2.5.2. Re-integration of banking systems in the CISs

There were also simultaneous attempts to settle the problems by the CIS states before they were squeezed out of the rouble zone and introduced national currencies. The situation in finance among the CIS countries was changing over time and with stabilisation of the economies in the countries. In May 14, 1993 the CIS countries expressed their willingness for a stepwise movement to economic union in the signed agreements (Armenia, Belorussia, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Uzbekistan and Ukraine). Then the Treaty on the

[15] On November 15, 1993 Kazakhstan introduced the national currency – tenge. On the second day after this event – on November 17, 1993 – the National Bank of the Republic of Kazakhstan and twenty three leading commercial banks of Kazakhstan made the decision on founding the currency exchange. The previously existed Centre of Interbank Currency Transactions (the Currency Exchange) was the structural subdivision of the National Bank. The main objective set for the new exchange was the organisation and development of the national currency market due to introduction of tenge. As the legal entity the exchange was registered on December 30, 1993 under the name Kazakhstan Interbank Currency Exchange with the closed joint-stock company business form. Thus, nowadays existing Kazakhstan Stock Exchange was formed on November 17, 1993. On March 3, 1994, the exchange was re-registered under the name Kazakhstan Interbank Currency Exchange. Available: http://en.wikipedia.org/ wiki/Kazakhstan_Stock_Exchange. Accessed on 02.10.2012.

creation of the Economic Union of the CIS countries was signed in September 1993, which contemplated cooperation in the financial sector.

The Interstate Bank (Mezhgosudarstvenny Bank) was created in December 1993 for the purpose of clearing interstate payments. The bank became a specialised institution for the Payment Union, which was created in 1994. The development of payment and clearing system among the CIS countries was spontaneous and initially it was based at the level of enterprises and banks in the form of barter and clearings (Glazkova, 2006).

However, any creation of the supranational institutions for financial integration represented a politically determined development, which was not related to the international economic and financial climate in the CIS. According to the many experts, the financial cooperation of the CIS countries was very weak for many years. It was lagging behind the economic and trade developments (Petrov, 2011).

The increased integration process started in the pre-crisis period of 2007-2009. It was due to economic growth in the CIS countries and on legislation to liberalise finance, which eased the access of foreign financial institutions to the markets in many CIS countries. Moreover, regional agreements such as the Eurasian Economic Community carried documents containing a programme for the creation of a common financial market for the CIS countries in 2007-2010, and the Strategy of economic development till 2020, which aimed at currency and financial cooperation as a priority.

The integration developments were more intensive in the banking sectors, which were the most developed segments of the financial systems. Banking sector integration was in the form of expansion of the CISs' banks to the other regional countries. Although in the beginning of 2000s

almost all banks in the region were operating in their national territory, after the mid-2000s many large financial institutions were operating in different CIS countries simultaneously.

In the mid-2000s national markets almost exhausted their capacities for domestic growth of national banks and pushed them out to look for other markets. However, the level of the banking sector development in the CISs, even where the sector is relatively developed, does not permite competition on an equal basis with the financial institutions in developed countries. Thus, the CISs region became one of the most attractive locations for the CISs banks expansion, where banks can compete and realise their economies of scope and scale. The priority for cross-border entry is into the CIS countries with a relatively lower level of financial intermediation. As was mentioned above, the Kazakh banks started their cross-border expansion first from the mid-2000s, later on this policy became part of the strategy of other CISs banks. The main players are Russia and Kazakhstan, which own the largest share of all assets in other countries of the CISs (Table 2.8).

Foreign assets increased more than 3 times for some banks between 2010 and 2013. Banks strengthened their market positions in the region and now play an increasingly important role in the banking systems of the recipient countries. For example, they account for more than 15% of all banking assets in Belarus and Kyrgyzstan, as well as more than 10% - in Ukraine and Armenia (Kondratov, 2014).

Russia invests mainly in Ukraine, Belarus, Kazakhstan and Armenia while Kazakhstan banks invest primarily in its branches in Russia and Central Asia. In general, most investments in banking in the CIS countries, over 70%, are accounted for by Ukraine and Belarus.

Table 2.8: CISs' banks with the largest assets in the region countries (2010, 2013)

Bank	Country of origin	The CIS country recipient	Assets in the country of origin, bln. US$		Assets in other CIS countries, bln. US$		Increase in foreign assets, %
			2010	2013	2010	2013	2010-2013
Bank VTB	Russia	Azerbaijan, Armenia, Belorussia, Kazakhstan, Russia, Ukraine	87.9	142.01	4.7	18.6	295.74
Vnesheconom Bank	Russia	Belorussia, Russia, Ukraine	60	81	4.6	18.6	304.35
Sberbank Rossii	Russia	Belorussia, Kazakhstan Russia, Ukraine	234	447.17	4	18.2	355
Alfa-Bank	Russia	Belorussia, Kazakhstan, Russia, Ukraine	19.3	43.04	4.2	14.9	254.76
BTA Bank	Kazakhstan	Armenia, Belorussia, Kazakhstan, Kyrgyzstan, Russia, Ukraine	13.3	1068	2.4	2.4	0
Kazkommertsbank	Kazakhstan	Kazakhstan, Kyrgyzstan, Russia, Tajikistan	15.9	16.7	1	2.1	110
Bank Moskvy	Russia	Belorussia, Russia, Ukraine	26	45.5	0.9	0.9	0
Gazprombank	Russia	Armenia, Belorussia, Russia	55.2	91.1	0.8	0.8	0
Privatbank	Russia	Russia, Ukraine	10.8	18.62	0.6	0.6	0
International Bank of Azerbaijan	Azerbaijan	Azerbaijan, Russia	13.4	7.5	0.5	0.5	0

Source: Interfax-CEA (Centre of economic analysis)

However, the highly uneven distribution of investments in banking sectors of neighbouring CIS countries by countries of origin and recipient countries reflects only a slight integration of banking sectors of the CISs. While Russian and Kazakh banks actively expand in the CISs region, other CISs countries are mainly recipients of foreign CISs banks. Thus, the share of foreign CISs assets in the total banking assets of the region is about 3% (Kondratov, 2014). Mutual expansion of the CISs financial institutions is constrained by the weakness of other than Russian and Kazakh financial institutions in the CISs, which don't have enough resources to enter the markets of their neighbours, as well as conditioned by the absence of regional legal and institutional mechanisms facilitating penetration of banks into each other's markets, particularly protection against political risks. Nevertheless, the CIS banking systems actively integrate into the global financial markets particularly the most developed ones.

Despite the increased financial integration in the CIS before the crisis 2008-2010, there are many factors that slow down the integration. The main are as follows: differences in the financial sectors developments; divergence of interests of the individual countries; restrictions on capital movements in many CIS countries, which undermine investments in those countries; concerns that Russia, which continues to dominate in the post-soviet region, would impose its interests when implementing integrational projects in the region. On the other hand Russia is concerned that other centres like European Union and China might increase influence in the region and could contribute to an acceleration of disintegrational tendencies. Russia sees the increased presence of the financial institutions from the third countries in the region as undesirable because Russia consideres that they are less interested in integrational projects in the CISs. At the same time, Russia's goal of domination in the region would suppose a major role in financing

integrational projects, which could be costly, and this decreases Russia's interest in these initiatives (Kondratov, 2014).

Along with that, there are some factors that should contribute to financial integration among the CISs. There is growing trade cooperation among countries and mutual penetration of businesses (though mostly from Russia's side), which in turn require interconnection among national financial markets and institutions. There are several organisational structures present in the region. To name the main: the Customs Union Treaty signed among Belarus, Kazakhstan and Russia signed in 2007 and then the Customs Union came into effect in 2010 by common external tariff adoption and abolishment of the customs clearance among the member-countries in July 2010. New regional agreement, the Treaty on Eurasian Economic Union (EEU) of Belorussia, Kazakhstan, and Russia was signed in May 2014, indicating further integration processes among the CISs; Armenia, Kyrgyzstan and Tajikistan are observers. The Treaty on EEU will come into effect in January 2015.

The financial and banking integration in the CISs is far from exhausted. The CIS countries seek for more efficient financial cooperation, which is a precondition for recovery of economic ties, enhancement of trade links and investments. In this regard, better regulation and supervision standards in individual countries, a higher quality of banking sector services, and convergence in banking sector efficiency and development would contribute to the movement of the national banking capital and elimination of any entry barriers. All this should be done for mutual benefit and not in the interests of one particular country.

2.6. Conclusion

This Chapter focused on issues related to banking in transition countries. The objective was to shed light on several key issues pertaining the massive changes in the financial systems of the former soviet bloc countries and their influence on the countries' banking system landscape at the present time.

The chapter has tracked massive changes in the banking sectors of the post-soviet countries, which put the end to the centrally planned finance or monobank financial system and introduced market based commercial banking or two-tier banking system. We start from the overview of the establishment of the plan-based finance in the Soviet Union. The financial system formed in the beginning of the Soviet state remained as a "standard system" for the period of the soviet rule with minor reforms. The main features and principles of the banking system established in the Soviet Union were closely copied in all other soviet bloc countries. It was a monobank financial system, which is a one-tier banking system with vertically dependent financial activities.

We continued by chronicling the vast financial reforms in the former soviet bloc countries. The post-soviet countries had undergone non-homogeneous processes of transition, which can be explained by the differences in the initial economic conditions and diverse policies. However, the post-soviet countries' banking systems, particularly those of the CIS countries, share common properties and, despite the long period of transition (more than 20 years), the financial systems in the CIS transition countries to different extent have features, which are the legacy of the soviet time finance.

Next came a survey of banking sectors of the CISs countries and their analysis in figures. Not surprisingly, banking sectors are the key financial intermediation in the CIS countries, although

they can be distinguished into the most developed, medium developed and underdeveloped groups. The first group includes Russian, Kazakh and Ukrainian banking systems, while the last group presents Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan. However, even in Russia, Kazakhstan and Ukraine, the banking sectors remain underdeveloped compared to the western countries.

We note a continuous consolidation of the banking sectors in the CISs. There has been a net decrease in the number of commercial banks in the region. Compared with the situation in 2007, when there were 1,492, there has been a net decrease of 280 banks by 2014 (when there were 1,212), which accounts for 18.8% of banks in the region. In relative terms, 24.5% of banks were closed in Russia, 12.5% in Moldova, 10.3% in Uzbekistan, and 6.5% in Azerbaijan. Considerable reduction in the number of banks in the CISs took place during the crisis years and the number continued declining after the crisis. On 01 January 2014, the net decrease was 40 units (-3.2%) relative to the previous year. However, we observe a steady increase in the number of banks in Tajikistan by 4 banks and Kyrgyzstan by 2 banks after the crisis, which shows the growing capacity of the financial systems in these countries. The consolidation in number of banks takes place against drop in concentration by 13.3%, which is the regional tendency over the period from 2005 to 2013. This could be explained that the decline in concentration has occurred despite the consolidation process, which suggests that consolidation has not involved many mergers among very large banks.

The ownership structure in the CISs banking sectors differs across countries. While the state ownership share decreased in Azerbaijan, Belarus and Moldova for the period 2005-2013 and Armenia totally privatised former state-owned banks, Belarus, Russia, Uzbekistan and Turkmenistan have chosen dominance of state ownership in banking sectors, and after the world

financial crisis 2007-2009 there was an increase in state ownership both on a country level as in Russia, Kazakhstan and Tajikistan, and on a regional level. Foreign capital, including the CISs intraregional investments, dominates in Armenia and Moldova, which had chosen this emphasis due to limited domestic resources. Ukraine's banking system was dominated by private domestic and the foreign capital from outside the region in 2005-2008, nevertheless after the outflow of foreign capital due to the world financial crisis, it was replaced by the CISs countries' capital. The Kyrgyz banking sector is dominated mainly by Kazakh capital.

The world financial crisis caused the banking sector's growth rate to slow down all over the region. Banks experienced a liquidity crunch as they couldn't refinance borrowing from international markets. There was an overall decline in financial intermediation after the crisis in all the regional countries involving a decrease in lending to households and enterprises, an increase in interest rates and a deterioration of banks' portfolios. Destabilised financial intermediation drew attention of the policy makers to the issues of insufficient regulation and supervision, which were at the core of the crisis, especially in those transition countries with a less developed legal environment for financial sectors. We will refer to this issue in our empirical study on stability.

We conclude our historical review of the CISs banking by examining re-integration of finance in the CISs; there is a trend of financial integration among the CIS countries. The integration in the banking sector is the most intensive as this segment of the financial systems is the most developed one in the CIS countries. Mainly because the level of the banking sectors development in the CISs does not permit competition on an equal basis with the financial institutions in developed countries, the CIS region became one of the most attractive locations for the CIS own banks expansion, where banks can compete and realise their economies of scope and scale. The

priority for cross-border entry is towards those CIS countries with a relatively lower level of financial intermediation.

To all this it should be added that there were achievements of the banking sector in the CISs. Banking sectors were the most dynamic sectors in the CISs, and had very high growth rates of their assets and credits to the economy before the world financial crisis 2007-2009 and slowly recovered after that. The positive change was that liberalisation of the banking sectors allowed foreign banks entry to the markets, which increased competition and services quality, and diversified banking services. Most of the CIS countries introduced international standards of financial statements, which contributed to transparency and a better monitoring of risks. Introduction of Basel standards had a positive impact on the capitalisation of banking sectors of the CISs (Kazakov, 2007). In general, the banks in the CISs were transferred into commercial banks and adopted the concept of conventional banking though to different degrees across countries.

The analysis of records of the banking sectors in the CISs prompt us to study, whether the liberalisation and financial reforms led to creation of a workable and stable financial structure, which is efficient and competitive in quickly changing environment. Financial liberalisation together with deregulation and integration of the CISs' banking sector, both into the world and regional financial markets, have substantial implications on competition and stability. While theory and empirics point to the presence of links between competition and stability in banking sectors, the theoretical literature and empirical studies produce different findings. Efficiency, competition and stability is a subject of our empirical investigations in the following chapters.

Chapter 3

Technical efficiency of the CISs banks

Preamble

This chapter examines bank performance in terms of technical efficiency in the CIS countries with particular attention to the impact of bank ownership and risk-taking behaviour and addressing environmental effects on efficiency. This chapter introduces various efficiency concepts, including cost and profit efficiency in the Literature review part, to demonstrate their advantages and disadvantages. However, we make an accent on technical efficiency, which is the base for our main empirical analysis of this chapter. Technical efficiency indicates whether a bank produces maximum amount of output employing minimum amount of inputs. The advantage of technical efficiency is that it can be measured without the need for price information because it doesn't set objectives to measure cost-minimisation or profit-maximisation behaviour. Instead, it measures whether managers organise production so that a bank would operate on its production frontier.

3.1. Introduction

The CISs banking system went through a profound reforms since the beginning of 1990s due to transformation from passive banking, when finance was following physical planning, and monobank system where all the financial activities were vertically dependent and totally owned by the state, to two-tear market based banking system. One of the most important changes in the CISs banking sectors is the ownership of banks.

This Chapter examines whether banks' technical efficiency varies with different ownership structures, which provides information to policy makers on ownership policies. Due to moderate levels of foreign banks entry and not all banking system privatisation the CISs countries turn out to be fertile testing grounds for the analysis of ownership impact on efficiency because of sufficiently large number of each group of banks such as state, private and foreign. Another interest of this Chapter is banks' risk-taking behaviour, which critically transformed due to changes in regulation and supervision during the transition. The risk-taking effect examines whether banks' technical efficiency varies with different risk factors such as capital, credit, liquidity and market risks. This would inform bank managers on bank risk-taking strategy. We also include other bank level and environmental variables into the model to investigate their effect on technical efficiency. Besides, inclusion of environmental variables accounts for across countries differences. Accordingly we formulate our research questions.

This chapter seeks to answer specific questions on banking in the CISs. Particular research questions include: How do bank ownership characteristics affect bank technical efficiency? Do foreign banks outperform their domestic counterparts? Does the performance of foreign banks from the CISs differ from other banks performance? How does bank risk-taking behaviour affect bank efficiency in the CISs? While focusing on these issues, this study also controls the effects of other environmental factors, such as the 2007-2009 global financial crisis, GDP growth, and entrance into the custom union agreement.

The objectives of this chapter are three-fold. First is to estimate consistent technical efficiency for the CISs banks under the influence of different bank level and environmental factors (a). Second is to examine the impact of bank ownership (b) and risk-taking (c) behaviour on bank performance measured by technical efficiency. Third is to provide information and insights for

financial sector authorities and practitioners on banks' performance driving forces in the CISs countries that can be used for regulation and supervision reforms and policies.

We discuss the objectives stated above in more details. (a) This research estimates technical efficiency using the stochastic frontier approach for the transition CIS countries, which to our best knowledge has not been done. Defining the production frontier for the banking sectors of the CISs countries is a valuable exercise because most of the cross-country studies on bank performance in transition countries focus on the CEE countries. Among the bank efficiency studies, the common frontier was estimated for Eastern Europe, for instance in Fries and Taci (2004), Bonin et al. (2005a, 2005b), Rossi et al. (2005) and Yildirim and Philippatos (2007). These countries have to a certain extent similar environment because they went through similar privatisation processes and opening up to foreign banks entry, while the latter took the large part of their banking sector's share. The other studies applied a common frontier to estimate efficiency for 15 European Union countries (Hollo and Nagy, 2006). The advantage of estimating common frontier is that cross countries frontier allows for a batter comparison across countries because bank efficiency in each country would be compared against the same norm (Berger and Humphrey, 1997). Though some studies include a few CIS countries clustered with the CEE countries estimating a common frontier, results from these studies may not be representative of the CIS countries as there is a great divide in the development of financial sector between the CEE and the CISs countries (De Nicolo et al., 2003)[16]. The model is applied to ten CIS countries because the transition from planned to market based economies

[16] Barisitz (2008) also distinguished between banking systems of the CEE countries and the former Soviet Union countries. He argues that this division has its roots in the EU influence on the CEE countries' economic development (like EU membership perspective and integration, and geographic proximity), while the CIS countries financial system development remains specific for these countries' situations. Other authors like Mitra et al (2010) share these views.

encompassed similar banking sectors' institutional, structural and managerial transformations. Therefore, common frontier estimation for the CIS countries' bank efficiency analysis separate from the CEE countries may be more reasonable.

(b) The CISs countries choose different ownership structures according to their economic situation, availability of funds in the countries and institutional development. State capital prevails in the Russia, Belorussian and Uzbekistan banking systems. Russia has developed more advanced market mechanisms, while Belorussian and Uzbekistan banking sector mostly replicates the finance of soviet times. Domestic private banking dominates in Kazakhstan, Azerbaijan, Tajikistan and Ukraine. Countries, such as Armenia, Kyrgyzstan and Moldova, are lack of domestic finance and have chosen the strategy of attracting foreign capital. The discrepancies in the ownership structures resulting in differences in bank efficiency in the CISs countries are informative for countries' financial authorities for implementing effective regulation reforms.

(c) As stated before, the changes in regulation and supervision have critically transformed banks' risk-taking behaviour. Additionally, the financial crisis of 2007-2009 hit the banking sectors of the CISs countries and indicated that high risks had accumulated in the banking sectors. The risk-taking behaviour's influence on banks performance has mostly been studied for the developed countries of Europe and the US. However, there has recently been a comparative study for the BRICs, which includes Russia. It was concluded that the performance of BRICs banks was jeopardised by the acceptance of too much credit, market and overall risks (Zhang at al., 2013).

To this end, this chapter contributes to the literature by estimating common frontier for the CISs banks (1) and analyses the CISs bank performance by gauging the impact on technical efficiency of ownership structure – state-owned, private domestic, foreign-owned banks, and CISs-owned

banks; and risk-taking behaviour – capital risk, credit, market, and overall risks; and environmental factors, such as the 2007-2009 global financial crisis, GDP growth, and custom union entrance (2). This chapter employs stochastic frontier approach introduced by Aigner et al. (1977), and contributes to the methodology (3) by estimating technical efficiency using empirical model, which is based on the Berger et al. (2005) method, one-step estimation technique and a hyperbolic distance function offered by Cuesta and Orea (2002), which assumes input and output change simultaneously, and which we modified by estimating time-varying hyperbolic technical efficiency.

The period under consideration is between 2005 and 2012. Before this period the most reforms in transition of the banking sectors to a market basis had been undertaken in the CIS countries. During this period of time banking sectors of the CIS countries remained the dominant providers of financial intermediation and were subject to the global financial crisis of 2008-2010, which exposed weaknesses of the transition reforms in financial sectors of the countries. The next Section surveys literature pertaining technical efficiency and estimation technique, and relationship between efficiency and ownership, and efficiency and risks. Section 3 covers methodology and data description. Section 4 presents results from empirical model estimation, and Section 4 concludes and provides with policy remark.

3.2. Literature review

In this part we survey literature on methodology and variables we used in both empirical chapters on technical and cost/profit efficiency. This chapter introduces various efficiency concepts, including cost and profit efficiency, and discuss their advantages and disadvantages making accent on technical efficiency. Technical efficiency indicates whether a bank produces maximum amount of output employing minimum amount of inputs.

3.2.1. Literature review on methodology

X-efficiency is a combination of technical and allocative efficiencies, which is called also price efficiency (Lovell, 1993). In the banking sector X-efficiency is more important than scale and scope efficiencies[17], which are mostly exogenous problems (Berger and Humphrey, 1991). X-efficiency captures mostly endogenous factors that influence inefficiency, while it explains only 20% of exogenous factors (Bos and Kool, 2006). In other words, the X-efficiency explains most of the inefficiencies in the financial markets and we employ technical and allocative approaches to study bank performance in the CIS countries. This study examines both technical efficiency and cost/profit (allocative) efficiency to give a more complete assessment of bank performance of the CIS countries. Here we give definitions of both technical and allocative efficiencies, though, this chapter focuses on technical efficiency and next chapter investigates cost/profit efficiency.

[17] The scope economies measuring problems are identified in Berger and Mester (1997).Economies of scale arise when there is an increase in profits as a result of output increase. Berger et al. (1993) identified the aspects that can capture economies of scale.

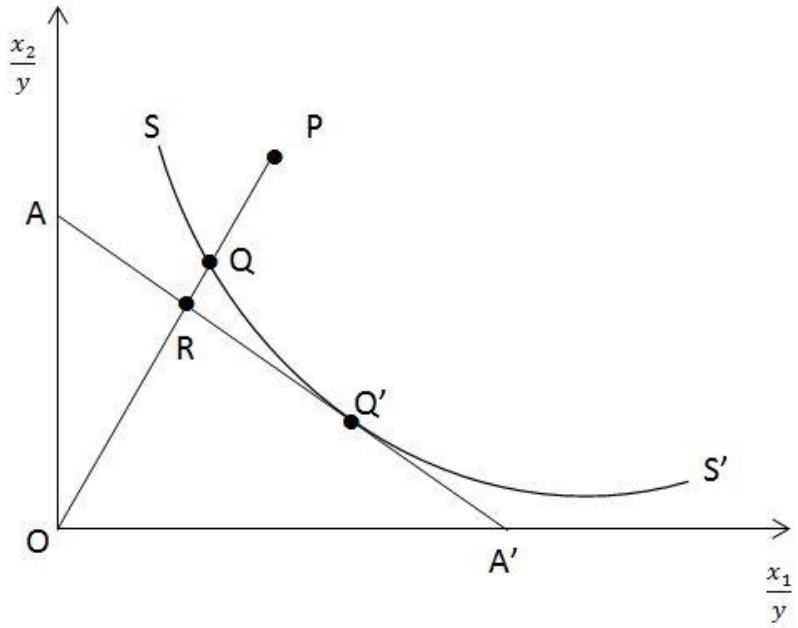
We begin with the discussion of different efficiency concepts, which are necessary when studying efficiency. Overall economic efficiency is a broad concept, which includes technical and allocative efficiency together (Coelli et al., 1998). Technical efficiency can be measured without the need to specify cost-minimisation or profit-maximisation objectives, thus there is no need for price information. Technical efficiency requires only input and output data to gauge the ability of a bank for output maximisation or input minimization given a certain output or input level, which also reduces the measurement error. Estimation of technical efficiency tells us whether managers organise production so that a bank would operate on its production frontier (Hughes and Mester, 2010). Technical efficiency is a radial measure and is calculated as the ratio of the linear distance between the production frontier and position of a bank within the feasible production set (Bikker and Bos, 2008).

On the other hand, when input prices are available, and assumptions on firm behaviour, such as cost minimisation or profit maximisation, are relevant, the allocative efficiency can be measured in addition to technical efficiency (Coelli et al. 1998). Allocative efficiency tells us whether managers choose the optimal proportions of inputs and outputs in response to relative prices. The allocative efficiency concept sets a different standard by incorporating relative prices.

Thus, to be overall economically efficient a firm should use the best technology (a) and effectively respond to changes in the relative prices (b). This requires two different abilities of managers, which are reflected in the differences of technical and allocative efficiency scores of the same firm. So, technical efficiency scores are tend to be higher on average than allocative efficiency (Bauer et al., 1998).

The efficiency concepts are closely related to the efficiency measurement and the following part provides a brief introduction to a simple measure introduced by Farrell (1957). Farrell suggested practical techniques for measuring productive (economic) efficiency of a firm, which can be presented by multiplication of technical and allocative efficiency. In his analysis he used an example of a firm, which uses two inputs x_1 and x_2 to produce output y, and the production is characterised by constant returns to scale. In Figure 1 (Coelli et. al, 1998), SS' represents the unit isoquant, which allows the measurement of technical efficiency. If the firm produces at the point P, then by Farrell its overall efficiency can be measured by the ratio OR/OP, which can be further decomposed into technical efficiency and price (allocative) efficiency. A firm is considered as technically efficient if it operates on the isoquant SS'. The firm located at P in

Figure 3.1: Technical and allocative efficiency



Source: Coelli et al., (1998)

Figure 3.1 is technically inefficient as it operates at the point above the isoquant. Its efficiency can be calculated as OQ/OP. Allocative efficiency can be defined for the firm at point P, if the

information on input prices is available; and allocative efficiency is measured by the ratio OR/OQ. The firm on the Figure 3.1 is allocative inefficient. As stated above, the overall efficiency is expressed by the product:

Overall efficiency = (OR/OQ)*(OQ/OP) (3.1)

Before we get overall efficiency and allocative efficiency we have to determine minimum cost and technical efficiency values. The minimum cost and technical efficiency are obtained using linear programming technique (Hassan et. al, 1990). In the case of multiple input-output production the linear programming problem specifies:

minimum costs as:

$$Min\ px\ subject\ to\ y \leq zY, x \geq zX,\ z \in R_{+}^{k}, \quad (3.2)$$

and technical efficiency as:

$$Min\ T\ subject\ to\ y \leq zY, Tx \geq zX, z \in R_{+}^{k}, \quad (3.3)$$

where *y* is the *m*-dimension vector of output, which is produced by a particular firm; *x* is the *n*-dimension vector of inputs utilised in production by a particular firm; *p* is the *n*-dimension vector of input prices, *Y* is the industry output expressed as the $(k \times m)$ matrix where *k* stands for the number of firms; *X* is the $(k \times m)$ matrix of inputs used by the industry; *z* is the vector of weights attached to the firm in calculation of minimum costs; and *T* is a scalar.

Resolving the problem (3.2) we obtain the minimum cost level for a particular observation. The overall efficiency is then calculated as the ratio of the minimum costs to produce the output of a particular firm over actual costs of the firm producing that output, which corresponds to OR/OP

in the Figure 3.1. Resolving the problem (3.3) we get technical efficiency values, which correspond to OQ/OP ratio. Finally, allocative efficiency is derived from the equation (3.1).

It is important to understand different efficiency concepts. In our example the firm is technically and allocative inefficient, however, the ratios, which measure two inefficiencies are different. Thus, the values of technical and allocative efficiency may differ. Moreover, a particular firm can be technically efficient, if it operates at point Q in the Figure 3.1, and at the same time it is allocative inefficient, and it should operate at point Q' to be both technically and allocative efficient.

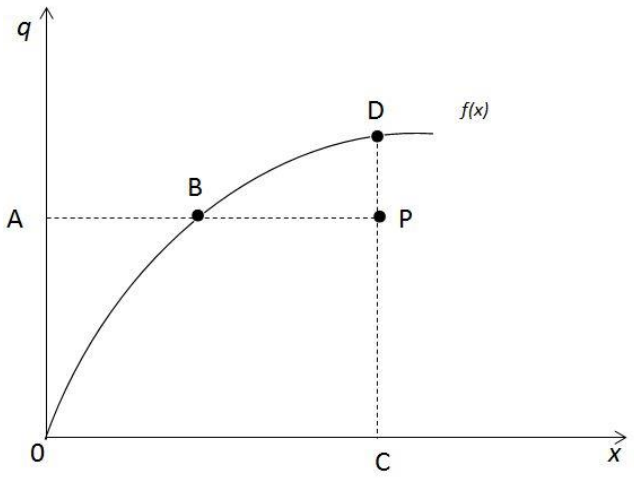
Distance function measure and approach

The idea of radial contractions and expansions is underlying the concept of distance functions, which are very useful in measuring technical efficiency. There are two different measurement orientations: input and output. The input-orientated technical efficiency measure answers the question on proportional reduction of inputs in optimising production when keeping the same level of output. From the other side one can be interested in answering the question on how much the output can be proportionally increased keeping the same amount of inputs. The discussion on technical efficiency measurement illustrated in Figure 3.1 takes into account input-orientated measure. The differences between the two orientations can be illustrated as in the Figure 3.2 (Coelli et al., 1998).

Suppose that a firm produces one output q using one input x; it has decreasing returns to scale technology $f(x)$ and operates at point P. Then, following Farrell, the input-orientated measure of technical efficiency equals AB/AP, which differs from output-orientated technical efficiency measured as CP/CD. Thus, the measures of inefficiency can differ depending on whether input-

or output-orientated model is estimated even if inefficiencies are measured against the same efficiency frontier of the best-operating firms (Coelli et al., 1998).

Figure 3.2: Input and output-orientated technical efficiency measures



Source: Coelli et al., (1998)

The choice of measuring inefficiencies by using the distance function is based on its qualities outlined (when its applications had become common in the literature) in Cuesta and Orea (2002), Coelli and Perelman (2000), Grosskopf et al. (1995) and Fare et al. (1993). The distance functions provide several advantages. First, distance functions can accommodate multiple outputs and multiple inputs production technology. It makes them useful for estimating efficiency of multioutput industries, like financial sector. Multioutput technologies traditionally were modelled using (a) a single output index or (b) a dual cost/profit function. Comparing results of estimated parameters using these two models with distance function model, Coelli and Perelman (2000) found distance function to be superior to others. Second, it is bound up with the technical efficiency. Third, distance function does not need information about prices in contrast to cost/profit function approach. It can measure the multi-product technology using only information about outputs and inputs quantities. The additional requirement on price information

can be problematic to meet especially when doing research on developing countries. Yet existing price information may lack of exougeneity property, which is assumed in the estimation of cost or profit frontiers (Cuesta and Orea, 2002). In this case, the distance function approach is beneficial over cost/profit function approach for the reasons that it doesn't face the problem of the absence of price information and mismeasurement. Fourth, behavioural assumptions such as cost minimisation or profit maximisation are not required when using distance function approach. In case of highly regulated industries these assumptions may be inappropriate, making the distance function approach a valuable option.

Estimation techniques

The evolution of performance analysis started from traditional ratio assessment and incrementally grew into more sophisticated techniques, which included econometric models of least-squares analysis, total factor productivity analysis and efficiency frontier analysis. While least-squares and total factor productivity analyses measure performance (technical change) based on the assumption that all firms are technically efficient, frontier analysis allows for estimating technical change and differences in efficiency across firms, which also allowed for identification of the factors that trigger the differences (Coelli et al., 1998).

Efficiency frontier analysis requires the best practice frontier to be estimated from a given sample; against this frontier relative efficiencies are to be measured. There are two main approaches to estimate the best practice frontier, such as nonparametric techniques and parametric techniques. The first group includes two nonparametric techniques: data envelopment analysis (DEA) and free disposable hull (FDH) analysis. The second group includes three commonly used parametric techniques: the stochastic frontier approach (SFA), the thick frontier approach, and the distribution-free approach (DFA) (Mester, 1994). A comprehensive literature

overview on banking sector efficiency studies, which consider different time periods and estimation techniques, was carried out by Berger and Humphrey (1997). The two groups of techniques to measure efficiency differ mainly in the assumptions imposed on the data set in terms of how much shape of a frontier is dictated by the functional form, the treatment of random error, and the distribution assumption to distinguish between random error and inefficiency (half-normal or truncated normal) (Berger and Humphrey, 1997). They conclude that efficiency results variations resulting from different estimation techniques used. Among 130 reviewed studies of 21 countries sixty studies use the stochastic frontier approach.

Estimation technique: nonparametric methods

Nonparametric techniques are presented by DEA and its version FDH, which differs from DEA by presuming that linear substitution of observed input combinations is not possible and excludes the points on the lines, which connect the DEA vertices. DEA presents a frontier, which consists of efficient firms' input/output combinations observed (vertices) and connected by piecewise linear segments. Originally introduced by Charnes et al. (1978), DEA became a popular approach of frontier estimation. Though, nonparametric approaches have their benefits that they do not require the explicit specification of the form of the distribution of inefficiencies across observations and allow efficiency to vary over time, these approaches suffers a major drawback. The nonparametric approaches do not distinguish between random error and inefficiency, which significantly distorts technical efficiency results (Bauer et al., 1998). To overcome this problem, there were some efforts to impellent stochastic inference by using bootstrapping (Grosskopf, 1996). This additional properties of DEA made this approach promising for efficiency analysis (Simar and Wilson, 2000; Glass et al., 2010). Another problem with DEA approach is that it suffers from 'self-identifiers' and 'near-self-identifiers' problem. That means that a firm can be

100% efficient when other constraints are specified such as environmental factors, regulatory variables or quality controls; it becomes impossible for other firms to be comparable in so many dimensions (Bauer et al., 1998).

Estimation technique: parametric methods

All parametric methods (SFA, TFA and DFA) allow for random error, but differ in assumptions on how to disentangle random error from inefficiency, which are both unobserved. The distribution-free approach (DFA) measures inefficiency using panel data set; it assumes no specific distributions of the inefficiencies or random errors, however, presumes that random error averages out over time while 'core' efficiency or average efficiency of each firm stays the same. The inefficiency then calculated as the difference between firm's mean residual and the mean residual of the firm on the frontier (Berger and Humpfrey, 1997). The critique comes from the point that while averaging out firm's efficiency variations over time together with the random error, it also implicitly assumes that inefficiency is the time invariant fixed effect, which in turn incorporates some persistent factors omitted in the model specification as inefficiency (Bauer et al., 1998).

The thick frontier approach (TFA) approach specifies a functional form however, does not impose distributional assumptions on inefficiency and random errors. TFA approach presumes that random errors are deviations from predicted performance values within group of firms with the highest performance quartiles and lowest performance quartiles, and inefficiencies are deviations in predicted performance between the quartiles (Berger and Humpfrey, 1997). The 'thick frontier' is formed by the firms in the lowest average cost quartile, which assumed to have above average efficiency. This assumption that lowest average cost quartile is a true 'thick

frontier' of efficient firms is rather arbitrary and makes efficiency levels vulnerable. Moreover, TFA estimates the general level of overall efficiency rather than provides efficiency estimates for individual firm.

The stochastic frontier approach (SFA) imposes a functional form on frontier (cost, profit or production function) and employs a composed error, which consists of inefficiencies and random errors. The two parts are disentangled using different distributional assumptions, where random errors are normally distributed (usually they have standard normal distribution) and inefficiencies follow an asymmetric distribution: half normal and exponential distributions, which are single-parameter distributions, and Gamma distribution and truncated normal distributions, which are two-parameter distributions (Kumbhakar and Lovell, 2000).

Parametric and nonparametric approaches are two main estimation techniques, which are implemented for frontier analysis. Both approaches have their pros and cons, and the choice depends on researcher's objectives. Nonparametric method imposes less structure on the frontier avoiding misspecification errors of underlying production processes. At the same time, nonparametric method assumes that there is no random error, which accounted as inefficiency, distorting efficiencies estimates. Contrary to these, parametric approaches impose a particular functional form that defines the shape of the frontier which can be misspecified. As a result, measured efficiencies would suffer from misspecification error. However, positive aspects of the parametric estimation overweigh potential problem.

Parametric estimation avoids inaccuracy in estimation of inefficiencies by decomposing error term into random error and inefficiencies. Random error may include measurement error in constructing the frontier; luck that temporarily gives a decision making unit better measured

performance one year from the next, inaccuracies created by accounting rules that would make measured outputs and inputs deviate from economic outputs and inputs (Berger and Humphrey, 1997); and different environmental shocks. Parametric and nonparametric approaches had been compared to check if there is a substantial difference between the two in Berger and Humphrey (1997). They compared average efficiency levels and ranking across various techniques, and found that there is similarity in central tendency of the distribution of average efficiency scores but similarities are weaker for financial institutions ranking using estimated efficiency values. Bauer et al. (1998) compared different efficiency techniques based on six consistency conditions' framework, and concluded that while there is general consistency within parametric and nonparametric approaches in terms of distributional properties (mean, standard deviations), ranking, best and worst practice institutions identification and efficiency levels, there is substantial divergence between parametric and nonparametric methods. They also established that parametric methods better complies with consistency conditions, which assess the degree to which the efficiency scores are consistent with competitive conditions in the market and standard non-frontier performance measures such as cost/revenue ratio or return on assets, than nonparametric methods.

Defining input-output: intermediation approach

There are two most applied approaches to which input and output variables should be included to capture more precisely banking activity. One is the production approach, which supposes that a banking firm serves its clients where deposits and numbers of loans are considered as output, while labour and physical capital are input factors. Production approach requires information for outputs such as the number and types of transactions or documents processed over a period of time. This kind of data on transactions' flow is typically not available. Instead, data on the

number of deposits or loan accounts, or number of transactions made are usually used (Goddard et al., 2001). The production approach is found in early literature (Benston, 1965) and later, for instance, in Berger and De Young (1997), Berger and Humphrey (1991), Swank (1995), Resti (1997).

The intermediation approach, which was initiated by Sealey and Lindley (1977), treats bank as intermediaries, where a banking firm attracts funds (from savers) and transforms them into loans and investments (to borrowers). Loans and investments' values are treated as outputs, and labour, capital and deposits are taken as inputs. In this approach, opposite to production approach, deposits regarded as an input, which results in that operating and interests costs are taken into account. This approach was applied in works by Barr et al. (1994), Avkiran, (1999), Casu and Molyneux (2003), Fries and Taci (2005).

Each approach includes only one part of the dual role of financial firms: the provision of transaction and document-processing services (production approach) or the transfer of funds from savers to borrowers (intermediation approach). However, each of them can serve better for different purposes. The production approach has advantages in evaluating efficiencies of banks' branches as customer documents are processed mainly in branches for the bank as a whole, bank's funding and investment decisions are not under control of branch managers. On the other hand, the intermediation approach allows for better evaluation of entire financial institution as this approach takes into account interest expenses, which comprise from one-half to two-thirds of total costs. Additionally, it can be better for measuring profitability in frontier analysis as the minimization of total costs required for maximising profits (Goddard et al., 2001).

The other two less commonly used approaches are a value-added approach and a user-cost approach. The first one includes assets and liabilities, which add considerable value to the financial institution, as outputs, and labour and the value of physical capital (premises and fixed assets) as inputs. The user-cost approach pioneered by Hancock (1985) takes those assets and liabilities, which contribute to a financial institution's revenues, as outputs and those assets and liabilities, which contribute to a financial institution's cost of production, as inputs (Park and Weber, 2006).

The early literature in banking was involved in debates on which approach explains better banking industry, because it has an influence on modelling and input-output choice. All approaches agree on loans and other earning assets to be treated as outputs, while deposits could be considered as inputs and outputs due to the dual role of deposits in a financial institution. Deposits have input characteristics because interest is paid for them; they have output characteristics because they are associated with considerable amount of liquidity, safe-keeping and payment services to depositors (Berger and Humphrey, 1997). However, recently the intermediation approach is commonly used (See, for example, Koetter et al., 2012, Zhang et al., 2013).

In order to conduct efficiency analysis, input and output variables must be specified. Based on the above considerations and objectives of this study to measure bank efficiency at firm and industry level using frontier analysis, this research adopts the intermediation approach for both empirical works on bank performance. Viewing banks as financial intermediations we employ the following inputs and outputs for the analyses. We discuss inputs and outputs used for technical efficiency and cost and profit efficiency analysis here and in the next empirical chapter we refer to this discussion.

The multiple output production technology of banking industry is taken into account in our study. This research defines outputs employing profit before taxes and loans values, which are commonly used in bank performance analysis, and inputs are labour, capital and deposits. Based on what outputs we use, we distinguish two models such as revenue-focused model and asset-focused model, which we estimate for technical efficiency and cost/profit efficiency respectively. Following literature (Sturm and Williams, 2004; Park and Weber, 2006 and Zhang, 2013), this study estimates technical efficiency using revenue-focused model specification and defines pre-tax profit such as interest income and non-interest income as outputs, and interest expenses and non-interest expenses as inputs. This model measures the efficiency of financial institutions in turning costs into revenue.

Asset-focused model applied to measure cost and profit efficiency and represents a classical intermediation model; it specifies two outputs such as loans and other earning assets (Sealey and Lindley, 1977) and uses two input prices for estimating bank cost and profit efficiency: labour and physical capital calculated as a ratio of non-interest expenses to total assets (Hasan and Marton, 2003; Fries and Taci, 2005; Bonin et al, 2005a; and Jiang et al., 2013) and funds calculated as interest expenses to total customer deposits (Bonin et al., 2005a; Berger et al., 2009). The definition of input variables in this model slightly deviates from the intermediation approach theory due to unavailability of data on number of employees; the model uses a variable, which consist of labour and physical capital together (non-interest expenses to total assets). However, this approach is practical especially for transition countries, and was used in a number of studies sited above. Total costs are measured as the sum of interest and non-interest costs (Bonin et al., 2005a) and total profits are measured by pre-tax profit (Jiang et al., 2013). Cost

and profit efficiency measures how close a bank is to the 'best-practice' minimum cost or maximum profit frontier determined by best performer in the sample (Berger et al., 2009).

The models include one fixed input – equity – to control for risk preferences, which was proved to be important for the accuracy of bank efficiency estimates (Mester, 1996; Berger and Mester, 1997). Particularly, the inclusion of equity as a fixed input in the cost and profit efficiency estimation is important. Financial capital is a buffer against portfolio losses, thus it is an important aspect for insolvency risk absorption. Bank costs and profits are influenced by insolvency risk through the risk premium the bank has to pay for uninsured debt and through the risk management activities that bank managers undertake. On top of that, raising equity is more costly than raising deposits, which has direct effect on costs (Berger and Mester, 1997).

3.2.2. Literature survey on the relationship between bank ownership and performance

Bank ownership influence on banks performance has attracted a great deal of research attention. Massive privatisation in banking sectors after the change in political regime reshaped the ownership landscape in these countries. However, the centralised banking and state ownership prevailing in soviet times left its legacy in many CISs banking sectors. Over the years, a substantial deal of literature on the relationship between ownership and bank performance has been developed.

State ownership is dominant in developing and transition countries, however, it has been lessening steadily over time (Megginson, 2005). In general, different types of bank ownership reflect different forms of governance (Berger et al., 2005), which exist in transition countries

nowadays offering rich grounds to measure difference in efficiency across ownership types. The pro and cons of the state ownership are argued from different theoretical points.

From the 'political' view theory, state owned banks are less efficient because they finance the inefficient but socially desirable projects while having major control over the choice of projects to finance (La Porta et al., 2002). Government maximises its own welfare and does not maximise social welfare. Politicians and regulators may persuade banks to give credits to a politically connected firms, or potent banks may pursue politicians and regulators to act in the banks' best interest instead of society (Rajan and Zingales, 2003; Levine, 2004); while direct official supervision reduces the efficiency of banks (Horiuchi and Shimizu, 2001). However, the countervailing 'development' view has been advocated state ownership by the reason that government can swiftly organise and direct finance to boost economic development and industrialisation. The role of government in this case is to balance social and economic aims. Government control is also considered as an antidote to market failures (Megginson, 2005). Thus, state ownership of banks has two different theories reflecting the government's objectives 'development' and 'political'.

Another two clear strands of theories are helpful in studying ownership: the principal-agent framework, which explains relationship on the micro level, and soft-budget constraint, which also can be referred to as 'political' theory. Bearle and Means (1932) examined the separation of ownership and control. The theory states that over time executives get the main power over the corporate control so that the board's supervisory role becomes ineffective. This theory was rekindled in the debates over ownership and control explicitly referring to a principal-agent problem in 1970s.

In banking, the question on what is the most appropriate governance structure for banks concerns the principal-agent problem. The principal-agent problem arises when agents (bank managers) and principals (banks shareholders) have different interests, and principles cannot directly control that the other party always acts in principals' interests. Therefore, the principal should exert monitoring and control via external auditing and board of directors, which could be both costly and difficult due to separation of ownership and control. Principal-agent problems exist in any type of ownership structure where this separation presents. These problems result in differences in banks performance depending on how banks with different ownership types solve the principal-agent problems (Williams and Nguyen, 2005). The problems' source is asymmetric information, where managers know better about the bank's state; besides managers may have own interests conflicting with shareholders', and may maximise their own utility (Heffernan, 2005). Little monitoring in principal-agent framework can arise for the following reasons. The control of information flow is one of the factors that small shareholders lack of expertise to monitor managers. Moreover, small shareholder with small stake in the bank may find it costly to monitor managers and induce a 'free-rider' problem when individual shareholder would rely on others for monitoring. In general, the principal-agency problem is thought to lead to inefficiencies (Button and Weyman-Jones, 1992). In the case of banks' state ownership the problem appears because principals are all individuals in the state and ownership is dispersed. That leads to the 'free-rider' problem as no one individual would undertake the costly monitoring over the governmental management. That gives the power of control to the government (Huibers, 2005, p. 289) and leads to a non-optimal monitoring[18].

[18] See also for nonfinancial firms: Furubotn and Pejovich (1972); Vickers and Yarrow (1991); Dyck (2001).

The soft-budget constraint concept was introduced in the context of socialist enterprises by Kornai (1979, 1980). The socialist enterprises had an access to finance constantly or had soft budget constraints when they could not cover their costs. Kornai reformulated his concept and expanded to "the paternalistic role of the modern State" without judgemental attitude towards it as being "good" hard budget constraint and "bad" soft budget constraint. He also made a point that the syndrome of soft budget constraint exists in other than socialist economies (Korani 1986), though the soft budget constraint syndrome is more damaging in the systems with public ownership either socialist economies rather than those with private ownership (Kornai, 1998). The concept is about the rational planning problem, which appears when there is a relaxation of the relationships between earnings and expenditures, so that the firm's expenditures, which exceed earnings, will be paid by the State. When there is the high expectation probability that those extra expenditures will be covered, it influences the behaviour of the managers and in the end the efficiency (Korani, 1986). Thus, there is a trade-off between efficiency and the social or human consequences when it comes to the policy considerations whether to harden or soften budget constraint (Korani, 1986). According to the theory, state owned banks can easily get refinancing as state owned enterprises, which is characterised as soft budget constraints in economic literature (Kornai, 1979, 1980, 1986). Implicit government guarantees may negatively influence banks' performance by limiting market discipline and discouraging efficient performance of banks' management and thereby increasing the moral hazard problem (Huibers, 2005, Megginson, 2005).

Empirical studies show mostly negative impacts from state ownership. Government ownership may slow down financial development, lead to a lower income and productivity growth, and even increase the probability of banking crisis (Barth et al., 1999, La Porta et al., 2002, Caprio

and Peria, 2000). However, while private banks were significantly more profitable, private banks appeared to be less cost efficient than government owned banks among western banks between 1999 and 2004 (Iannotta et al., 2007).

The substantial presence of state owned financial institutions in transition economies provided rich grounds for investigation of the impact of the state ownership on performance. It is generally found that predominantly state ownership has a negative impact on banks (Bonin et al., 2005; Fries and Taci, 2005; Jiang et al., 2009; Yao et al., 2007; Zhang et al. 2013). State banks underperformed persistently in cost efficiency, while privatised banks improved their mark-ups in 15 transition countries including Kazakhstan, Russia and Ukraine during the period between 1995-98 and 2002-2004 (Fries et al., 2006). Fries and Taci (2005) found that private banks were more cost efficient than public banks in transition countries over the period 1994–2001[19].

However, some studies for transition and developing countries argue in support of state ownership. Bonin et al. (2005a) came to the conclusion that there is no much evidence that state-owned banks in transition countries are less efficient compared to domestic private banks for the period from 1994 to 2000. In Turkey state owned banks are more efficient than their peers both domestic private and foreign banks (Isik and Hassan, 2003) as well as in India (Shanmugam and Das, 2004) and Argentina (Staub et al., 2010; Tecles and Tabak, 2010). Additionally, transition is effective for decreasing interest margins, which were employed as indicators of efficiency by Drakos (2003). He finds that notably narrower margins are set by state-owned banks, including Belorussia and Ukraine.

[19] Fries and Taci (2005) found that Kazakh banks are more efficient than Russian banks over the considered period.

Karas et al. (2010) estimated cost efficiency frontier for Russian banks and found that state-owned banks are more efficient than domestic private banks, while foreign banks are more efficient than their peers. The reasons why public banks may be more efficient than domestic private banks are found in deficiencies of market based institutions in Russia. Institutional deficiency in Russia include widespread distrust, dishonesty in business and fraudulent behaviour, which hinder the private banking development and lead to a domination of public banks associated with 'government's stable hands'.

In line with that, Grigorian and Manole (2002) used DEA technique and found that privatisation of state banks to domestic owners didn't improve efficiency in the period 1995-1998 in their cross-country analysis of the CEEs and CISs banking sectors (Armenia, Belarus, Kazakhstan, Moldova, Russian Federation and Ukraine). However, controlling for foreign ownership proved that foreign banks have higher efficiency in transition countries. It suggested that privatisation to domestic owners hasn't led to substantial efficiency advances and entrance of foreign banks would be preferable.

Foreign ownership

Another aspect of ownership issue relates to globalization and liberalisation of the financial sectors in transition countries, which led to a greater involvement of foreign owners in the banking sectors of the countries. Foreign banks increase competition in the banking sectors of the host countries but also can crowd out the domestic banks causing their bankruptcies. There are two different hypotheses that predict efficiency of foreign owned and domestic owned banks proposed by Berger et al. (2000): the home field advantage hypothesis and global advantage hypothesis.

The global advantage hypothesis claims that foreign banks can be more efficient that the domestic banks in host countries (Buch, 2003; Berger et al., 2005). These banks can be more efficient for several reasons. First, foreign institutions can have superior managerial skills, best-practice policies and procedures; and in developing countries these institutions can have access to superior information technologies for collecting and processing 'hard' quantitative information. Second, being a part of large banking firm, they face the same economies of scale as their home bank. Third, they set up their branch offices in the countries to serve their multinational customers, which operate in foreign countries, and provide them with services that cannot be offered by domestic banks. Finally, those organisations have a better access to capital markets and superior skills of risk diversification, which allow them to make investments with higher risks and higher expected returns.

The global advantage hypothesis has two forms. General form considers that foreign banks, regardless of the nation in which they are headquartered, are more efficient than domestic banks because they are able to overcome any cross-border difficulties, and they are managed effectively. Under the limited form of the global advantage hypothesis, foreign banks are efficient only in a limited number of nations with favourable market or/and regulatory and supervisory conditions.

The home field advantage hypothesis states that domestic banks are more efficient than foreign banks. Domestic banks do not experience diseconomies of managing from a distance, which include operating, monitoring and organisation. Domestic institutions have soft knowledge of local customers; opposite to foreign institutions, domestic banks have no barriers of language, culture, currency, regulatory and supervisory structures and country-specific market features (Berger et al., 2000; 2005).

A comprehensive comparison of findings regarding foreign versus domestic ownership was carried out by Berger (2007) for over 100 studies. He found that the home field advantage hypothesis holds in developed nations, where domestic banks are on average more efficient than foreign banks. The studies that support this hypothesis are done by De Young and Nolle (1996), Berger and De Young (2001, 2006), Berger et al. (2000). However, some studies find that foreign banks are more efficient in the developed nations than domestic (Sturm and Williams, 2004).

The reverse tendency in favour of global advantage hypothesis is found in developing countries (Berger, 2007), though with notable exceptions. Empirical studies in favour of home field advantage hypothesis evidence benefits of the foreign entrance via privatisation in transition countries (Bonin et al., 2005b, Fries et al., 2006) and improvement of home banks' efficiency (Fries and Taci, 2005; Bonin et al., 2005a; Weill, 2003; Kasman, 2005; Kasman and Yildirim, 2006). Styrin's work (2005) covered the banking sector performance of Russia reporting that foreign banks are more efficient than Russian domestic banks. However, some studies provide with the opposite evidence of foreign bank ownership in transition counters, when foreign owned institutions are less efficient in support of home field advantage hypothesis (Rao, 2005). Differentiating between foreign, domestic private and state banks Shanmugam and Das (2004) found that foreign banks outperform domestic private but not state banks in developing country. Mixed results are found in Poland where foreign owned banks are less profit efficient but more cost efficient (Nikiel and Opiela, 2002).

3.2.3. Literature on the relationship between risks and performance

Risks are a key aspect of banks' production. Banks need to assess, monitor and diversify risks and, thus, risk management is an essential part of the banking business. Risk-taking behaviour is approached *at the macro and micro levels*. On the macro level the stability of banking system is considered in terms of competition in the banking sector. Some commentators argue that lack of competition enhances monopolistic behaviour in banking sector and monopoly charges high interest rates, which in turn increase the adverse selection problem leading to unstable banking sector (Boyd and De Nicolo, 2005; Allen et al., 2011; Schaeck et al., 2009). The opposite view states that competition could be harmful for the banking sector as it encourages risk-taking behaviour and adverse selection problems as riskier projects are financed. That could be bad for financial stability; the risk-taking behaviour can be decreased by monopoly rents (Allen and Gale, 2004, Keeley, 1990). We address the macro level stability in the third empirical chapter where we explore competition issues in the CIS banking sectors.

At the micro level, bank performance dependence on different types of risks and importance of their inclusion for efficiency studies was outlined in many studied (Berger and De Young, 1997; Altunbas et al. 2000; Altunbas et al. 2007; Brissimis et al., 2008; Fiordelisi et al. 2011). In our study we employ four risk taking behaviour measures such as capital risk, credit risk, liquidity risk and market. These bank behaviour characteristics shows the amount of risk manager of a bank are taking on, and do not necessarily indicate causation of efficiency or inefficiency; rather they would indicate clues towards increasing efficiency (Mester, 1996).

Capital risk is measured as equity over total assets and characterises regulatory conditions. Usually, a lower capitalisation leads to lower efficiency levels because banks with low capital

face higher risk taken at greater leverage, which results in greater funds' costs. Capital ratio also can be related to cost inefficiency because inefficient bank earns low profits (or profit inefficient), which results in lower capital level in the future (Mester, 1996). In line with that Berger and Mester (1997), Kwan and Eisenbeis (1997), and Isik and Hassan (2003) found that well-capitalised banks are more efficient. Later studies by Fiordelisi et al. (2011) found negative relationships between risk taking behaviour and performance in the European banking for the period 1995-2007 showing that higher capital had positive relationship to efficiency; however, Altunbas et al., (2007) stated that inefficient banks tend to hold more capital studying the period between 1992 and 2000.

Bank failures are caused by two main reasons: bad loan quality and insufficient liquidity levels. To minimise risks banks may choose an increase in liquidity and/or portfolio diversification, which relate to *liquidity* and *credit risk* respectively. Following the empirical literature, liquidity risk is measured as ratio of liquid to total assets. Liquidity raising strategy would involve better monitoring and screening liquidity risk and, therefore, improving efficiency. This strategy can predict future risk level. Liquidity holdings also reflect management efficiency because efficient manager would hold lower levels of liquid assets, while not efficient manager would hold excess amount of these low-yield assets. Moreover, liquidity holdings imposed by the regulation are costly for a bank because higher levels of cash and liquid assets have higher costs (Altunbas et al., 2000). The relationship between the level of liquidity and profitability was found to be negative in Molyneux and Thornton (1992), while the opposite was found by Bourke (1989). We expect negative association between higher liquidity levels and efficiency.

Credit risk is measured as loan loss reserves over total loans. Credit risk arises when loans and accrued interests are not paid by the borrowers, and characterises asset quality. Riskier loans are supposed to have higher return, and thus have a positive impact on income; however, a low asset quality should increase the bank's cost of funding reducing income. At the same time, higher loan quality requires more efforts on loan monitoring and credit underwriting, thus increasing costs. Thus, the net impact of loans on profit is inconclusive (Iannotta et al., 2007). Loan loss reserves to total loans ratio was used as a proxy for asset quality and risk to study banks performance and risk in 15 European countries over the period 1999-2004 in Iannotta et al. (2007); mutual banks are characterised by higher asset quality and lower asset risk, while public sector banks are riskier and less profitable than their peers. They considered the impact of the ratio of loans loss provision to total loans on profits and found positively significant relationship between the two variables. Miller and Noulas (1997) and Athanasoglou et al. (2008) found a negative influence on profitability from credit risk.

Some studies calculate credit risk as non-performing loans to total loans ratio (Berger and De Young, 1997; Williams, 2004), which is backward looking measure accounting for realised credit risk (Fiordelisi et al., 2011), while the loan loss reserve to total loans indicator focuses on present and future credit risk assessment by managers. Sun and Chang (2011) measured credit risk effect on cost efficiency in emerging economies using loan loss reserve to total loans ratio. They found that a bank with a higher loan loss reserves to total loans ratio operates less cost efficient; a higher ratio implies that the bank has a threat that its loans will become nonperforming. In general they concluded that there is a significant effect of risks such as credit, operational and market risks on cost efficiency and variability over studied period 1998-2008.

Less efficient banks are overloaded with bad loans and have a higher credit risk. Cost inefficient banks are likely to have more nonperforming loans for a number of reasons. Bad management of a bank may make mistakes in monitoring both bank's costs and loan customers resulting in capital losses and potential failure of a bank, which is described as 'bad management' hypothesis. On the other hand, some exogenous to a bank events, which are not under management control such as economic downturn and associated with it extra costs for monitoring, negotiating workout arrangements, seizing and disposing of collateral, divert senior managerial focus, can influence low cost efficiency. This phenomenon is described as 'bad luck' hypothesis (Berger and De Young, 1997). Berger and De Young (1997) analysis suggested that problem loans precede reductions in measured cost efficiency and that reductions in capital at poorly capitalised banks precede increases in problem loans.

Similar to Berger and De Young's (1997) result was found by Altunbas et al., (2000) where non-performing loans are negatively related to bank cost efficiency. Their finding suggests that efficient banks better evaluate credit risk. In line with that, Isik and Hassan (2003) tested whether non-performing loans are negatively associated with X-efficiency, and found that there was a statistically significant negative association between non-performing loans and cost, allocative, technical and scale efficiency. These findings confirm that managing problem loans is costly.

For transition countries, Brissimis et al. (2008) find that capital and credit risks have negative impact on bank performance in newly accepted EU members, while liquidity risk have positive impact on performance. In developing countries the risk-taking effects on bank efficiency was carried out for the BRIC banks including Russia (Zhang at al., 2013). Zhang at al. (2013) used

output-distance function to estimate technical efficiency and efficiency effects, and concluded that BRICs banks performance was jeopardised by taking excessive credit, market and overall risks, but taking more capital risk led to higher efficiency. In general, the lower risk taking strategies are better for banks' performance in BRIC countries.

Market risk is calculated as interbank loans to total borrowed funds and reflects bank's market exposure to interbank unsecured borrowings, which can lead to high risk exposure in case of market rates volatility. Funds' costs purchased in the interbank market differ from deposits' funds over the business cycle. Foreign banks in the US that used more purchased funds appeared to be less cost efficient (Berger and Humphrey, 1997). Banks that rely on purchased regardless foreign or domestic funds found to be less profit efficient but contrary to expectations more cost efficient in the US (Berger and Mester, 1997). In support to the results of Berger and Mester (1997), Isik and Hassan (2003) found that banks with relatively higher level of purchased funds are likely to be more cost efficient, which they explain by that that bank can economise on labour of physical capital using external funds. The efficiency can be also explained by the market discipline. Schaeck and Cihak (2007) included the ratio to adjust for market discipline referring to the opportunity for banks to monitor other banks in the interbank market and incentive for discipline as interbank deposits are uncovered by deposit protection schemes. Market risk found to have a negative influence on bank performance in developing countries when bank performance frontier is measured for a single country (Jiang et al., 2009), and as a common frontier for BRIC countries (Zhang et al., 2013).

3.2.4. Control variables

We control for environmental and bank level factors that might influence efficiency. In our study we control for income diversity, assets diversity and listing at the bank level; and for the word financial crisis, GDP growth and custom union at the country level.

Bank level factors

Product *diversification* is closely related to scope efficiency, whether a bank is efficient at combining outputs. Bank's efficiency might be linked to bank's strength in targeting particular market niche; a specialised bank is more efficient than a universal bank (due to diseconomies of scale). Diversification is desirable for reduction of idiosyncratic risks, growth, realisation of efficiency gains via economies of scale and scope (Stiroh, 2010). However, the benefits of diversification towards no-traditional banking can be overweighed by more volatile revenue streams and inefficient performance (Stiroh, 2004; Laeven and Levine, 2007; Demirguc-Kunt and Huizinga, 2010; Liu and Wilson, 2010). Poorer asset diversification had a negative impact on cost efficiency in Russia overweighing savings on skimping behaviour (Styrin, 2005).

A number of empirical studies find that product diversity has a negative impact on cost efficiency Aly et al. (1990), Isik and Hassan (2003). In recent study by Zhang et al. (2013) diversification strategies appeared to have negative impact on bank performance with the exception of positive impact on the revenue sources in income-based model. We expect that diversification would negatively influence bank performance.

Listing status captures the governance effect on performance, and it is used to analyse whether banks which go public are more efficient due to market pressure and transparency requirements or multiple monitoring than unlisted banks. In developed countries listed banks appeared to be

less cost efficient but more profit efficient than unlisted banks, which can be related to the difference in size, both mix and quality of assets, and operating performance (Iannotta et al., 2007). Earlier findings also found that publicly traded banks are more cost and standard profit efficient (Berger and Mester, 1997). For developing countries results differ depending on what business processes are analysed. Listed banks are more efficient in income generation but less efficient in earning assets growing in China (Jiang et al., 2009); similarly, listed banks are more cost, profit and interest income efficient than unlisted banks. We expect that listed banks would have better performance than unlisted banks because going public policy are likely to improve performance.

Environmental factors

The *financial crisis of 2007-2009* and its negative consequences for transition countries we discussed in the chapter on the CISs banking systems review. We include dummy variable to capture financial environmental risk of the World financial crisis of 2007-2009. The crisis has fuelled the research relating to financial crisis and bank performance. The literature mainly indicates a negative impact of the crisis on efficiency. Cost efficiency significantly plunged down in emerging Asian economies (Sun and Chang, 2011). The impact of the global financial crisis was examined across the emerging economies' banks by Zhang et al. (2013). They found that BRIC banks performance was negatively affected by the crisis with Russian banks being the most affected. Other study indicated that profit efficiency was more affected by the crisis than cost efficiency in China (Jiang et al., 2013). The recent study by Matousek, et al. (2015) reports the overall decline in efficiency of European banks following the financial crisis and slow adjustments to the pre-crisis efficiency level, which confirmed Tsionas (2006) argument that efficiency does not recover fast after systemic shocks. We expect negative influence of the

global financial crisis on bank performance. We include *GDP growth* in to control for the level of economic development of the countries. This is a control variable, which is commonly used in cross-country studies. While GDP growth had a negative impact on performance in developing BRIC countries reflecting banks involvement in economic growth but not improving performance (Zhang et al., 2013), it had a positive impact on efficiency in China (Jiang, 2009). We anticipate a positive impact of GDP growth on efficiency.

In our study we consider the regional integration processes and their influence on banks performance. Within the *custom union* treaty and its establishment, a common external tariff was adopted; and the customs clearance among the member-countries was abolished in July 2010, though member-countries agreed several exclusions from the common customs territory, the majority of which was valid until 2015 (World Bank Report, 2012). We use the dummy variable to reflect the integration process: 1 for after the customs clearance abolishment and 0 for before. We expect that the custom union membership would negatively affect bank performance due to worsening of economic conditions including increased price level on goods and services, which countries encountered after the lifting of trade barriers (especially in Kazakhstan and Belarus, where prices had to adjust and equalise with the price level in Russia). The influence of integration and particularly the custom union on bank efficiency has not been studied yet, though regional integration is one of the most important topics on political agenda in the CISs.

3.3. Methodology

3.3.1. Stochastic frontier approach and inclusion of environmental variables

In this work the stochastic frontier approach (SFA) is employed to measure the CISs banking sector efficiency. The advantages that SFA method has for our sturdy include the argument that disregarding which specific distributional assumptions are imposed, the SFA approach will always rank the efficiencies of the firms in the same order as their residuals, because the conditional mean is always increasing with the size of the residual (Bauer et al., 1998). This SFA property calls for measuring bank efficiency for regulatory purposes because a bank, which keeps its costs low for its given exogenous conditions, is evaluated as a high rank in terms of efficiency. The other argument refers to the error term decomposition. As it was stated in the literature section, the random component of a residual may include measurement error, accounting inaccuracies and environmental disturbances, which are more likely in transition countries (Fries and Taci, 2005).

The widely applied stochastic frontier analysis approach to measure efficiency originated in two papers, one by Aigner et al. (1977) and the other by Meeusen and van den Broeck (1977) a month later. As mentioned before SFA models impose functional form for cost, profit and production relationship and allows for composed error term. In the SFA, an error term (ε_i) is decomposed into two parts and a distribution assumption is made about their functional forms. One part is production inefficiency as a non-negative random variable (u_i) and the other is a random error (ϑ_i). That is: $\varepsilon_i = \vartheta_i + u_i, \text{where } u_i \geq 0$. The random error ϑ_i is normally independently and identically distributed as $N(0, \sigma_v^2)$, and u_i has truncated normal distribution,

which is truncated at 0 because inefficiencies cannot be negative. The two terms are independent of each other. Both random error (ϑ_i) and inefficiency (u_i) are orthogonal to the input (x_i) and output (y_i) vectors or environmental variables entering the equation. The efficiency of each firm is based on the conditional mean (or mode) of inefficiency part of composed error (u_i), given the estimated composed error term (ε_i) (Bauer et al., 1998).

Stochastic frontier approach postulates existence of the inefficiency effects, which vary across firms and/or through time. If there are variations, it is important for efficiency studies to seek determinants of these variations since it could inform on what policies are appropriate to influence producer performance. Three different groups of factors were described that can influence producer performance. The one group of factors is associated with management abilities to organise production processes. The other two groups are exogenous such as environmental characteristics in which producer operates, and the influence of good/bad luck and omitted variables, which are reflected in a random error (Fried et al., 2002). The biasness in estimation of efficiency in models without environmental characteristics is due to the assumption that inefficiency differences across banks appear only because of managerial decisions. This should be corrected by including those environmental variables into models. This analysis requires a model, which can incorporate these factors.

Existing analyses of producer performance can be divided into two stages. The first step is to estimate a stochastic frontier of cost, profit or production function, which serves as a benchmark against which the cost, profit or technical efficiencies are estimated. The objective of this component is to estimate the efficiency with which a producer uses inputs in producing outputs under some behavioural and distributional assumptions. In this step the distributional assumption is that inefficiencies are identically and independently distributed.

The second stage explores the causes of efficiency differences across firms by associating variations in producer performance with firm level characteristics and environmental variables (z_i). These exogenous variables play a specific role in explaining efficiency differences by influencing the structure of the technology by which inputs are converted into outputs, or by influencing the efficiency with which outputs are produced using inputs. The environmental exogenous variables are out of managerial control and not the part of inputs to the production process or outputs, however, they influence the performance. Exogenous environmental variables among others may include various macroeconomic factors, ownership form, competitive pressure (Kumbhakar and Lovell, 2000).

Unfortunately, the formulation of the second stage has serious econometric problems. The two-stage estimation procedure is inconsistent in the independence of the inefficiency effects assumptions in both stages. First, in the first stage a stochastic frontier excludes the exogenous variables (z_i), and maximum likelihood estimator is used to generate regression residuals assuming that the components of z_i and x_i are uncorrelated with each component of ε_i. If there is a correlation then the obtained maximum likelihood estimates are biased due to omitted variable z_i in the stochastic frontier model. Thus even a successful second-stage regression would give dubious results as it used biased estimates of the true efficiencies. Second, in the first stage it is assumed that inefficiencies are identically distributed, however, in the second stage the estimated inefficiencies are used to regress against the exogenous variables z_i, which means that z_i should vary with u_i to give the explanations. For these contradictions the two-stage approach is called as 'schizophrenic' approach (Kumbhakar and Lovell, 2000).

Environmental variables incorporated

In stochastic frontier framework, the environmental variables z_i may be incorporated directly into the estimation of production frontier as control neput variables together with inputs x_i and outputs y_i. In this case each firm faces a different production frontier (Drake et al., 2006)[20]. However, even if the environmental variables are included in the deterministic part as they influence the production processes, these models don't inform on the impact of those variables z_i we are interested in on producers' performance, which can be useful for policy implication. The other way of incorporation of the environmental variables z_i is to employ a two-stage procedure by including them in the second stage of regressions after estimating production frontier. It is assumed that z_i directly influence efficiency and the purpose is to explain the differences in obtained efficiencies. However, the drawbacks of this two-stage procedure, which are discussed in Kumbhakar and Lovell (2000), have been listed two paragraphs above.

These problems were tackled by offering a single-stage procedure, where estimation of production technology and factors influencing inefficiencies are implemented simultaneously. In Wang and Schmidt (2002) the two-stage procedures are proved to be severely biased in both the first and second stages by using Monte Carlo evidence. They argue in favour of one-stage procedure, which estimators perform well, if one wants to assess the causes of differences in efficiencies. Single-stage procedure was proposed in stochastic frontier models by Kumbhakar et al. (1991), Reifschneider and Stevenson (1991) and Battese and Coelli (1995).

Kumbhakar et al. (1991), Reifschneider and Stevenson (1991) and Huang and Liu (1994) models estimate stochastic frontier functions and specify the inefficiency effects (u_i) as an explicit

[20] Inclusion of the environmental variables is discussed by Dietsch and Lozano-Vivas (2000), Lozano-Vivas et al. (2001) and Lozano-Vivas et al. (2002).

function of a vector of firm-specific variables and a random error. Battese and Coelli (1995) model reflects the same specifications as in the proposed models but the first-order profit maximisation conditions are removed, allocative efficiency is imposed, and it can be used for a panel dataset (Coelli, 1996). The Battese and Coelli (1995) stochastic frontier model is specified as follows:

$$Y_{it} = \exp(x_{it}\beta + V_{it} - U_{it}), \tag{3.4}$$

where Y_{it} is the output of firm i (i = 1,2,…, N) at the t-th observation (t =1, 2,…,T); x_{it} denotes a $(1 \times k)$ vector of values of known functions of inputs of production and other explanatory variables related to the i-th firm at time t; β is a $(k \times 1)$ vector of unknown parameters to be estimated; V_{it} are random errors $i.i.d.N(0, \sigma_V^2)$; U_{it} are independently distributed technical inefficiencies of production, which are non-negative normal distribution truncated at zero with mean $z_{it}\,\delta$, and σ^2 variance; U_{it} and V_{it} are distributed independently of each other.

The technical inefficiency effects U_{it} in the model (3.4) are specified in (3.5):

$$U_{it} = z_{it}\delta + W_{it}, \tag{3.5}$$

where z_{it} is a $(1 \times m)$ vector of exogenous variables associated with the technical inefficiency of production of firm i over time t; and δ is a $(m \times 1)$ vector of unknown coefficients, W_{it} is a random variable defined by the truncation of the normal distribution with mean '0' and variance σ^2, such that the truncation point is $-z_{it}\delta$, i.e. $W_{it} \geq z_{it}\delta$ (Battese and Coelli, 1995).

The simultaneous estimation of the stochastic frontier parameters and inefficiency effects is made by using maximum likelihood function, which parameters are expressed in terms of variance, $\sigma_S^2 \equiv \sigma_V^2 + \sigma^2$ and $\gamma \equiv \sigma^2/\sigma_S^2$ (Battese and Coelli, 1993).

Then the technical efficiency of production for the i^{th} firm at time t is calculated using the equation in (3.6):

$$TE_{it} = \exp(-U_{it}) = \exp(-z_{it}\delta - W_{it}). \quad (3.6)$$

The Battese and Coelli (1995) model can be easily specified as other efficiency models. The original model of Aigner et al. (1977) with half-normal distribution is specified, if all elements of the δ vector equal zero. In case if all z variables' coefficients are equal zero except the first one, which has value 1, than the model represents Stevenson (1980) and Battese and Coellli (1992, 1988) cases.

Thus, the Battese and Coelli model uses maximum likelihood method and estimates both the model for the time-varying technical inefficacy effects and the parameter of the stochastic frontier simultaneously (in a single-stage) (Battese and Coelli, 1995). Besides the model can utilise technologies represented by distance, cost, profit and production functions fitting the Cobb-Douglas, Fourier Flexible and translog functional forms.

3.3.2. Distance functions approach

Hyperbolic distance function

The efficiency frontier can be measured using cost, profit and distance functions. The first two cost and profit functions were usually used for estimation of frontiers (Berger et al., 1999), however, distance functions gained more extent application recently (Orea, 2002; Lovell, 2003; Koutsomanoli-Filippaki et. al., 2009).

After the distance functions were defined by Debreu (1951) and Shephard (1953), and empirically implemented by Farrell (1957), they were widely used based on input or output production possibility set representation of the technology. The first attempt to relax this assumption was done by Fare, Grosskopf and Lovell (1985), when they presented hyperbolic graph distance function. The hyperbolic distance function quality that it does not depend on a fixed level of inputs or outputs technology was an advantageous leap forward.

Paul e t al. (2000) embedded distance functions into SFA approach, which allowed for stochastic frontier estimation and separation of error term into random error and inefficiencies. The next improvement in hyperbolic distance function was done by Cuesta and Zofio (2005), who introduced a parametric translog hyperbolic distance function specification. This improvement allowed using the hyperbolic distance function for stochastic frontier analysis.

We employ hyperbolic distance function for the following reasons. Hyperbolic distance function overcomes restrictions that are set by output and input distance functions. The traditional distance functions' orientation allows for expansion of outputs while inputs are assumed exogenous in case of output distance function, and for contraction of inputs while outputs are assumed exogenous. So that, while input or output distance functions assume that outputs or inputs (respectively) are fixed, there is no such restriction in a hyperbolic distance function approach. These kind of restrictiveness is undesirable in some cases. We are interested in such a measure of efficiency that accounts for both inputs and outputs adjustability; and hyperbolic distance function allows for a simultaneous expansion of outputs and reduction of inputs. Lastly, a translog specification introduced by Christensen et al. (1971, 1973) is widely used in the literature on efficiency. For empirical application, translog specification for hyperbolic distance function, which complies with the conventional properties of the hyperbolic distance function,

was introduced by Cuesta and Zofio (2005). The translog specification of the hyperbolic distance function requires relatively simple transformations of the variables and can be implemented in a stochastic frontier analysis framework. We count on the Aigner et al. (1977) stochastic frontier model and its generalisation to the panel data by Battese and Coelli (1988) in analysis of bank efficiency in the CIS countries.

Hyperbolic distance function and technical efficiency

This study uses the stochastic hyperbolic distance function. As it was sated in literature review part, the advantages of the distance function in general is that it allows a production frontier to be estimated for industries with multiple inputs and multiple outputs when behavioural assumptions of optimisation of costs or maximisation of profit are not applicable and/or prices of output are not observed or inaccurately measured (Coelli and Perelman, 2000; Cuesta and Orea, 2002). Technical efficiency can be expressed as a hyperbolic distance function that is the distances from the actual vector of inputs-outputs and the production frontier. Therefore, technical efficiency denotes the ability to reduce inputs and expand output to maximally place production on the production frontier. Because of relaxation of assumption imposed on input- and output-distance functions, which allow for only input or output-orientation, the stochastic hyperbolic distance function allows for simultaneous estimation with expansion of outputs and contraction of inputs (Fare et. al., 1985; 1994).

This study employs a one-step model, estimates all countries' banks common efficiency frontier and uses the stochastic hyperbolic distance function. Suppose a production technology can produce outputs vector $y_i = (y_{1i}, \dots, y_{M_i}) \in \Re_+^M$, out of inputs vector $x_i = (x_{1i}, \dots, x_{K_i}) \in$

$\Re_+^K$, where $i = (1,2, \dots, N)$ is a number of firms. The technology can be presented following Cuesta and Zofio (2005):

$$T = \{(x, y): x \; can \; produce \; y\} \tag{3.7}$$

The hyperbolic distance function is introduced as maximum proportional expansion of the output vector y and same proportional reduction of the input vector x. The hyperbolic distance function $D_H: \Re_+^K \times \Re_+^M \rightarrow \Re_+ \; U \; \{+\infty\}$ is defined as:

$$D_H(x, y) = inf\{\lambda > 0: (\lambda x, \lambda^{-1} y) \in T \} \tag{3.8}$$

where λ represents the contraction of inputs and expansion of outputs proportionally, $0 < \lambda \leq 1$.

The name of the hyperbolic distance function identifies the path to the production frontier that it generates. The hyperbolic distance function ranges: $0 < D_H(x, y) \leq 1$.

$D_H(x, y) \leq 1(x, y) \Leftrightarrow (x, y) \in T$ indicates that vector (x, y) is efficient when $D_H(x, y) = 1$ and the vector is inefficient if $D_H(x, y) < 1$, which can be improved by increasing outputs by λ and decreasing inputs by 1/ λ. In this representation the hyperbolic distance function describes the production technology and technical efficiency is measured by the hyperbolic distance.

For our purposes, the hyperbolic distance function $D_H(x, y)$ should satisfy the monotonicity constraints of increasing in output and decreasing in inputs[21]. The function is almost homogeneous of degree -1 in inputs (Aczel, 1966, Ch.7), 1 in outputs, and 1 in itself (Fare et al., 1985).

[21] According to Fare et al. (1985) the hyperbolic function can behave non-monopolistic or be flat.

We intend to estimate hyperbolic technical efficiency using distance function in its translog form. The condition of almost homogeneity of translog distance function is imposed using Euler Theorem, which was introduced by Lau (1972). The hyperbolic distance function for an individual bank, *i*=1,2,…,I with *n* inputs and *m* outputs and time periods *t* = 1,2,…,*T* in translog form is shown below (Cuesta and Zofio, 2005):

$$\ln\left(D_{H_i}\right) = \alpha_0 + \sum_{n=1}^{N} \alpha_n \, lnx_{nit} + \frac{1}{2} \sum_{n=1}^{N} \sum_{j=1}^{N} a_{nj} \, lnx_{nit} \, lnx_{jit} + \sum_{m=1}^{M} \beta_m lny_{mit} +$$

$$\frac{1}{2} \sum_{m=1}^{M} \sum_{p=1}^{M} \beta_{mp} \, lny_{mit} lny_{pit} + \sum_{n=1}^{N} \sum_{m=1}^{M} \gamma_{nm} \, lnx_{nit} \; lny_{mit} \qquad (i = 1, 2, \dots, I) \tag{3.9}$$

The condition of almost homogeneity is satisfied when we normalise the equation (3.9) by an arbitrary output y (or input x) and we get the equation (3.10):

$$\ln\left(D_{H_i}/y_{M_{it}}\right) = \alpha_0 + \sum_{n=1}^{N} \alpha_n \; lnx_{nit}^{**} + \frac{1}{2} \sum_{n=1}^{N} \sum_{j=1}^{N} \alpha_{nj} \, lnx_{nit}^{**} \, lnx_{jit}^{**} + \sum_{m=1}^{M} \beta_m lny_{mit}^{*} +$$

$$\frac{1}{2} \sum_{m=1}^{M} \sum_{p=1}^{M} \beta_{mp} \, lny_{mit}^{*} lny_{pit}^{*} + \sum_{n=1}^{N} \sum_{m=1}^{M} \gamma_{nm} lnx_{nit}^{**} \, lny_{mit}^{*} \qquad (i = 1, 2, \dots, I) \tag{3.10}$$

where $y_{mit}^{*} = y_{mit}/y_{Mit}$ and $x_{nit}^{**} = x_{nit} \, y_{Mit}$. It results that all the logarithmic terms that have the normalising M^{th} output equal zero; and summation comprising y_{mit}^{*} includes *M*-1 outputs. At the same time, the inputs are preserved at the same number *N*.

The almost homogeneity condition of degrees -1, 1, 1 is satisfied when the following constraints (3.11) are imposed in equation (3.10) and involves all *lnx* and *lny*. This means that when the outputs are increased by a certain proportion and the inputs are decreased by that proportion, it will result that the distance function will be increased by the same proportion.

$$\sum_{m=1}^{M} \beta_m - \sum_{n=1}^{N} \alpha_n = 1 \; ;$$

$$\sum_{m=1}^{M} \gamma_m - \sum_{n=1}^{N} \alpha_n = 0 \; (t = 1, 2, \dots, N), and$$

$$so \sum_{n=1}^{N} \sum_{m=1}^{M} \gamma_{nm} - \sum_{n=1}^{N} \sum_{j=1}^{N} \alpha_{nj} = 0; \; \sum_{m=1}^{M} \beta_{mt} - \sum_{n=1}^{N} \gamma_{nt} = 0 \; (t = 1, 2, \dots, M), and$$

$$so \sum_{m=1}^{M} \sum_{p=1}^{M} \beta_{mp} - \sum_{m=1}^{M} \sum_{n=1}^{N} \gamma_{nm} = 0; \qquad (3.11)$$

and therefore: $\sum_{m=1}^{M} \sum_{k=1}^{M} \beta_{mk} = \sum_{m=1}^{M} \sum_{n=1}^{N} \gamma_{nm} \sum_{n=1}^{N} \sum_{j=1}^{N} \alpha_{nj} = \Phi$ (3.12)

We present the hyperbolic distance function in a stochastic framework, which allows for a random disturbance (3.13).

$$\begin{aligned} -lny_{M_{it}} = \; & \alpha_0 + \sum_{n=1}^{N} \alpha_n \; lnx_{nit}^{**} + \frac{1}{2} \sum_{n=1}^{N} \sum_{j=1}^{N} \alpha_{nj} \, lnx_{nit}^{**} \, lnx_{jit}^{**} + \sum_{m=1}^{M-1} \beta_m lny_{mit}^{*} \\ & + \frac{1}{2} \sum_{m=1}^{M-1} \sum_{p=1}^{M-1} \beta_{mp} \, lny_{mit}^{*} lny_{pit}^{*} + \sum_{n=1}^{N} \sum_{m=1}^{M-1} \gamma_{nm} lnx_{nit}^{**} \, lny_{mit}^{*} + \delta_t t + \frac{1}{2} \, \delta_{tt} t^2 \\ & + \sum_{m=1}^{M-1} \delta_{ym} t \; lny_n^{*} + \sum_{n=1}^{N} \delta_{xn} \, t \, lnx_n^{*} + v_{it} - lnD_{H_i} \qquad (i = 1, 2, \dots, I) \end{aligned} \qquad (3.13)$$

where, $-lnD_{H_i}$, which is interpreted as $u_i \sim |N(0, \sigma_u^2)|$, captures technical inefficiency and has a truncated non-negative normal distribution, which measures the distance between the observed input-output vector and the common production frontier; v_{it} is a random error, which incorporates noise and has a normal standard distribution, v_{it}~N(0,σ_v^2); and v and u_i are independent of each other.

The assumption that v_{it} and u_{it} are independent for all t = 1, 2,…, T, and i = 1,2,…, N is a simplification, which is required to be accounted. The method of maximum likelihood methodology introduced by Pitt and Lee (1981) and extended by Battese and Coelli (1988) is used to retrieve the individual conditional distribution of the one-sided error term, $E(u_{it}|\varepsilon_{it})$, and the technical inefficiency model simultaneously. Equation in (3.13) represents stochastic translog hyperbolic distance function, and its generalised empirical model incorporating Battese and Coelli (1995) model is in (3.14; 3.15), which is used to obtain $E(u_{it}|\varepsilon_{it})$. These values are the inputs to (3.16), which is used to obtain time-varying hyperbolic technical efficiency estimate for each bank:

$$\ln\left(D_{H_i}/y_{M_{it}}\right) = TL(y_{it}, x_{it};\ \alpha, \beta, \gamma) + (v_{it} - u_{it}) \tag{3.14}$$

$$u_{it} = \sum_n \delta_n z_{nit} + \mu_{it} \tag{3.15}$$

$$TE_{it} = exp[lnD_H(y_{it}, x_{it};\ \alpha, \beta, \gamma)] = exp(-u_{it}), \tag{3.16}$$

where the model should be re-parameterised using: $\sigma^2 \equiv \sigma_v^2 + \sigma_u^2$ and $\gamma \equiv \sigma_u^2/(\sigma_v^2 + \sigma_u^2)$ (Battese and Corra, 1977).

The possibility of endogeneity problem in econometric estimation of distance functions is an issue when in the standard input-oriented and output-oriented distance functions both sets of

inputs and outputs appear as explanatory variables. This problem was mentioned in some empirical works[22] and later was discussed in Coelli (2000). It was established that distance functions can be safely estimated. Due to the nature of normalisation of the input (output) distance function the set of explanatory variables are the outputs (inputs) and the input (output) ratios. After this normalisation the ratios explanatory variables can be treated as exogenous, because the homogeneity of degree one condition in inputs (outputs) indicates that the error term equally affects all the inputs (outputs). This argument can be applied to the econometric estimation of hyperbolic distance functions as well (Cuesta and Zofio, 2005). When one of the outputs is used for normalisation, regressors are now presented by the outputs ratios and the products of that normalising output and inputs. Both outputs and inputs are affected by the error term, though outputs are affected directly and inputs inversely. Therefore, all regressors can be treated as exogenous variables.

Overall, the model includes merits of hyperbolic distance function approach, and one-step stochastic model of Battese and Coelli (1995), and adds to the hyperbolic function model of Cuesta and Zolio (2005) by estimating time-varying technical efficiency model. Additionally, the empirical model of technical efficiency estimates the effects of bank ownership and risk-taking characteristics, and environmental conditions simultaneously. The complex analysis is possible to implement in practice using the software package developed by Coelli: Frontier4.1.

Robustness tests

We check our main results obtained using hyperbolic distance function by using different functional specification, namely output distance function. As it was stated in section 3.2 distance

[22] See Sickles et al. (1996), Cuesta and Orea (1998), Atkinson and Primont (1998), Atkinson et al. (1999) and Alvarez (2000).

functions can model multi-input and multi-output technologies; in this section the output-distance function is defined.

The output distance function is chosen for robustness test for the following reasons. Financial liberalisation that experienced transition countries together with high growth rates of economies on average in the region provided favourable conditions for, that banks would be most likely concentrated on output production expansion. The other reason is that if we want to robust check the hyperbolic distance function, which takes into account both expansion in outputs and contraction in inputs, we are interested in explaining a larger part of inefficiencies using other distance functions. In this case our choice is the output-distance function, given that the most of differences in bank efficiency arises from the output side (Berger et al., 1993).

The output distance function is an alternative representation of a production technology with multiple inputs and outputs. The duality relationship between several production technologies and economic behaviours was established by Shephard, who also linked output distance function and revenue function (Shephard, 1970)[23]. The multiinput-multioutput technology can be modelled by the technology set of feasible combinations of inputs and outputs in a convenient functional form (Fare and Primont, 1995). Let us assume the following technology:

$$T = \{(x, y): x \in \Re_+^N, y \in \Re_+^M, x\ can\ produce\ y\}, \tag{3.17}$$

where $x = (x_1, \ldots, x_N)$ is the input vector N; $y = (y_1, \ldots, y_M)$ is the output vector M; and $\Re_+^N$ is the set of non-negative and real n-tuples.

Let $P(x)$ be the set of feasible output vectors, y, that are obtained from the input vector x:

[23] Earlier Shephard (1953) established the duality between the input distance function and the cost function in 1953.

$$P(x) = \{y: (x, y) \in T\}. \quad (3.18)$$

Then the output distance function in terms of the output set is (Fare and Primont, 1995):

$$D_O(x, y) = min\{\theta > 0 : (y/\theta) \in P(x)\}, \quad (3.19)$$

where θ is the scalar, which corresponds to the 'distance' by which the output vector can be deflated; $D_O(x, y)$ is non-decreasing, positively linearly homogeneous, and convex in y – the output vector, and non-increasing in x – the input vector (Lovell et al., 1994), and it is defined as the maximum feasible expansion of the output vector, *y*, with the input vector, *x*, held fixed. The distance function $D_O(x, y)$ will be less or equal to one, if the output vector, *y*, is an element of the feasible production set of *P(x)*. The firm is considered as efficient if the distance function $D_O(x, y)$ equals to one meaning that the firm's output, y, is located on the best-practice frontier. The firm is inefficient, if its output, y, is interior of the frontier, and the value of the distance function $D_O(x, y)$ is less than one. The constant return to scale is imposed by imposing homogeneity of degree -1 in inputs (Coelli and Perelman, 1996).

We employ a translog functional form instead of Cobb-Douglas from. The translog function is flexible and allows satisfying regulatory restrictions of degree one in outputs. Following Lovell et al. (1994), if firms use *n* inputs to produce *m* outputs, then a translog form of the above output distance function is:

$$lnD_O(\boldsymbol{y},\boldsymbol{x},t) = \alpha_0 + \sum_{m=1}^{M}\alpha_m\, lny_m + \frac{1}{2}\sum_{m=1}^{M}\sum_{p=1}^{M} a_{mp}\, lny_m\, lny_p + \sum_{n=1}^{N}\beta_n lnx_n + \frac{1}{2}\sum_{n=1}^{N}\sum_{j=1}^{N}\beta_{nj}\, lnx_n lnx_j + \sum_{n=1}^{N}\sum_{m=1}^{M}\gamma_{nm}\, lnx_n\, lny_m + \delta_t t + \frac{1}{2}\,\delta_{tt}t^2 + \sum_{m=1}^{M}\delta_{ym} t\, lny_m + \sum_{n=1}^{N}\delta_{xn}\, t\, lnx_n \quad (3.20)$$

where 'o' sands for the 'output-oriented' distance function, ***x*** denotes input, ***y*** denotes output and *t* denotes time trend. The constraints for homogeneity of degree one for outputs are sown in (3.21):

$$\sum_{m=1}^{M}\alpha_m = 1;\ \sum_{p=1}^{M} a_{mp} = 0\ (m = 1,2,\dots,M);\ \sum_{m=1}^{M}\gamma_{nm} = 0\ (n = 1,2,\dots,N);\ \sum_{m=1}^{M}\delta_{tt} = 0\ (m = 1,2,\dots,M), \quad (3.21)$$

and symmetry is in (3.22):

$$\alpha_{mp} = \alpha_{pm}\ \text{(m,n = 1,2,…,M) and}\ \beta_{nj} = \beta_{jn}\ (n,j = 1,2,\dots,N) \quad (3.22)$$

The homogeneity constraint for output-distance function is imposed by dividing the output-distance function by one of the outputs. The homogeneity property infers that $D_o(x,\omega y) = \omega D_o(x,y)$ for any $\omega > 0$. The constraint can be met in empirical practices, if we normalise by the Mth output and set ω equal to $1/y_m$, then $D_o(x,\ y/y_m) = D_o(x,y)/y_m$. In this case the Equation (3.20) converts into:

$$\ln D_{o_i}/y_{M_i} = \alpha_0 + \sum_{n=1}^{N}\alpha_n\, lnx_{ni} + \frac{1}{2}\sum_{n=1}^{N}\sum_{j=1}^{N}\alpha_{nj}\, lnx_{ni}\, lnx_{ji} + \sum_{m=1}^{M-1}\beta_m lny^*_{mi} + \frac{1}{2}\sum_{m=1}^{M-1}\sum_{p=1}^{M-1}\beta_{mp}\, lny^*_{mi} lny^*_{pi} + \sum_{n=1}^{N}\sum_{m=1}^{M-1}\gamma_{nm} lnx_{ni}\, lny^*_{mi} \quad i = 1,2,\dots,N \quad (3.23)$$

were $y^*_{mi} = \frac{y_m}{y_M}$, $y^*_{pi} = \frac{y_{pi}}{y_M}$.

After rearranging the (3.23) we get the following expression:

$$-lny_{M_i} = \alpha_0 + \sum_{n=1}^{N} \alpha_n \, lnx_{ni} + \frac{1}{2} \sum_{n=1}^{N} \sum_{j=1}^{N} \alpha_{nj} \, lnx_{ni} \, lnx_{ji} + \sum_{m=1}^{M-1} \beta_m lny^*_{mi} +$$

$$\frac{1}{2} \sum_{m=1}^{M-1} \sum_{p=1}^{M-1} \beta_{mp} \, lny^*_{mi} lny^*_{pi} + \sum_{n=1}^{N} \sum_{m=1}^{M-1} \gamma_{nm} lnx_{ni} \, lny^*_{mi} - \ln D_{o_i} \qquad i = 1,2, \dots, N \qquad (3.24)$$

When we fit in a distance function into the stochastic frontier models we interpret the distance, $-\ln D_{o_i}$, as an inefficiency error term u_i, which is an inefficiency part of a composed error term of a standard stochastic frontier; the other part is a symmetric random error v_i.

The left hand side term $-lny_{M_i}$ is transformed into positive term lny_{M_i} for empirical purposes, and we substituted $-\ln D_{o_i}$ by its components u_i and v_i. Then, the function $D_O(\boldsymbol{y}, \boldsymbol{x}, t)$ in our study is converted into the following output distance model with standard stochastic frontier settings, when normalised by the output y_M (Lovell et al., 1994; Coelli and Perelman, 1996) and rearranged:

$$lny_{M_{it}} = \alpha_0 + \sum_{n=1}^{N} \alpha_n \, lnx_{nit} + \frac{1}{2} \sum_{n=1}^{N} \sum_{j=1}^{N} \alpha_{nj} \, lnx_{nit} \, lnx_{jit} + \sum_{m=1}^{M-1} \beta_m lny^*_{mit}$$

$$+ \frac{1}{2} \sum_{m=1}^{M-1} \sum_{p=1}^{M-1} \beta_{mp} \, lny^*_{mit} lny^*_{pit} + \sum_{n=1}^{N} \sum_{m=1}^{M-1} \gamma_{nm} lnx_{nit} \, lny^*_{mit} + \delta_t t + \frac{1}{2} \delta_{tt} t^2$$

$$+ \sum_{m=1}^{M-1} \delta_{ym} t \, lny^*_n + \sum_{n=1}^{N} \delta_{xn} \, t \, lnx_{nit} + v_{it} - u_{it} \qquad (i = 1, 2, \dots, I) \qquad (3.25)$$

where $y^* = y_m/y_M$, u captures technical inefficiency and has a truncated non-negative normal distribution, and when by definition $lnD_o \leq 0$, then $u = -lnD_o$; v incorporates noise and has a normal standard distribution, $v \sim N(0,\sigma_v^2)$; and v and u are independent of each other.

As with the hyperbolic distance function, a translog stochastic output distance function in (3.25) is empirically estimated by fitting into Battese and Coelli (1995) model:

$$lny_{M_{it}} = TL\left(x_{it}, y_i/y_{M_{it}}, \alpha, \beta, \gamma\right) + v_{it} - u_{it} \quad (3.26)$$

$$u_{it} = \sum_n \delta_n \ z_{nit} + \mu_{it} \quad (3.27)$$

$$TE_{it} = \exp(-u_{it}) = \exp(-z_{it}\delta - \varepsilon_{it}) \quad (3.28)$$

where the model is re-parameterised (Battese and Corra, 1977) by: $\sigma^2 \equiv \sigma_v^2 + \sigma_u^2$ and $\gamma \equiv \frac{\sigma_u^2}{\sigma_v^2+\sigma_u^2}$.

When both inputs and outputs are dependent variables, it can cause endogeneity problem as they are simultaneously identified, as discussed in section on hyperbolic distance function. This problem is tackled by normalising all outputs by one of the outputs, thus imposing homogeneity of degree one in outputs. As a result the independent variable now is the output ratios rather than output volumes, which make these variables exogenous (Coelli and Perelman, 1996). Kumbhakar (2013) advises on using two-step estimation approach for endogeneity problem. This remedy is offered for the non-constant returns to scale models, and when inputs and outputs are considered as endogenous variables. The first step is to estimate the model using instrumental variables for endogenous variables while ignoring inefficiency effects, while the second step is to estimate inefficiency using the stochastic frontier technic.

3.3.3. Empirical model and data

The empirical model estimated in the study represents the intermediation approach based on Sealey and Lindley (1977). The choice of inputs and outputs of the financial firm in this chapter specifies income-based model. The estimated empirical model specifies two inputs such which are *interest* and *non-interest expenses* and two outputs as *net interest income* and *non-interest operating income*, which helps to focus on the efficiency of generating revenue (Sturm and Williams, 2004). Technical inefficiency effects model estimates the influence of risk-taking behaviour, different ownership types, and environmental characteristics on bank efficiency. We don't include firm-specific/environmental factors directly in the deterministic part of cost/profit functions and assume that they influence inefficiency distribution (as in Coelli et al., 1999). It means that these factors impact the distance between banking firm performance and the best practice frontier. The estimated efficiency scores are regarded as 'gross' measures of efficiency when firm-specific and macroeconomic factors define inefficiency effects and take into account differences among countries (Coelli et al., 1999).

The empirical technical inefficiency effect model for an individual financial firm below (3.29), which contains indicators of ownership; risk taking behaviour and a set of control variables, is estimated, using on-stage estimation procedure, together with the equation in (3.13) by Cuesta and Zofio (2005), with the difference that we estimate time-varying hyperbolic technical efficiency.

$$u_{it} = \delta_0 + \sum_{a=1}^{4} \delta_a Owner_{it} + \sum_{b=5}^{8} \delta_b Risk_{it} + \sum_{c=9}^{14} \delta_c \, Contorl + \varepsilon_{it} \qquad (3.29)$$

where $Owner_{it}$ stands for a set of dummy variables representing the nature of ownerships such as foreign, state, private, and CIS-country-owner, for bank i in time t; $Risk_{it}$ is a set of explanatory variables capturing risks such as capital, credit, liquidity and market risks, for bank i in year t; $Contorl$ represents a vector, which contains control variables for the model such as bank level controls: income diversity, asset diversity and listing, and environmental controls: GDP growth, the world financial crisis 2007-2009 and custom union establishment.

Risk represents different types of risk that financial firm can face. Following the empirical literature we define capital, credit, liquidity, and market risks as follows. The first is *capital risk*, which is measured by the *ratio of equity to total assets*. The higher is the ratio means the higher is the capital, as a result the lower is the risk that the bank becomes insolvent. The second is *credit risk*. The ratio of *loan loss reserves to total loans* indicates how credit risk is managed by a bank. If the ratio is low, a bank makes sufficient successful loans, given a similar charge-off policy, the lower the ratio the better the quality of the loan portfolio. The third risk is *liquidity risk*. The liquidity risk is lower if there are enough holdings of liquid assets, which can be measured by *the liquid assets to total assets ratio*. However, the imposed liquidity levels are the cost for bank as higher levels of cash and liquid assets holdings causes higher costs. The fourth is *market risk*, which is proxied by the ratio of *interbank borrowing to total borrowing*. The more a banking firm relies on the interbank loans the higher the market risk that occurs in case of hikes in interest rate or during the crises periods.

The *Control* variables present two levels of specific indicators. The first is *environmental* indicators, which include dummies *custom union establishment (2010)*, *GDP growth* and the global *financial crisis* (2009). The dummy variable for the *custom union establishment* takes value 1, when the custom union-member countries when the customs clearance among the

member-countries was abolished in 2010 and 0 before that. The *GDP growth* reflects the economic environment while the *custom union dummies* reflect institutional environment and legal framework in which banking firms operate in the custom union member-countries (Belarus, Kazakhstan and Russian Federation). The last country level control – *financial crisis* dummy variable (2009) – divides the period into two parts before the crisis from 2005 till 2009 and after the crisis from 2009 till 2012. The definitions of dummy variables used for technical and cost/profit inefficiency effects models are in the Table 3.1.

Table 3.1: The definitions of dummy variables in the technical inefficiency effect model

Ownership variables	Definition
Government-owned banks	Equals 1 for state-owned commercial banks and 0 otherwise
Domestic private banks	Equals 1 for private commercial banks and 0 otherwise
Foreign-owned banks	Equals 1 for foreign-owned banks and 0 otherwise
CIS-member-owned banks	Equals 1 for CISs member country owned banks and 0 otherwise
Control variables	
Global financial crisis 2007-2009	Equals 1 for after 2008 and 0 before
Custom union establishment	Equals 1 for after the establishment of the custom union and 0 for before
Listing	Equals 1 for publicly listed banks and 0 otherwise

Note: The first indicator is omitted from the estimation because of collinearity

The second group is *banking firm-specific indicators*. They include the dummy *Listing*, which considers whether a banking firm is registered on a stock market (1) or not (0). Listed banks may be more disciplined and transparent and thus are expected to perform better. For controlling diversity in banking activities we look at *assets* and *income diversity*. Diversification of banking activities reflects economies of scope. Non-traditional banking activities combined with traditional ones may show small positive results for profitability (Gallo et al. 1996), and may not contribute to risks reduction; on the contrary it can increase risks and income volatility[24] in comparison with banks oriented to the lending loans as a traditional banking activity (Lepetit et

[24] See for example De Young and Roland, 2001; Boyd and Graham, 1986; Demsetz and Strahan, 1997; Kwan, 1998; Stiroh, 2004; Stiroh, and Rumble, 2006; Laeven and Levine, 2007

al., 2008). In our work, *Assets diversity* is expressed as the *fraction of securities in total earning assets*, which means that the higher the share the more assets are diversified. *Income diversity* is represented as the *fraction of non-interest earnings* received from non-traditional banking activities *in total earnings*, where the higher the share the greater is diversification.

Data and descriptive statistics

This study uses data for commercial banks of the CISs countries. The period under consideration is between 2005 and 2012, because most of the reforms on transition from planned to market bases in the banking sectors had been implemented in the CIS countries before 2005. We use the unbalanced panel data obtained from the Bankscope[25] data base, national central banks of the CIS countries, the Financial Structure Dataset from the World Bank, and the websites of the commercial banks of the sample. The data are in thousands of US dollars and adjusted to the GDP deflator with 2005 as the base year. The number of observations is 2431; the number of commercial banks of the CIS countries is 376, including all commercial banks of CIS countries available from the Bankscope database except for Russia. Russian banks include banks that are in the list of the Interfax-100 data as the top 100 banks in Russia and, all other banks with average total assets greater than 150,000 thousand dollars, and banks with average less than 150,000 thousand dollars, if ownership information is available. Turkmenistan banks were excluded from the sample for two reasons. The number of observations left only 5, which meet the requirements for the sample. Moreover, in Turkmenistan banks operate as payment agents of the central bank to subsidise the economy, which make the efficiency analysis meaningless.

[25] Bankscope is a database provided by Bureau van Dijk. It provides harmonised data for banks based on financial statement information. Bankscope data has been extensively used for banking sectors analysis as well as for cross-country comparisons.

The sample breakdown by country and number of bank as well as average assets size is resented in Table 3.2.

Table 3.2: Sample description: number of banks and average assets size by country and year

Country/Year	2005	2006	2007	2008	2009	2010	2011	2012	Total by country	Total assets of average bank (th $)
Armenia	8	10	11	14	14	13	13	11	94	162,927
Azerbaijan	9	11	12	13	16	17	18	19	115	570,906
Belarus	7	7	9	9	10	15	15	13	85	1,106,009
Kyrgyzstan	3	3	3	4	3	3	6	5	30	101,872
Kazakhstan	13	13	17	19	19	18	20	22	141	3,331,045
Moldova	8	8	10	11	9	9	10	10	75	218,076
Russian Federation	157	192	207	209	230	246	250	245	1736	2,239,447
Tajikistan	2	2	2	2	1	4	4	4	21	221,335
Ukraine	8	8	10	11	11	12	14	12	86	3,265,249
Uzbekistan	3	3	3	5	6	8	11	9	48	841,556
Total by year	218	257	284	298	320	346	362	351	2436	2,005,317

Note: Turkmenistan is not included in the sample as the only one bank information was available from Bankscope with three consequent years data for commercial banks.

3.3.4. Descriptive statistics

The banking sector statistics of the CISs are shown in Table 3.3. The mean statistics indicates the average numbers over the period for the countries. The first part of the Table 3.3 contains input and output variables used for technical efficiency estimation. The risk-taking behaviour variables reveal that the banking sectors are capitalized by 17.8%. The ratio of credit risk shows 7.2% for the CISs. The CISs' banks as a whole hold 28.7% of total assets as liquid assets. The CISs banks source 17.6% of their total borrowings from the interbank markets. The similar average risk ratios in BRIC countries are 8%, 5%, 34% and 22% for capital, credit, liquidity and market risk respectively (Zhang et al., 2013) indicating that CISs countries are on average are better capitalised and have lower market risks, while have riskier credit portfolio and higher liquidity

risk[26]. The CISs banks on average choose income diversification over asset diversification strategies.

Table 3.3: Descriptive Statistics (2005-2012)

Variables	Mean	Std. Dev.	Min	Max
Input and output variables				
Interest expenses*	68864.76	159693	222.136	873927
Non-interest expenses*	91799.09	157905.1	1551.42	836355
Net interest income*	61232.57	138375.7	915.427	756753
Non-interest income*	68067.14	121591.5	131.344	661512
Inefficiency effect variables				
Risk-taking				
Capital risk	17.75	32.29	0.035	943.04
Credit risk	7.15	6.98	0.009	108.87
Liquidity risk	28.67	32.92	1.601	932.24
Market Risk	17.58	20.31	0	100.01
Other control variables				
Income diversity	54.12	56.15	0.01	2298.14
Asset diversity	12.75	13.12	0.0001	97.28
Log of GDP growth	2.39	0.84	0	3.131

Note: (1) * Values are in thousands US dollars (2005 price level).

[26] The EU countries had 7.5% and 8.2% of capital and credit risk ratios respectively (World Bank Financial Indicators. Available from: http://data.worldbank.org/region/EUU. Accessed on: 19.98.2015).

3.4. Empirical results

3.4.1. Results from frontier estimation

Table 3.4 reports estimation results of the one-step maximum likelihood obtained from the income based model using stochastic hyperbolic distance function and traditional output-based distance function both without and with inclusion of country dummy in the frontier model. Models (1) and (3) use hyperbolic distance function, while (1) is without country dummies in frontier model and (3) has country dummies in its frontier model; (2) and (4) use traditional output-based distance function, while (2) is without country dummies in frontier model and (4) has country dummies in its frontier model. While individual coefficients for inputs and outputs are not discussed because of problematic interpretation due to collinearity problem arising from quadratic and interaction terms in the translog specification, the overall quality of the model in the maximum likelihood estimation is characterised by the re-parameterised deviations $\sigma^2 \equiv \sigma_v^2 + \sigma_u^2$ and $\gamma \equiv \sigma_u^2 / (\sigma_v^2 + \sigma_u^2)$ (Battese and Corra, 1977). The first variance σ^2 is the sum of random errors' squared standard deviations and inefficiencies' squared standard deviations, and the second variance γ is the ratio, which measures the share of the inefficiency term σ_u as a part of the total composite error term.

Results indicate that the models are of a good fit. Gamma ($\gamma \equiv \sigma_u^2 / (\sigma_v^2 + \sigma_u^2)$) is 0. 78 in the base model (1) estimated using stochastic hyperbolic distance function and 0.86, 0.87 and 0.86 in other (2), (3) and (4) respectively. The gammas indicate that a significant part of the error terms reflect inefficiencies. The goodness of fit statistics of the model such as the log likelihood function' statistics and the LR test, which show the presence of the one-sided error component, indicate a good fit of the models. The monotonicity of the output distance function is proved by

the expected signs of the elasticities at the geometric mean. That means that the hyperbolic distance function is decreasing in outputs and non-decreasing in inputs. The scale elasticities are defined as the sum of all input elasticities of order one, which negative value indicates returns to scale (Färe and Primont, 1996). If the absolute value of the sum input elasticities is less (greater) than one then there are decreasing (increasing) returns of scale. In our models estimation the scale elasticity indicates decreasing returns to scale for the CISs banks in all model specifications (1) (3) and (4) with elasticities -0.545, -0.953, -0.527 and -0.908 respectively. The average efficiency of the CISs banks in the models are 94%, 89%, 94%, and 89% during the period 2005-2012.

Table 3.4: Estimation results of efficiency frontiers

	(1)	**(2)**	**(3)**	**(4)**
	Hyperbolic distance function	Traditional output oriented distance function	Hyperbolic distance function	Traditional output oriented distance function
Scale elasticity	-0.545	-0.953	-0.527	-0.908
Sigma-squared	0.100***	0.433***	0.100***	0.401***
Gamma	0.783***	0.866***	0.731***	0.860***
Log likelihood	1395	-276	1341	-238
LR test	1166	1191	984	1231
Average efficiency	0.943	0.893	0.936	0.896
Country dummy in frontier model	No	No	Yes	Yes

Notes: *, **, *** signifies significance level at 10 %, 5%, and 1%, respectively.

Table 3.5 show results of technical efficiency by country and by year for the model (1)[27]. Mean technical efficiency scores on average are higher than profit and cost efficiencies reported in the next chapter. The scores also indicate differences in technical efficiencies across the CISs'

[27] See Appendix B, Table B1 for mean technical efficiencies estimated using other model specifications.

banks. On average, banks from Ukraine are the most technical efficient (0.956) while Kazakhstani banks are the least efficient (0.896).

Table 3.5: Mean technical efficiency by country and by year (2005-2012), model (1)

	2005	2006	2007	2008	2009	2010	2011	2012	Average by country
Armenia	0.888	0.915	0.891	0.905	0.936	0.934	0.932	0.934	0.919
Azerbaijan	0.939	0.927	0.921	0.904	0.953	0.957	0.954	0.955	0.942
Belarus	0.960	0.944	0.925	0.934	0.939	0.932	0.923	0.929	0.934
Kyrgyzstan	0.902	0.885	0.885	0.905	0.931	0.933	0.928	0.914	0.912
Kazakhstan	0.938	0.933	0.911	0.930	0.806	0.899	0.896	0.883	0.896
Moldova	0.956	0.943	0.915	0.926	0.957	0.950	0.946	0.952	0.942
Russia	0.936	0.933	0.934	0.952	0.956	0.951	0.950	0.951	0.946
Tajikistan	0.958	0.948	0.952	0.955	0.956	0.955	0.959	0.937	0.952
Ukraine	0.965	0.960	0.959	0.929	0.960	0.966	0.966	0.964	0.959
Uzbekistan	0.961	0.958	0.953	0.951	0.956	0.959	0.946	0.961	0.955
Average by year	0.937	0.933	0.930	0.943	0.945	0.948	0.946	0.946	

3.4.2. Results from inefficiency effect model

The results of the technical inefficiency of the income-based model estimated using stochastic hyperbolic distance function and traditional output-based distance model are reported in the Table 3.6. We report first the results from the model estimated using stochastic hyperbolic distance function as the base model in the column (1) and the other results are the robustness tests (column 2, 3, and 4). One must keep in mind that the model we estimate identifies inefficiency, thus to interpret the results the positive sign would mean more inefficiency or less efficiency and vice versa.

Our model distinguishes among ownership types, risk taking characteristics and environmental variables impact on bank performance. We first report the ownership impact on performance. The findings are of particular interest as they shed light on the bank ownership structure

effectiveness in terms of technical efficiency. The state-owned indicator is omitted for comparison reason.

Table 3.6: Estimation results of technical efficiency using distance function approach

	(1) Main model	(2) Robust check	(3) Robust check	(4) Robust check
	Hyperbolic distance function	Traditional output oriented distance function	Hyperbolic distance function	Traditional output oriented distance function
Ownership				
Domestic private banks	0.354***	0.210**	0.609***	0.235***
Foreign-owned banks	0.865***	0.168***	0.827***	1.609***
CIS-member-owned banks	-0.250***	-0.100***	-0.043	-0.817***
Risks				
Capital risk	0.003***	0.0095***	0.0008	0.013***
Credit risk	-0.006***	0.005*	-0.009***	0.003
Liquidity risk	-0.004***	-0.0096***	-0.002	-0.0129***
Market risk	-0.433***	-0.007***	-0.0013	-0.007***
Controls				
Income diversity	-0.00002	-0.00009**	-0.0004	-0.145***
Asset diversity	0.007***	0.016***	0.004***	0.014***
GDP growth	-0.008	-0.077**	-0.065***	-0.150***
2007-2009 Global financial crisis	-0.390***	-0.100***	-0.431***	-1.311***
Custom union establishment	0.110***	0.134***	0.166***	0.379***
Listing	-0.495***	-1.09***	-0.257***	-0.843***
Country dummy in frontier model	No	No	Yes	Yes

Notes: (1) Robust t-statistics in parentheses; (2) *, **, *** signifies significance level at 10 %, 5%, and 1%, respectively.

Our findings suggest that, taking state owned banks as a benchmark, privately owned banks are less technically efficient at 1% significance level then state-owned banks in terms of income generation. These results of the revenue focused model indicate that state-owned banks are more efficient in turning costs into revenue then private domestic banks. The reasons could be two fold. Firstly, the state-owned banks usually invest in large scale government projects due to 'development' objective (Megginson, 2005), thus having high output level. Secondly, it can be

explained by the legacy of the financial sector inherited from the soviet times; due to being widely trusted and long present in the market, state owned banks have wider and less costly access to deposits in terms of labour and physical capital. As a result they have advantages in costs[28]. Switching costs endogenously appear when banks have an advantage because they have better information on their clients in comparison to their rivals (Rajan, 1992).

The positive and significant coefficient at 1% significance level for our second banks type specification indicates that foreign banks are less efficient than state-owned banks in the CISs countries, which can be explained by the differences in institutions between host and home country of foreign bank (Lensink et al., 2008). Though, Lensink et al. (2008) found that foreign banks are less cost efficient than domestic, while we found it for technical efficiency. Our results, nevertheless, support the home field advantage hypothesis for foreign banks technical efficiency, which may be the result of comparative disadvantages in technologies involving 'soft' information about the host country market conditions, which is difficult to process for foreign banks (Berger, 2007).

We found that the CISs-member ownership has statistically significant positive association with bank performance at 1% significance level. It is not surprisingly, taking into account the strategy of the expansion of the CISs banks abroad. That is the CISs banks enter countries with less developed financial sectors in the region, this banks priori are more efficient than banks of the host country. It is mostly Russian state-owned banks and Kazakhstan commercial banks, which banking sectors are the most developed in the region, that penetrate into the other CIS countries banking sectors.

[28] Switching costs can arise from time and efforts needed to close and open an account and to become accustomed to new procedures and stuff in another bank (Kim et al., 2003).

Turning to our second group of variables, the findings show different impacts of risk behaviour on bank technical efficiency in the CISs countries. The coefficient on capital risk is positive and highly significant, indicating that there is a positive association between capital risk (lower capital) and performance. Such results may have analogous implications as those of Altunbas et al. (2007) who suggest that inefficient banks hold more capital and take less risk.

The credit risk coefficient is negative and significant indicating that banks with riskier behaviour are more efficient. The higher loan loss reserves indicate the managers' anticipation of a higher future level of credit risk being aware of the riskier loans they made in the past. However, riskier loans produce higher interest income, which is one of the outputs of our model specification, reflecting higher efficiency. The result implies that managers are deliberately trading off between risk and expected returns, which is known as 'skimping' behaviour such as economising on selection and monitoring of loans (Breger and De Young, 1997). Les selection and monitoring results in higher output level of assets. Additionally, costs that are reduced by less selection and monitoring of loans may have positive impact on efficiency. Our results are similar to Iannotta et al. (2007). However, 'skimping' or mistakes in monitoring of loan customers might precede capital losses, which may result in potential failure of a bank. The financial authorities should monitor tightly banks, which have higher levels of credit risk.

Liquidity risk is significant and negatively relates to banks performance in our data set. Though the magnitude of the impact is low, taking a greater liquidity risk reduces technical efficiency of a bank, which means that the less liquid is the bank, the less efficient it is. The results indicate that more liquid banks are more efficient as they can produce more output of liquid and other assets and can be considered as 'liquidity efficient' (Gorton and Huang, 2002).

The market risk coefficient is statistically significant at 1% level in our study and has a negative sign. The result implies that the high exposure to the market risk via obtaining banks' liquidity in the interbank markets increases the CISs banks technical efficiency. The result contradicts to some results for emerging economies, for instance the BRIC countries are less efficient in presence of higher market risk (Zhang et al., 2013). We can suggest that the CISs banks that rely more on interbank loans may be subject to more market discipline and able to monitor other banks in the interbank market, and, thus, they are better at monitoring and screening market risk enhancing their efficiency.

Control Variables

The first control variable on bank level income diversity is not significant for the hyperbolic distance function, though it has the same negative sign as in the traditional output distance function specification where this variable is statistically significant. The negative sign is interpreted as positive impact of income diversification on bank efficiency. Taking to the account that banks have considerable share of their income earned from non-interest activities, this indicate that revenue sources' diversification would positively impact bank efficiency. Asset diversity coefficient has positive sign and statistically significant. This implies that assets diversification strategy negatively influences bank performance. The ratio is calculated as total securities to total earning assets. The last bank level control variable is listing. Listed banks are more efficient, which can be explained on the bases that listed banks are using better and more transparent practices. The results are similar with Zhang et al. (2013).

Results for a set of control variables at the country level suggest that *GDP growth*, which reflects the macroeconomic environment, has a no effect on efficiency in our main model. Though, it has

significantly positive effect in the rest of our models (Table 3.6, columns (2), (3) and (4)), which complies with our expectations. The GDP growth rates were high in most of the CISs countries as it is shown in the previous chapter, providing favourable macroeconomic conditions, which positively influenced bank performance.

The coefficient on the 2007-2009 Global financial crisis is positive and significant, which means that the crisis had significantly positive impact on bank performance. For the income-based model, which we specified, banks retained their efficiency due to increased spreads between lending rates and deposit rates. Banks in almost all countries increased their lending rates while increasing deposit rates by lesser amount. In 2008 the increase in interest rates spread was in Russia (1.6 pp), Tajikistan (2.3 pp) and Ukraine (1.8pp); in 2009 the increase was in almost all the CIS countries: Azerbaijan (0.3pp), Belarus (1.0 pp), Kyrgyzstan (3.3 pp), Moldova (2.5 pp), Russia (0.3 pp) and Tajikistan (0.8 pp)[29] .

The last control variable covers the integration processes in the CIS region. We find that in the base model estimated using hyperbolic distance function the abolishment of the customs clearance among the custom union member-countries and introduction of the common external tariffs had a negative effect on banks performance, perhaps due to changes in economic environment. Having in mind that Belorussia has the same adjustments to the custom union membership as Kazakhstan because of the weaker economic positions, the repercussions of the custom union on Belorussia's economy are likely to be similar to the repercussions on Kazakhstan's economy. According to the World Bank report on assessment of custom union's cost and benefits for Kazakhstan, the impact of the common tariffs reduced the real income by

[29] World Bank Indicators. Available at: http://data.worldbank.org/indicator/, accessed on 20.06.2015. There was no data on Kazakhstan, Tajikistan, Turkmenistan and Uzbekistan.

0.2% in 1 year after implementation of the common tariffs. The custom union increased import costs for businesses and customers from outside the custom union and the common tariff umbrella led to inefficient production. There was depression of real wages by 0.5%, and decrease of the real return on capital by 0.6%. The reduction of trade with other world countries than CISs and more with Russia and Belorussia resulted in less imported high-techs from more technologically advanced European Union and other countries, which leads to productivity loss in the long term. Service sectors do not benefit from the custom union protection and became less profitable experiencing sector contraction and decline (World Bank Report, 2012).

3.4.3. Robustness tests

We ran a number of robustness checks. First we estimate the models with changed sample specification. We excluded Russia from the sample and ran both hyperbolic and output distance function specification. We ran robustness checks by adding and dropping other variables such as deposit insurance, overall risk and concentration ratio. The main results remained robust. We use the traditional output-oriented distance function approach as another robustness test, further we add country dummy in the frontier control variables of the traditional and hyperbolic distance functions. Robustness test results are reported in columns (2) (3) and (4) in the Table 3.6. In general, results from different specifications suggest that the base model is robust. The efficient scores from the output-distance function, model (2), demonstrate a bit lower technical efficiency (Table 3.7), though the ranking in term of average scores by country are similar to our main model.

The robustness tests indicate the major consistency of the results obtained using the stochastic hyperbolic distance function approach, relating our concerns to qualitative change of sign for

credit risk in traditional output function specification, though it is only marginally significant. The ownership variable of CISs member-owned banks, capital risk, liquidity and market risk are sensitive to the inclusion of the country dummy specification in the frontier model. The inclusion of country dummies in the frontier absorbs the effect of the CISs country differences, which leads to the insignificance of these variables. The GDP growth variable is insignificant for the hyperbolic distance function, but statistically significant in all robustness checks; it also has the same sign across all specifications.

Table 3.7: Mean technical efficiency by country and by year (2005-2012), using output-distance function

Country/Year	2005	2006	2007	2008	2009	2010	2011	2012	Average by country
Armenia	0.823	0.870	0.831	0.848	0.890	0.886	0.881	0.883	0.866
Azerbaijan	0.891	0.874	0.862	0.830	0.906	0.914	0.862	0.911	0.884
Belarus	0.927	0.900	0.872	0.885	0.885	0.876	0.865	0.879	0.882
Kyrgyzstan	0.850	0.820	0.814	0.837	0.870	0.872	0.865	0.840	0.847
Kazakhstan	0.884	0.874	0.841	0.870	0.757	0.856	0.846	0.812	0.839
Moldova	0.921	0.900	0.856	0.868	0.918	0.905	0.898	0.909	0.895
Russia	0.881	0.877	0.878	0.906	0.905	0.906	0.903	0.904	0.896
Tajikistan	0.915	0.898	0.899	0.910	0.906	0.918	0.927	0.890	0.909
Ukraine	0.928	0.919	0.916	0.859	0.906	0.924	0.926	0.920	0.912
Uzbekistan	0.920	0.912	0.900	0.889	0.909	0.908	0.886	0.914	0.903
Average by year	0.885	0.879	0.873	0.893	0.895	0.902	0.896	0.897	0.891

3.5. Conclusion

This study has analysed the banking sector performance in the CIS countries. Particularly it investigated the impact of ownership structure and bank risks (capital, credit, liquidity, market, and overall risks) on banks technical efficiency in the CIS countries over the period from 2005 till 2012. The study uses intermediation approach and estimates the income based model with two inputs: interest expenses and non-interest expenses, and two outputs: interest income and non-interest operating income using stochastic hyperbolic distance function. Our main findings are generally robust to the alternative model specifications and other robustness checks we conducted. The results are as follows. From the estimation of the frontier model the average technical efficiency of the CISs countries is estimated as 94%. The most efficient banking system is in Ukraine as average over the studied period while the least efficient are Kazakhstani banks. Efficiency of Kazakh banks exceeded efficiency of Russian banks in the beginning of the period studied, which is similar to what was found by Fries end Taci (2005) for the period between 1994 and 2001, and declined after the world finical crisis.

Turning to the results on the inefficiency effects, firstly we discuss the ownership impact on bank technical efficiency. Our findings suggest that *ownership structure* matters for banks efficiency. We distinguished impact of four ownership types on bank performance such as State-owned banks, Domestic private banks, Foreign-owned banks and CIS-member-owned banks. Firstly, private banks are less efficient than state-owned banks in the CISs countries for possible two reasons. On the one hand, the state banks are widely trusted and long present in the market, and have wider and less costly access to deposits and advantage in switching costs. On the other hand, the state-owned banks could have different activity sets than private banks. The ‘development’ role of state-owned banks is that sate-owned banks swiftly organise and direct finance into the projects, which boost economic development and

industrialisation. This kind of projects does not require customer evaluation and monitoring as the customer is the state itself and the projects are usually large scale, which results in high ouput level of state-owned banks.

Banks with foreign majority are also less technically efficient than state-owned banks, which supports the home field advantage hypothesis. The difference in institutional environment between the country of origin and the host country is likely the reason for foreign banks' technical inefficiency. Moreover, difficulties in processing of 'soft' information about the host country market conditions may result in comparative disadvantages in technologies involving this kind of information for foreign banks.

The cross-regional CISs ownership has a significant positive impact on banks performance. It means that CIS-owned foreign banks perform more efficient than other banks. Unlike foreign banks from out of the region, the CIS-owned foreign banks are familiar with the environment and can easily process the 'soft' information regarding the market conditions in the country of entry. Additionally, being priori more efficient CISs banks (mostly from Russia and Kazakhstan), which pursue going abroad policy, enter the CIS countries with less developed financial sectors, which provide them with more advantageous environment conditions. This finding is in line with limited advantage hypothesis.

Secondly, we observe different results for the *risks-taking behaviour* and bank performance in the CISs countries. There is positive association between capital, credit and market risk and performance, while negative association of liquidity risks with bank performance in the CISs.

Finally, various control variables shed light on the economic and institutional environment impact. All control variables have significant impact on efficiency indicating that they have to be included. The *GDP growth* has a positive effect on bank efficiency, indicating that the

CISs banks benefited from the considerable GDP growth, which was high in the most of the CISs countries. The financial crisis of 2007-2009 had a positive impact on bank performance due to the increased interest rate spread supported by the authorities in their effort to cushion the crisis impact. There is a drop in the efficiency in the wake of abolishment of the customs clearance among the member-countries in 2010 and establishment of common external tariffs. Listed banks are more efficient perhaps because they have strong incentives to discipline and transparency.

This question especially important in the context of recent developments in the CISs region including armed conflicts, the unstable political situation in the CISs region and economic sanctions towards Russia, which in complex can influence negatively economic and financial stability in the whole region and needs to be closely investigated. Although, there are some divergence in economic situation and financial sector development in the CIS countries, there are on-going processes of financial integration among the CIS countries, which are politically supported. In the light of these processes the questions still remain, whether the banking sectors are moving toward regional integration, and whether the banking sectors are stable in changing environment. Considering financial integration, further issues of bank efficiency and convergence will be addressed in the following empirical study in Chapter 4.

Concluding policy remark

Given the fact that CISs private banks are less efficient than public banks, the state ownership in the CISs banking sectors is not necessarily the only reason of lower levels of financial intermediation or relative inefficiency. While the main inefficiency is inherent in domestic private banks, the policy implication is that the banking systems' efficiency may be enhanced via increased competition in financial sectors. It can be achieved by creating a sufficient and efficient regulation and supervision framework to clear the CISs banking systems of

inefficient and fraudulent banks and by impoving banks entry and exit requirements. Taking into account the negative association of liquidity risk to bank performance in the CISs, banks may improve their technical efficiency by increasing liquidity levels or taking less liquidity risk, which is the main reason for bank failures. Additionally, due to deterioration of economic conditions as a result of the common external tariff adoption and abolishment of mutual customs clearance as a result of the custom union establishment, efforts should be directed towards mutually beneficial inter-country policies and regulations.

Chapter 4

Cost and profit efficiency and financial integration in the CIS countries

Preamble

This chapter examines cost and profit efficiency of the CISs' banks and investigates the impact of banking sector ownership and risk-taking behaviour on bank cost and profit efficiency. Different concepts of efficiency introduced in this study extend the analysis of bank efficiency, and offer a comprehensive study of the CISs banking performance. Cost efficiency occurs when a bank does not waste input resources in its production processes resulting from allocative and technical inefficiency (Isik and Hassan, 2003). Profit efficiency arises when a bank uses optimal amount of input mix (cost minimisation) to produce optimal amount of output mix (revenue maximisation) (Kumbhakar and Lovell, 2000). The estimation of cost and profit efficiency allows us to further extend the analysis and investigate the process of integration in the banking sector of the CISs by testing for convergence in bank cost and profit efficiency.

4.1. Introduction

Having examined the technical efficiency and various factors that impact bank efficiency, the thesis comes to assess bank cost and profit efficiency employing the same one-stage SFA as in the previous chapter, however, using different efficiency concepts, cost/profit function and stating cost and profit optimisation objectives.

As we discussed in the previous chapter, when input prices are available, allocative efficiency can be measured (Coelli et al. 1998). Technical efficiency doesn't consider allocative

efficiency and one cannot use it to compare banking firms that might specialise in different input or output mixes, while cost and profit efficiency make it possible to compare input and output compositions and the extent to which they respond to relative prices (Vander Vennet, 2002). Farrell (1957) suggested the practical techniques for measuring productive efficiency of a firm (technical and allocative efficiency).

This chapter takes account of allocative efficiency and examines the impact of ownership and risk-taking behaviour on bank cost and profit efficiencies. Different concepts of efficiency introduced in this study extend the analysis of the previous empirical chapter, and allow for a comprehensive comparative analysis of efficiency in CISs banking. Moreover, the estimation of profit and cost efficiencies allow us to further investigate degree of integration in banking sector of the CIS, which is one of the goals of this study, additional to the custom union establishment impact on efficiency.

The cost and profit concepts are based on economic optimisation as a reaction of banking firms (management) to market prices and competition (Berger and Mester, 1997). The convergence in cost efficiency relates to the one price law criterion, when banking firms offer similar products for the same price. This implies that banks' costs of inputs such as, for example, deposits (in the intermediation approach), labour and capital (in the production approach), should equalise leading to the convergence in banks cost efficiency. The convergence in profit efficiency was justified by Gropp and Kashyap (2009). Integration results in lifting barriers among countries; and new entry and takeovers lead to convergence in profitability. Therefore, we apply two-step approach: first we estimate the cross-country cost and profit efficiency in the CISs; and second, we check, whether there was a convergence in cost and profit efficiency scores using β and σ - convergence tests (Weill, 2009).

There is a vast literature on efficiency in banking including developed countries[30], and developing and transition countries[31]. Despite this, there is currently a lack of literature and empirical research on finance development in the CISs. Cost and profit efficiency estimation for all the CIS member countries using stochastic frontier approach has not been done before nor have there been estimates of the effects of ownership type, risk-taking behaviour and different environmental factors on bank efficiency.

There are several studies that used β and σ - convergence to test the financial integration of banking sectors across the EU countries (see Weill, 2009; Casu and Girardone, 2010; Mamatzakis et al., 2008). To our knowledge, there is no literature on banking sectors convergence in the CISs using beta and sigma convergence.

To this extend, the specific research questions of this chapter are: How do bank ownership characteristics and risk-taking affect banks cost/profit efficiency? To what extent has financial integration taken place in the banking sectors in the CIS countries in terms of cost/profit efficiency scores convergence?

The objectives of this Chapter are to extend the analysis of the CISs banking and implement a different concept of efficiency namely cost/profit efficiency for comprehensive analysis of banks performance; analyse the influence of different types of ownership and risk-taking behaviour on banks cost/profit efficiency; explain the integration of banks among the CISs by measuring cost and profit efficiency scores convergence; provide information for policy makers or/and financial sector authorities in the CIS countries on the banking sector policies in terms of better services and financial reintegration of the banking sectors.

[30] Berger and Mester, 1997; Berger and De Young, 1997; Mester, 1996; Eisenbeis et al., 1999; Altunbas et al., 2001

[31] Fries and Taci, 2005; Bonin et al., 2005a, b; Weill, 2003; Rossi et al., 2005; Kasman and Yildirim, 2006; Hollo and Nagy, 2006; Yildirim and Philippatos, 2007; Jiang et al. 2013.

This study contributes to the literature as follows. First, it estimates cost/profit efficiency derived from the stochastic frontier approach for all the CIS member countries measuring allocative efficiency with cost-minimisation and profit-maximisation behavioural settings, which has a higher standard than technical efficiency by incorporating relative prices. Thus, it measures the ability of managers to respond effectively to changes in the relative prices and depicts different from technical efficiency aspects of bank efficiency. Second, it measures cost and profit efficiency incorporating important variables, which are considered critical for efficiency differences, such as ownership type, risk-taking behaviour and different environmental factors, to estimate reliable cost and profit efficiency measures. It also contributes to literature by investigating the impact of CISs ownership in the region on bank' cost and profit efficiency. The results are expected to illuminate most weak segments of the banking systems and to advise financial authorities on financial institutions policy. Third, it proceeds to the estimation of β- and σ-convergence of cost and profit efficiency scores for further analysis of integration in banking sectors of the CISs.

Research methodology statement

We estimate both cost and profit efficiency as both concept are important for examining bank performance. Though, Berger et al. (1995) and Berger and Mester (1997) provide arguments in favour of using profit function for bank inefficiency analysis, we also estimate cost inefficiency.

As the main methodological framework is similar to the previous chapter, here we give a general overview of the methodology and highlight the aspects relating to cost and profit efficiency estimation, while detailed discussion is given in the previous chapter. In the previous chapter we discussed that the best-practice frontier can be derived by using two nonparametric techniques: data envelopment analysis and free disposable hull analysis; and three parametric: the stochastic frontier approach (SFA), the thick frontier approach, and the

distribution-free approach (Mester, 1994). The widely applied approach to measure efficiency introduced by Aigner et al. (1977) is stochastic frontier analysis. Similar to technical efficiency estimation, we employ stochastic frontier analysis in this chapter to estimate cost and profit efficiency.

There are two different approaches to the selection of variables of input and output order to capture more precisely banking activity: the production approach and the intermediation approach. The production approach treats deposits and number of transactions and loans as outputs, while labour and physical capital are inputs (See Berger and Humphrey, 1991; Swank, 1995; Resti, 1997; Berger and De Young, 1997). The intermediation approach treats banks as intermediaries, where a banking firm attracts funds and transforms them into investments such as loans and securities (See Sealey and Lindley, 1977; Barr et al., 1994). This chapter uses the intermediation approach similar to the previous chapter.

Cost efficiency and alternative profit efficiency is estimated using one-step estimation model (Battese and Coelli, 1995)[32]. The alternative profit efficiency is preferred over the standard profit efficiency as the alternative profit function keeps output constant and profits are affected by the variations in input prices.

The process of banking integration among CISs countries is investigated by measuring convergence in cost/profit efficiency scores among commercial banks using β and σ - convergence. We follow Canova and Marcet (1995), Parikh and Shibata (2004) and Weill (2009) methodology in estimating cost and profit convergence.

The data for commercial banks of the CISs cover an eight year period from 2005 to 2012. The data are obtained from the Bankscope data base, national central banks of the countries,

[32] Wang and Schmidt (2002) discussed various methodological limitations of one-step and two-step methods.

Financial Structure Dataset World Bank, and the websites of the commercial banks of the sample. The data and information on ownership have been revised and adjusted where necessary to get reliable information. The dummy variable on the custom union establishment reflects the effect on efficiency in member-states before and after the custom union common tariffs introduction and mutual abolishment of the customs clearance. The data differ from our sample in the previous analysis due to additional requirements of input prices for allocative efficiency estimation. In this regards, our sample decreased from 376 to 328 banks and the number of observations changed from 2431 to 2208.

4.2. Literature review

4.2.1. Cost and profit efficiency

There is a massive literature on bank efficiency in developed and developing countries. Banking performance in developed and developing countries is different due to the differences in financial systems, economic development, banking regulation and management[33]. In international comparison of cost and profit efficiencies was done by Maudos et al. (2002), where they established that cost efficiency is lower than profit efficiency in ten countries of the European Union. The other evidences show that profit inefficiency is higher than cost inefficiency in banks (see Berger and Mester, 1997; Lozano, 1997; and Rogers, 1998). This can be explained by the difference in profit and cost concepts. The concept of profit efficiency is better in measuring the overall performance because it accounts for inefficiencies both on the output and input sides, when the output side inefficiencies are as large as the input side inefficiencies (Berger et al., 1993). Here we present literature with a particular focus on association between risk-taking behaviour, ownership and the cost and profit efficiency.

Risks

As mentioned in the previous chapter, risks are a key aspect of banks' production as banks should assess, monitor and diversify risks and thus risk management is an essential part of the banking business. Studies on bank performance dependency on different types of risks on micro level, like capital, credit, liquidity risk and market risk shed light on risk-taking behaviour in banking sector (Berger and De Young, 1997; Kwan and Eisenbeis, 1997; Altunbas et al. 2007; Fiordelisi et al. 2011; Brissimis et al., 2008). The inclusion of different

[33] This part will consider the literature on bank performance in transition and developing countries too.

types of risks to control for their influence on bank efficiency was proved to be useful for accurate measurement of efficiency (Altunbas et al., 2000; Mester, 1996; Clark, 1996 and McAlliser and McManus, 1993).

Literature on bank cost and profit efficiency included different risk-taking characteristics into efficiency estimation. The capital risk was included in the studies by Mester, 1996, Berger and Di Patti (2006), Altunbas et al. (2007), Athanasoglou et al. (2008), Brissimis et al. (2008), Fiordelisi et al. (2011), and Radic et al. (2012). The credit risk influence on bank efficiency was studied by Athanasoglou et al. (2008), Brissimis et al. (2008) and Fiordelisi and Molyneux (2010). The liquidity risk was included in the function estimation in Altunbas et al. (2000), Brissimis et al. (2008), Fiordelisi and Molyneux (2010) and Radic et al. (2012). The market risk exposure was studied by Berger and Humphrey (1997), Berger and Mester (1997), Isik and Hasan (2003) and Fiordelisi and Molyneux (2010).

Lower capital level leads to lower cost efficiency levels because banks with low capital face greater funds' cost due to greater leverage (Radic et al., 2012). Mester (1996) found that lower capital level can be related to cost inefficiency, which was in line with Brissimis et al. (2008) and Fiordelisi et al. (2011), who found negative effect of capital risk on cost efficiency. However, Altunbas et al., (2007) stated that cost inefficient banks are likely to hold more capital. Profit efficiency was positively related to higher capital level (Athanasoglou et al., 2008). Opposite to this, Berger and Bonaccorsi Di Patti (2006) found that lower equity ratio (higher leverage) was associated with higher profit efficiency. Credit risk found to have negative impact on bank profitability in Athanasoglou et al. (2008). Credit risk or higher credit losses are likely to increase the cost of capital offsetting higher banks' interest income, which arises from larger business volume and lower quality of loan portfolio in EU banking (Fiordelisi and Molyneux, 2010). These findings are in line with Iannotta et al.

(2007). Liquidity is negatively related to cost efficiency because holding a large amount of liquid assets is costly (Altunbas et al., 2000). Liquidity risk exposure showed positive link to economic profits but negative link to cost of capital, which offsets the economic profits effect in Fiordelisi and Molyneux, 2010. They also found that higher market risk exposure was negatively linked to both economic profits and economic value added in European banking. Earlier studies evidenced that higher level of purchased funds is related to lower cost efficiency (Berger and Humphrey, 1997) and lesser profit efficiency (Berger and Mester, 1997). Contrary to the findings by Berger and Mester (1997), Isik and Hassan (2003) found that banks with relatively higher level of purchased funds are likely to be more cost efficient.

Most of the studies focused either on the influence of risk-taking behaviour on either cost efficiency (Berger and DeYoung, 1997; Kwan and Eisenbeis, 1997; Williams, 2004; Altunbas et al. 2007) or profit efficiency (Berger and Bonaccorci di Patti, 2006). The influence of risk-taking behaviour on both cost and profit efficiency was taken into account in some works such as Fiordelisi et al. (2011), Fang et al. (2011) and Radic et al. (2012). Fiordelisi et al. (2011) recognised that cost and revenue efficiencies reflect different abilities of managers such as cost minimisation and profit maximisation abilities, thus can have different links with bank risks. Radic et al. (2012) analysed among others bank risk-taking factors including liquidity and capital risk exposure for investment banks in developed countries. They found that liquidity risk is negatively related to cost efficiency but has a positive impact on profit efficiency, and higher capital risk reduces cost efficiency and increases profit efficiency. In this study, we are addressing influence of risk-taking behaviour on cost and profit efficiency.

Ownership

In the previous chapter we discussed ownership literature and underlying theories, which help to explain the influence of different types of ownership on efficiency. Here we continue literature survey concerning ownership issues with an accent on cost and profit efficiency studies. As discussed in the previous chapter, the main theoretical framework for analysis of ownership is principal-agent theory, soft budget constraint theory, 'developmental' and 'political' view theories, global advantage hypothesis and home field advantage hypothesis.

It was shown in a number of studies that different types of ownership influence differently efficiency, risks and profitability of banks. In the US, the early studies (Nicols, 1967; O'Hara, 1981; Mester, 1993; and Saunders et. al., 1990) suggested that private banks are less efficient than mutual banks. In other works it was shown that there was no difference in the efficiency of financial institutions (see Cebenoyan, 1993). In the European Union the ownership types have a different impact on efficiency. Private banks are more profitable then mutual banks, but are less cost efficient than other banks (Iannotta et al., 2007). German private banks are more profitable than mutual banks (Beck et al., 2009). Japanese private banks proved to be more cost and revenue efficient than regional banks in Loukoianova (2008).

Empirical studies show mostly negative impacts from the state ownership (Barth et al., 1999; La Porta et al., 2002; Caprio and Peria, 2000). Goddard et al. (2014) used a random parameters model to estimate cost efficiency progress for the period 1985-2010 in Latin America. Their conclusion was that the government-owned banks experienced a decrease in cost efficiency in the 1990s and improved it afterwards before the sub-prime crisis. However, some studies have opposite results and support state-ownership of banks. Bonin et al. (2005a) report that there is no much evidence that state-owned banks are less efficient

compared to domestic private banks, and Karas et al. (2010) find that domestic private banks are not more efficient than domestic public banks.

The presence of the *foreign ownership* is expected to bring advanced technology, up-to-date expertise and managerial skills as well as capital into the banking sector. In exchange, the local partnership allows foreign investors to gain local clients and knowledge of the market. Almost all empirical studies confirm the benefits of the foreign entrance via privatisation in transition countries (Bonin et al., 2005b, Fries et al., 2006) and foreign investors improve banks' efficiency in transition countries (Fries and Taci, 2005; Bonin et al., 2005a; Weill, 2003; Kasman, 2005; Kasman and Yildirim, 2006). Styrin's work (2005) covered the banking sector performance in Russia and reported that foreign banks are more efficient than Russian domestic banks. Weill (2003) considered the influence of foreign ownership on cost efficiency in the Czech Republic and Poland and found that foreign banks are more efficient than domestic banks, which is consistent with the global advantage hypothesis (Berger et al., 2000). The same association was found between foreign ownership and cost efficiency by Kasman (2005).

Bonin et al. (2005a) consider ownership effect on banks' cost and profit efficiency in eleven CEE transition countries for the period from 1994 to 2000. They find that majority foreign-owned banks are more cost and profit efficient and provide better quality services, while banks with single strategic foreign investor are more cost efficient. There is no much evidence that state-owned banks are less efficient compared to domestic private banks. In Bonin et al. (2005b) the ownership impact on banks' cost and profit efficiency confirms the hypothesis that foreign-owned banks are the most efficient of all bank types and that state-owned banks are the least efficient the CEE countries (Bulgaria, the Czech Republic, Croatia, Hungary, Poland and Romania), which relates to the global advantages hypothesis.

Support for the global advantage hypothesis was also found in the several other studies, such as in Staikouras et al. (2007) with the analysis of cost efficiency in six South Eastern European countries for the period from 1998 to 2003; in Mamatzaki et al. (2008) with the analysis of cost and profit efficiency in ten new European Union members for the period 1998-2003, who found that foreign bank are more profit efficiency than both state-owned and private banks; in Kasman and Yildirim (2006) with the analysis of cost and profit efficiency for new EU members, which joined the EU in 2004 for the period from 1995 to 2002.

The findings of studies of the regional evidence for the global advantage hypothesis were that the hypothesis was mostly rejected for the developed countries (Berger et al., 2000; Claessens et al., 2001; Vander Vennet, 1996).

However, the literature that includes banking sector *ownership* analysis of the CIS countries is in short supply. The handful amount of studies, which include some on the CIS countries, is following. State banks underperformed persistently in cost efficiency and demand, while privatised banks improved their mark-ups in 15 transition countries including Kazakhstan, Russia and Ukraine during the period between 1995-98 and 2002-2004 (Fries et al., 2006). Fries and Taci (2005) assessed banks efficiency in transition countries including three CIS members (Kazakhstan, Russia and Ukraine). They found that foreign-owned banks are more cost efficient than the other ownership types; private banks are more cost efficient than public banks and that Kazakh banks are more efficient than Russian banks. However, substantially reduced costs at the early stages of reforms had a tendency to rise at advanced stages.

The other work that includes the CEE and CIS countries banking sector analysis was done by Grigorian and Manole (2002), who estimated bank performance in those countries. Out of 17 countries under consideration six were CIS countries: Armenia, Belarus, Kazakhstan, Moldova, Russian Federation and Ukraine. The conclusion was that foreign banks

outperform domestic banks and that privatisation of state banks to domestic owners didn't improve efficiency.

Karas et al. (2010) found that in Russia state-owned banks are more cost efficient than domestic private banks, although foreign banks outperform domestic state and private banks in profit efficiency. The study of banking sector performance in Uzbekistan for the period 2004-2006 found no significant difference in performance between private, joint-stock and foreign banks Nigmonov (2010).

4.2.2. Convergence literature

The increased integration of financial markets should lead to a greater competition and efficiency in banking sectors. According to the definition, in an integrated financial market participants face a single set of rules; have equal access to the financial instruments and/or services; are treated equally when they are active in the market (ECB, 2009). The criteria relate to the one price law, when banking firms offer similar products for the same price. This implies that banks' costs of inputs such as, for example, deposits (in the intermediation approach), labour and capital (in the production approach), should equalise leading to a convergence in banks cost efficiency. Evidence in support of cost minimization and increased efficiency due to increased competition, financial innovations and economic and financial freedom is presented by Fiordelisi and Molyneux (2010), Chortareas et al. (2013).

Together with financial integration benefits Stavárek et al. (2012) define its main drawbacks, such as increased vulnerability to external macroeconomic shocks, and higher output and consumption volatility due to financial crises.

Gropp and Kashyap (2009) argue that the process of integration via new entry and takeovers due to lifting barriers will lead to a convergence in profitability. They shift the focus from the

law of one price towards integration via lifting entry barriers and takeovers, an approach which permits the use of profitability convergence to measure bank integration.

Literature on the link between efficiency and integration in the banking sector in the European Union include Molyneux et al. (1997), Goddard et al. (2007), Brissimis et al. (2010), Fiordelisi et al. (2011). A number of studies, which looked at the convergence in efficiency scores of the banking sectors before the financial crisis, also observed increased efficiency in banking sectors among the EU (Altunbas et al., 2001; Casu and Molyneux, 2003). More recent work on efficiency convergence in the EU banking sectors was carried out by Matousek et al. (2015). This study estimated technical efficiency using a hyperbolic distance function and found a negative influence of the financial crisis of 2008 on efficiency convergence.

There are several studies that used β and σ - convergence to test the financial integration of banking sectors across the EU countries. Weill (2009) investigates β and σ - convergence of cost efficiencies in the banking sector of the EU and comes to the conclusion that there was a convergence in bank efficiencies between 1994 and 2004. Casu and Girardone (2010) applied tests of convergence of banking efficiencies for panel data and tested a dynamic panel data model. They found that with integration there was a movement of cost efficiency towards the EU average level between 1997 and 2003. Mamatzakis et al. (2008) study cost and profit efficiency of the East and Central European country members of the EU in the period 1998-2003. They showed that there was some convergence in cost efficiency among the countries but no convergence in profit efficiency.

To our knowledge, there is as yet no literature on banking sector convergence in the CISs. The present study aims to find the evidence of integration in the CISs banking using tests of β and σ–convergence for cost and profit efficiency convergence.

4.3. Methodology

4.3.1. Cost and profit efficiency

In the literature three distinct *economic efficiency concepts* are employed: cost efficiency, standard profit efficiency and alternative profit efficiency. They are grounded in economic optimisation as a reaction of firms to changes in market prices and competition (Berger and Mester, 1997).

Cost efficiency measures bank's best performance in terms of producing the same amount of output with optimised amount of inputs. It is expressed from a cost function and has a general form as following Berger and Mester (1997):

$$C = C(w, y, z, v, u_c, \epsilon_c), \tag{4.1}$$

where C stands for variable costs; w is the vector of inputs prices; y is the vector of variable output quantities; z is a vector of netputs (inputs or outputs); v is a bundle of different environmental variables[34]; u_c represents inefficiencies in costs and ϵ_c is a random error, which contain measurement error and luck, that can temporarily increase or decrease banks costs.

We can represent the cost function as a natural logarithm function and separate the inefficiency and random terms from the rest of the cost function:

$$lnC = f(w, y, z, v) + lnu_c + ln\epsilon_c\,, \tag{4.2}$$

where f denotes a functional form of the cost function and other variables defined as above.

[34] The biasness in estimation of efficiency in models without environmental variables is due to the assumption that inefficiency differences across countries appear only because of managerial decisions. This should be corrected by including those environmental variables into models. Inclusion of the environmental variables is discussed by Dietsch and Lozano-Vivas (2000), Lozano-Vivas et al. (2001) and Lozano-Vivas et al. (2002).

For the individual bank *b* the cost efficiency ratio in Berger and Mester (1997) is:

$$COSTeff^b = \frac{\hat{C}^{min}}{\hat{C}^b} = \frac{\exp[\hat{f}(w^b, y^b, z, v^b)] * \exp[\ln \hat{u}_C^{min}]}{\exp[\hat{f}(w^b, y^b, z, v^b)] * \exp[\ln \hat{u}_C^b]} = \frac{\hat{u}_C^{min}}{\hat{u}_C^b} \quad (4.3)$$

where $\hat{u}_C^{min}$ is the $\hat{u}_C^b$ minimum across all banking firms in the sample.

Cost efficiency can vary from 0 to 1; and 1 is the score of the best cost efficient banking firm in the sample.

The other measure of efficiency is *profit efficiency*. There are two types of profit efficiency measures: standard profit efficiency and alternative profit efficiency. The alternative profit efficiency is more reliable when underlying assumptions of perfect competition in pricing for standard profit function is questionable, or when quality of services differ among the banks (Maudos et al. 2002).

Standard profit efficiency measures the bank's ability to select its outputs and inputs to produce maximum feasible level of profit given input and output prices. The revenues are also included in the profit function as it allows for variations in outputs and inputs. Prices of output are exogenous, which allows for output inefficiencies be responsive to these output prices.

The log form of standard profit function is:

$$\ln(\pi + \theta) = f(w, p, z, v) + lnu_\pi + ln\epsilon_\pi \,, \quad (4.4)$$

where π is the profit of the bank; θ is a constant added to every firm's profit to ensure that log function can be taken; p is the vector of output prices; w, z, v are defined as in the cost function; lnu_π captures inefficiency that influences profits; and $ln\epsilon_\pi$ is a random error.

The concept of profit efficiency can be more useful then cost efficiency in estimating the overall performance of the bank as it allows for measuring inefficiencies on both input and output sides, while inefficiencies on the output side could be even larger then on the input side (Berger et al., 1993; Berger and Mester, 1997). The standard profit efficiency ratio for an individual bank *b* as the ratio of actual to maximum predicted profits by Berger and Mester (1997) is:

$$Std\pi eff^b = \frac{\hat{\pi}^b}{\hat{\pi}^{max}} = \frac{\{\exp[\hat{f}(w^b,p^b,z,v^b)]*\exp[\ln \hat{u}_\pi^b]\}-\theta}{\{\exp[\hat{f}(w^b,p^b,z,v^b)]*\exp[\ln \hat{u}_\pi^{max}]-\theta}, \quad (4.5)$$

where $\hat{u}_\pi^{max}$ is $\hat{u}_\pi^b$ maximum across all the sample of banking firms.

In contrast to the standard profit function, the *alternative profit function* keeps output statistically constant as with the cost function and profits are affected by the variations in controlled output prices.

The log form of the alternative profit function is:

$$\ln(\pi_a + \theta) = f(w,y,z,v) + lnu_{a\pi} + ln\epsilon_{a\pi}, \quad (4.6)$$

where variables are defined as in (4.4) except for y, which is defined as a vector of variable output quantities.

The ratio for the alternative profit function expresses the same idea as the standard profit function, by Berger and Mester (1997) it is:

$$Alt\pi eff^b = \frac{a\hat{\pi}^b}{a\hat{\pi}^{max}} = \frac{\{\exp[\hat{f}(w^b,y^b,z,v^b)]*\exp[\ln \hat{u}_{a\pi}^b]\}-\theta}{\{\exp[\hat{f}(w^b,y^b,z,v^b)]*\exp[\ln \hat{u}_{a\pi}^{max}]-\theta}, \quad (4.7)$$

where $\hat{u}_{a\pi}^{max}$ is $\hat{u}_{a\pi}^b$ maximum across all the sample of banking firms.

When the standard profit efficiency is measured, larger banks may be characterized as more profit efficient than small banks, because small banks have lower output levels, and output levels are not statistically controlled. The alternative profit function holds output levels constant statistically, which eliminates the potential problem of scale bias by measuring capability of profit generating for the same levels of output.

4.3.2. Model specifications of cost and profit function

This empirical analysis applies stochastic frontier analysis, which was introduced by Aigner et al. (1977) to measure cost and profit efficiency; and was made traceable by Battese and Coelli (1995) in one-step model estimation for panel data, which was also used by Wang and Schmidt (2002). We follow the intermediation approach (Sealey and Lindley, 1977) when defining bank inputs and outputs. We discussed our methodology choice in the previous chapter.

Cost efficiency can be measured as allocative input efficiency, where maximum efficient firm uses the optimal input mix given input prices to produce the output. Economic characteristics of the production processes given input prices can be estimated. This assumes that a bank attempts to minimise its costs. The stochastic analysis identifies a bank as inefficient, if its costs lie above those of the most efficient bank, which uses the same mixture of inputs and produces the same mixture of outputs.

Profit efficiency measures the extent to which bank's profits are lower compared to the most efficient bank in the sample. There are two profit function approaches – the standard and the alternative profit function (Berger et al., 1993). However, we opt for the alternative profit function, which allows for an impact on profits through exogenous input prices and statistically controlled output quantities; output prices are no longer exogenous incorporating

product demand structure and technology structure resulting in a non-dual structure of production technology (Kumbhakar and Lovell, 2000). The alternative (nonstandard) profit function is used in measuring the CISs' bank profitability because we assume that (a) perfect competition condition does not hold and the bank has some power over the output prices, (b) there are some errors in output prices measurement, (c) there are differences in the quality of banking services among banks in the sample, and (d) banks in the CISs differ in size (See Berger and Mester, 1997). These conditions reflect better the reality in banking research (Humphrey and Pulley, 1997). At the same time the alternative profit function reduces the problem of scale bias by fixing the output and comparing the ability of banking firms to generate profit for the same level of output (Berger and Mester, 1997). The alternative profit function has been estimated in Berger and Mester (1997), Rogers (1998), Berger and Mester (1997), Humphrey and Pulley (1997), Maudos et al. (2002), Kasman and Yildirim (2006), Jiang et al. (2013).

The estimated empirical asset-based model specifies two inputs, namely *labour and physical capital* and *funds*; and two outputs namely *total loans and other earning assets.* Other earning assets mainly include total securities and loans and advances to banks (Bankscope). The netput equity is a quasi-fixed input, which is included into the model to capture the cost of equity and not only the cost of debt (Hughes and Mester, 2010). The value of the financial capital (equity) should be included rather than the total equity to total assets ratio because 'there is good reason to believe that cost-minimization does not fully explain a bank's capital level – e.g., regulations set minimum capital-to-assets ratios, and bank managers may be risk averse… this might lead one to conclude that the risk-averse bank was producing its output in an allocatively inefficient manner when actually it is the risk-preferences that differ' (Mester, 1996). The labour and physical capital price is defined as the ratio of non-interest expenses to total assets, following literature (Hasan and Marton, 2003; Bonin et al., 2005a), and the

borrowed funds price is the ratio of interest expenses to total customer deposits (Berger et al., 2009). The total costs are defined as the sum of interest expenses and non-interest expenses. The total profits are defined as pre-tax profit, the use of which is justified by the differences in the tax systems of the CIS countries.

The translog form of the cost/profit efficiency frontier is estimated by using the specification in (4.7). The specification imposes symmetry and linear homogeneity with respect to input prices by dividing dependent variables (total cost and pre-tax profit) by the fund price. The model is time-variant, and the time variable interacts with each input and output variable, thus assuming flexibility in efficiency both over time and among banks. The quadratic term of the time variable allows for non-monotonic technical change (Coelli et al., 1998, p. 303).

$$lnTC_{k,t}(lnTP) = \alpha + \sum_{i=1}^{2} \beta_i \, lnY_i + \sum_{j=1}^{2} \Psi_j lnP_j + \Phi_r lnE + \tau_1 T + \frac{1}{2} \sum_{i=1}^{2} \sum_{j=1}^{2} \sigma_{ij} lnY_i Y_j + \\ + \frac{1}{2} \sum_{i=1}^{2} \sum_{j=1}^{2} \gamma_{ij} lnP_i P_j + \frac{1}{2} \tau_8 T^2 + \sum_{i=1}^{2} \sum_{j=1}^{2} \acute{\omega}_{ij} lnY_i P_i + \sum_{i=1}^{2} \beta_{i\tau} \, lnY_i T \\ + \sum_{j=1}^{2} \Psi_{j\tau} lnP_j T + lnv_{kt} + lnu_{kt} \qquad (4.7)$$

where *TC* is the total costs of a banking firm *k* in year *t*; Y_i are outputs in a certain year for the i^{th} banking firm; P_j are input prices, where p_1 is the price of *labour and physical capital*, p_2 is the price of *funds*; and *E* is a fixed input, which is represented by bank's total equity (Altunbas et al., 2001); *T* captures change in technology over time; u_{kt} captures inefficiencies and has a truncated non-negative normal distribution; v_{kt} incorporates noise and has a normal standard distribution, $v \sim N(0,\sigma_v^2)$; and v_{kt} and u_{kt} are independent of each other; and the parameters are estimated: $\alpha, \beta, \psi, \phi, \tau, \sigma, \gamma, \acute{\omega}$.

The intuition behind the component error term is that deviations from the frontier captured by u_{it}, are under control of management of a bank. Meanwhile, v_{it} is a random error, which influences the random variations of the frontier across banks, which makes the frontier stochastic, and also incorporates measurement and observation errors.

The empirical cost/profit inefficiency effect model for an individual financial firm in (4.8) is estimated together with (4.7) using one-stage procedure.

$$u_{it} = \delta_0 + \sum_{a=1}^{3} \delta_a Owner_{it} + \sum_{b=4}^{7} \delta_b Risk_{it} + \sum_{c=8}^{13} \delta_c Contorl + \varepsilon_{it} \quad (4.8)$$

where $Owner_{it}$ stands for the nature of owners (state-owned, domestic private, foreign and CISs foreign) for bank *i* in time *t*; $Risk_{it}$ is an explanatory variable, which denotes risk taking behaviour of bank *i* in year *t* (capital risk, credit risk, liquidity risk and market risk); *Control* represents a vector, which contains other environmental variables in the model (assets diversification, income diversification, listing, Custom Union Establishment, Global financial crisis 2007-2009).

We use the functional form in (4.7) and equation (4.8) to estimate simultaneously a common frontier of commercial banks operating in the CISs countries. As in the previous empirical chapter we assume that the difference in risk-taking behaviour, various ownership types, and environmental characteristics influence bank efficiency level rather than the production technology, which is in the deterministic part of the equation.

We use the same specification as in (4.7) and equation (4.8) to obtain the profit efficiency scores with the difference that we replace *TC* by the *TP* variable and the inefficiency term u_{it} is subtracted for profit maximisation problem rather than added as in the case with cost minimisation problem.

We use the same firm-specific and environmental factors as in the empirical study on technical efficiency in the previous chapter. Ownership effect includes four dummies namely *government-owned banks, domestic private bank, foreign-owned banks, CIS-member-owned banks.* We assign corresponding ownership, if its share equals or exceeds 50% of ownership in the banks' capital.

Risk represents: capital risk, credit risk, liquidity risk and market risk. The importance of inclusion of the risk variables in cost and profit function specification was underlined by Altunbas et al. (2000), Mester (1996), Clark (1996), and McAllister and McManus (1993) as not controlling for risk can lead to a miscalculation of inefficiency. Similar to the previous chapter on technical efficiency, the *capital risk* is measured by the *ratio of equity to total assets*. Higher ratio means higher capital and lower insolvency risk. The c*redit risk* is calculated as the ratio of *loan loss reserves to total loans* and indicates how credit risk is managed by a bank. The higher is the ratio the poorer is the quality of the loan portfolio. The *liquidity risk* is measured by *the liquid assets to total assets ratio*. The liquidity risk is lower if the ratio is higher. The ratio of *interbank borrowing to total borrowing* is the proxy of the *market risk*. The more a banking firm relies on interbank loans the higher the market risk.

Control variables present two levels of factors, which influence efficiency. Country level indicators account for the impact of *GDP growth, financial crisis (2007-2009),* and *custom union establishment (2010).* The *GDP growth* reflects the economic environment while the *custom union dummy* reflects the legal framework and institutional environment of the customs union member-countries (Belarus, Kazakhstan and Russian Federation). The other control variable is the 2008-2009 *financial crisis* dummy variable, which measures the influence or the crisis on efficiency separating the period into two parts before 2008 and after the crisis.

Firm level indicators include *listing*, *assets* and *income diversity*. *Listing* is a dummy variable, which indicates that a bank is registered on a stock market. Listed banks are considered to perform more efficient than non-listed banks. A*ssets diversity*, measured as fraction of securities in total earning assets, and *income diversity*, measured as fraction of non-interest earnings in total earnings, control for diversification of banking activities, which reflects economies of scope. According to Gallo et al. (1996) non-traditional banking activities combined with traditional ones may show small positive results for profitability, and may increase risks and income volatility[35] in comparison with banks oriented to traditional bank lending (Lepetit et al., 2008). The definitions of dummy variables are presented in the Table 4.1, which is similar to dummy variables table in the previous chapter.

Table 4.1: The definitions of dummy variables in the cost/profit inefficiency effect model

Ownership variables	Definition
Government-owned banks	Equals 1 for state-owned commercial banks and 0 otherwise
Domestic private banks	Equals 1 for private commercial banks and 0 otherwise
Foreign-owned banks	Equals 1 for foreign-owned banks and 0 otherwise
CIS-member-owned banks	Equals 1 for CISs member country owned banks and 0 otherwise
Control variables	
Global Financial Crisis 2007-2009	Equals 1 for after 2008 and 0 before
Custom Union Establishment	Equals 1 for after the establishment of the Custom Union in 2010 and 0 for before
Listing	Equals 1 for publicly listed banks and 0 otherwise

Note: The first indicator is omitted from the estimation because of collinearity

4.3.3. Convergence

The main approaches to convergence estimation were developed in the framework of the economic growth theory and now are applied to a broad range of indicators. First of all we should distinguish β-convergence and σ-convergence. The concept of β and σ - convergence

[35] See for example DeYoung and Roland, 2001; Boyd and Graham, 1986; Demsetz and Strahan, 1997; Kwan, 1998; Stiroh, 2004; Stiroh and Rumble, 2006; Laeven and Levine, 2007.

was proposed by Barro and Sala-i-Martin (1991) and subsequently became well established[36]. According to the β-convergence idea, poorer countries at the starting point have higher rates of growth on average during integration process. In other words, growth rates of an indicator and its starting level are negatively correlated. On the other hand, countries with a higher initial level of an indicator will grow slower. Eventually, they reach convergence of the variables. The interpretation of β-convergence results has its weak points. When the growth rate is higher for a poor country, it can overshoot a rich country in growth and there would be no convergence present. β-convergence also doesn't explain the dispersion of a cross-section (Quah, 1996).

The concept of σ– convergence presumes measuring the dispersion of a cross-section over time. It captures the movement of the standard deviations in level across countries. If there is convergence among the countries, the standard deviation is declining. β-convergence does not always imply σ-convergence when groups of countries with different initial levels are exchanging their positions (rich become poor and poor become rich) and if there is a constant gap between rich and poor countries (Barro and Sala-i-Martin, 1992, 1995).

To assess the 'catching up' effect, which is measured as β-convergence, following the specification for panel data analysis by Canova and Marcet (1995) and Weill (2009) we estimate:

$$lnMFF_{i,t} - lnMFF_{i,t-1} = \alpha + \beta lnMFF_{i,t-1} + \sum_{i=1}^{10} Cy_i + \varepsilon_{it}\,, \qquad (4.9)$$

where $lnMFF_{i,t}$ is the mean efficiency score obtained using cost/profit efficiency functions for banks in country i in year t; $MFF_{i,t-1}$ is the mean efficiency score of a country i in the

[36] See also: Barro and Sala-i-Martin, 1992; Barro and Sala-i-Martin, 1995; Quah, 1996.

previous year; Cy_i is a country dummy, which captures fixed effects for countries to separate the country effect in the equation; α and β are the parameters to be estimated; and ε_{it} is the error term.

The convergence in efficiency is greater the greater is the β coefficient in absolute terms with a negative sign. Country dummies disentangle the country differences effects.

The σ- convergence is estimated following the specification by Parikh and Shibata (2004) and Weill (2009) for panel data:

$$\Delta E_{i,t} = \alpha + \beta E_{i,t-1} + \sum_{i=1}^{10} Cy_i + \varepsilon_{it}, \qquad (4.10)$$

where $\Delta E_{i,t} = E_{i,t} - E_{i,t-1}$, $E_{i,t} = lnMFF_{i,t} - MMFF_t$, $lnMFF_{i,t}$ is as for the previous equation the mean efficiency score of banks in country *i* in year t, and $MMFF_t$ is the mean of $lnMFF_{i,t}$ for each time period. Cy_i is again a country dummy, which disentangles the country differences effects, α and β are the parameters to be estimated, and ε_{it} is the error term. There is σ-convergence, if β is negative.

4.3.4. Data and descriptive statistics

The sample used in this chapter is similar to the sample in the previous empirical chapter, however, it differs in the numbers of banks as for the cost and profit efficiency estimation additional information on input prices are required. That caused sample differences because not all data were available for the banks participating in the cost and profit efficiency analysis. The data are obtained mainly from the Bankscope data base, national central banks of the countries, Financial Structure Dataset World Bank, and the websites of the banks included in the sample for more precise information on ownership. The data set is unbalanced

and covers the eight year period from 2005 to 2012. The number of observations is 2208; 328 commercial banks of the CIS countries available from the Bankscope database are included for the analysis. The sample breakdown by country and number of banks is presented in Table 4.2.

Table 4.2: Sample description: number of banks and average assets size by country and year

Country/Year	2005	2006	2007	2008	2009	2010	2011	2012	Total by country	Total assets of average bank (th $)
Armenia	6	7	8	10	10	10	10	9	70	174207
Azerbaijan	8	11	11	13	15	17	17	17	109	591225
Belarus	6	6	7	8	8	12	12	10	69	1201611
Kyrgyzstan	2	2	3	3	2	2	3	3	20	99748
Kazakhstan	10	10	14	15	13	13	15	16	106	3408461
Moldova	7	7	8	9	8	8	8	7	62	235430
Russia	150	187	199	201	218	229	227	219	1630	2279458
Tajikistan	1	1	1	1	1	4	4	4	17	218921
Ukraine	7	7	10	11	11	12	13	11	82	3420330
Uzbekistan	3	3	3	5	6	7	8	8	43	846848
Total by year	200	241	264	276	292	314	317	304	2208	2071358

Note: Turkmenistan is not included in the sample as the only one bank information was available from Bankscope with three consequent years data for commercial banks.

The information on ownership has been revised and adjusted where necessary to get more reliable information for the period of 2005-2012. The breakdown of ownership as privately owned banks, state ownership, foreign banks and banks owned by the member of the CISs as well as listing information as of 2012 is given in Table 4.3.

The banking sector descriptive statistics of the variables used in the estimation of cost and profit efficiency for the CISs' banks after cleaning for less than 3 consequent observations are shown in Table 4.4.

The upper part of the Table 4.4 contains dependent variables such as total costs and pre-tax profit, which are used for estimation cost and profit frontiers respectively. The next group of variables consists of the input and output variables, which differ from the previous chapter

because we calculate input prices to measure cost and profit efficiency (1) and because we use asset-based model (2). A small change in sample of banks caused a little difference in the data averages compared to the previous chapter, though keeping the main results similar.

Table 4.3: Listing and ownership information (2012)

Country/Dummy	Listed	Private	State-owned	Foreign	Foreign CISs
Armenia	0	2	0	7	3
Azerbaijan	1	14	2	1	0
Belarus	0	2	3	5	3
Kyrgyzstan	0	0	1	2	0
Kazakhstan	9	10	0	6	1
Moldova	4	5	0	2	0
Russia	43	156	23	40	7
Tajikistan	0	1	1	2	1
Ukraine	7	5	0	6	1
Uzbekistan	1	3	5	0	0

The CISs banks on average choose income diversification rather than asset diversification strategy with the 41.4% and 12.5% respectively. The risk-taking behaviour variables reveal that the banking sectors are on average capitalized by 15.7%. The ratio of credit risk shows 7.1% on average for the CISs. The CISs' banks as a whole hold 26.8% of total assets as liquid assets. Banks face 26.6% liquidity risk, and 13.5% market risk.

Table 4.4: Sample descriptive statistics of variables used in the cost and profit functions (2005-2012)

Variables	Mean	Std. Dev.	Min	Max
Dependent variables				
Total costs*	170637	316818	2384.1	1692001
Pre-tax profit*	2568652	200469	1.2	5865206
*Inputs, outputs and netput variables**				
Gross loans *	1380236	6173644	80.9	143007920
Other earning assets *	482774	2190453	440.3	46083448
Price of labour and capital	13.8	17.8	1.5	84.6
Price of funds	46.3	195.6	0.2	5368.0
Equity*	181250	385277	6200.6	2134776
Inefficiency effects variables				
Risk-taking				
Capital risk	15.7	9.5	5.6	54.6
Credit risk	7.1	6.1	0.2	28.9
Liquidity risk	26.6	13.5	5.6	65.8
Market Risk	13.5	16.0	0.01	65.4
Other control variables				
Income diversity	41.4	25.3	2.6	92.1
Asset diversity	12.5	12.1	0.002	51.0
GDP growth	20.3	5.79	1	50.3

Note: (1) * Values are in thousands US dollars (2005 price level); A banking firm is considered *government-owned*, if over 50% of its share is owned by the government. A banking firm is considered *domestic private bank*, if a major share (over 50%) is owned by a private company or individuals of the host country. A banking firm is considered a foreign-owned, if its major share is owned by foreign investor. A banking firm is considered a CIS-member-owned, if its major share is owned by a foreign investor from the CISs region; Custom Union establishment is 1 after 2010 for Custom Union member-states and 0 before; Global Financial Crisis is equal 1 after 2008 and 0 before; Listing is 1 for listed banking firms and 0 for non-listed.

4.4. Empirical results

4.4.1. Results from frontier estimation

Table 4.5 reports estimation results of the one-step maximum likelihood procedure obtained from the cost/profit efficiency model using the stochastic frontier approach without inclusion of environmental factors in the frontier. Cost frontier estimation is reported in the first column and profit frontier estimation is in the second.

Results indicate that the models are a good fit. Gamma – $\gamma \equiv \sigma_u^2 / (\sigma_v^2 + \sigma_u^2)$, which indicates how much of the error term is attributed to the inefficiency u_i, is 0.79 in the profit efficiency frontier estimation and 0.30 in the cost, which is a bit low. However, the log likelihood function's statistics and the LR test in the table indicate a good fit for both models (Table 4.1, Panel B). Additionally, the coefficients on inputs and outputs suggest that cost and profit efficiency models have been well estimated (Table 4.5, Panel A).

The average cost and profit efficiency of the CISs banks in the models are 40% and 55% respectively during the period 2005-2012.

The mean cost and profit efficiencies by year are plotted in Figure 4.1 for the CIS countries. Cost efficiency remained relatively stable during the period and peaked at about 46% in 2008; after that cost efficiency fell back to its previous numbers. Profit efficiency encountered the 2007-2009 Global Financial Crisis shock and dropped from 70% in 2007 to 39% in 2008. This shows that profit efficiency is more vulnerable to financial crisis than is cost efficiency. Profit efficiency recovered after the crisis by 10 percentage points, however it didn't reach its pre-crisis level. Although governments bailed out banking sectors and

Table 4.5: Estimation results of efficiency frontiers

Panel A: Production frontier variables	Cost	Profit
Gross loans (β_1)	0.14***	0.14**
Other earning assets (β_2)	0.21***	0.16***
Price of labour and capital (β_3)	1.28***	1.29***
Price of funds (β_4)	0.59***	0.07***
Equity (β_5)	0.07***	0.02**
Panel B: Diagnosis	Cost	Profit
Gamma	0.30***	0.79***
Sigma-squared	0.51***	0.39***
Log likelihood	176.97	-1421.98
LR test	1768.71	2621.53
Average efficiency	40	55

Notes: *, **, *** signifies significance level at 10 %, 5%, and 1%, respectively.

encouraged banks to extend loans, the economic environment and real sector difficulties remain unfavourable and new loans extension may be questionable.

Figure 4.1: Mean cost and profit efficiency estimates of the CISs banks (2005-2012)

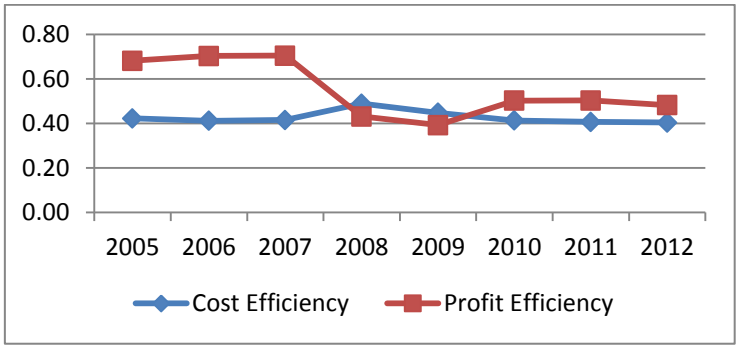


Table 4.6 shows results for cost (Panel A) and profit (Panel B) efficiency by country and by year. Mean profit efficiency scores on average are higher than the cost ones in all countries, which is in line with the literature on commercial banks in transition countries with the similar specification of the model (Bonin et al., 2005a). There was a movement of cost and profit efficiencies in opposite direction during the crisis yeas 2007-2009 indicating accumulation of nonperforming loans during these years, which increased output levels raising cost efficiency, however negatively influenced profit efficiency because no profit

could be generated form those loans. This situation reversed after crises period when anti-crisis measures were implemented and banks were bailed out by the governments.

The scores also indicate differences in cost and profit efficiencies across the CIS member countries. The best performance on average over the period showed Armenian banks in terms of cost efficiency and the least efficient became Ukrainian banks. The most profit efficient banks are Azerbaijani banks while the least efficient are Russian banks.

Table 4.6: Mean cost (Panel A) and profit (Panel B) efficiency by country and by year (2005-2012)

Panel A	2005	2006	2007	2008	2009	2010	2011	2012	Average by country
Armenia	0.66	0.59	0.55	0.65	0.52	0.40	0.37	0.31	0.51
Azerbaijan	0.43	0.35	0.36	0.38	0.30	0.30	0.30	0.32	0.34
Belarus	0.48	0.46	0.45	0.50	0.46	0.45	0.41	0.41	0.45
Kyrgyzstan	0.57	0.50	0.44	0.44	0.37	0.35	0.35	0.30	0.42
Kazakhstan	0.33	0.30	0.49	0.48	0.40	0.42	0.41	0.43	0.41
Moldova	0.40	0.45	0.49	0.43	0.41	0.41	0.43	0.41	0.43
Russia	0.42	0.42	0.41	0.50	0.47	0.43	0.43	0.42	0.44
Tajikistan	0.48	0.42	0.35	0.45	0.31	0.48	0.48	0.50	0.43
Ukraine	0.30	0.31	0.31	0.34	0.29	0.26	0.26	0.29	0.30
Uzbekistan	0.42	0.35	0.31	0.39	0.39	0.30	0.34	0.33	0.35
Average by year	0.45	0.42	0.42	0.46	0.39	0.38	0.38	0.37	
Panel B									
Armenia	0.85	0.83	0.84	0.80	0.80	0.88	0.90	0.90	0.85
Azerbaijan	0.87	0.91	0.91	0.82	0.87	0.85	0.83	0.81	0.86
Belarus	0.59	0.71	0.77	0.75	0.75	0.73	0.39	0.56	0.66
Kyrgyzstan	0.72	0.83	0.69	0.69	0.85	0.86	0.83	0.79	0.78
Kazakhstan	0.82	0.83	0.79	0.75	0.83	0.80	0.83	0.75	0.80
Moldova	0.73	0.73	0.78	0.79	0.74	0.82	0.82	0.80	0.78
Russia	0.66	0.67	0.67	0.31	0.26	0.39	0.40	0.37	0.47
Tajikistan	0.46	0.62	0.69	0.56	0.79	0.78	0.78	0.76	0.68
Ukraine	0.69	0.77	0.79	0.70	0.64	0.78	0.79	0.73	0.74
Uzbekistan	0.68	0.74	0.79	0.71	0.77	0.78	0.74	0.72	0.74
Average by year	0.71	0.76	0.77	0.69	0.73	0.77	0.73	0.72	

4.4.2. The effects of ownership, risks and other environmental variables on cost and profit efficiency measures

We report on the results of firm-specific and environmental factors influence on cost and profit efficiency estimated using stochastic frontier approach in the Table 4.7.

Our model provides estimates of the influence of different ownership types on bank performance. The findings are of particular interest as they shed the light on the ownership structure effectiveness of banking sectors in the CISs. The regression results exhibit that ownership affects efficiency significantly though it impacts cost and profit efficiency variously.

Table 4.7: Estimation results

	Cost	Profit
Ownership		
Domestic private banks	0.036***	-0.0105
Foreign-owned banks	-0.017	-0.143*
CIS-member-owned banks	0.104***	0.138
Risks		
Capital risk	-0.037***	-0.0020
Credit risk	0.0003	0.0206***
Liquidity risk	0.0031***	-0.0108***
Market risk	0.00068**	-0.00048
Controls		
Income diversity	-0.0080***	0.041***
Asset diversity	0.0030***	-0.0038**
GDP growth	0.0044***	-0.093***
2007-2009 Global Financial Crisis	0.20***	-0.995***
Custom Union Establishment	-0.13***	1.047***
Listing	-0.59	0.0468

Notes: (1) Robust t-statistics in parentheses; (2) *, **, *** signifies significance level at 10 %, 5%, and 1%, respectively. The t-statistics reported under the variable coefficient in parentheses.

Our findings suggest that, using state owned banks as benchmark, privately owned banks are less cost efficient at 1% significance level than state-owned banks, which is similar to the results in Karas et al. (2010) but different from the results reported in Fries and Taci (2005) for transition countries. However, the latter results correspond to the earlier stages of

financial reforms, while the current study considers more advanced stages when costs have a tendency to rise (Fries and Taci, 2005). Moreover, state-owned banks may have on average lower costs due to their activity mix, which does not typically require project screening, risk evaluation and customer monitoring, while for private banks those activities comprise a major part of costs. Further, state owned banks in the CISs have a less costly access to deposits being widely trusted and having lower costs in terms of labour and physical capital. The private banks coefficient is not statistically significant for profit efficiency indicating that domestic private banks are as profit efficient as state-owned banks. Yet its negative sign could signal that domestic private banks are more profitable than state-owned banks, which possibly can support the view that state-banks pursue different goals from private banks such as boost economic development and industrialisation but not profit maximisation. The results otherwise confirm the 'development' view theory on state-ownership in banking sector[37].

The negative and significant coefficient at 10% significance level for our second type banks specification indicates that foreign-owned banks are associated with significantly higher profit efficient than state-owned banks in the CIS countries; however in terms of cost efficiency they are as efficient as state-owned banks. Higher profitability of foreign banks could be a result of best-practice management leading to higher returns in transition and developing countries (Claessens et al, 2001; Hasan and Marton, 2003; Berger et al, 2010). This results are in line with the most of the literature, which points that foreign banks are more profit efficient than domestic counterparts (Bonin et al., 2005a; Kasman and Yildirim, 2006; Mamatzaki et al., 2008). The fact that foreign banks are no more cost efficient than state-owned banks in transition countries, albeit all the expertise, provides some evidence in favour of home field advantage hypothesis when foreign banks are lack of 'soft' knowledge, which may impose a liability of foreignness (Zajc, 2006; Lensink et al, 2008).

[37] See previous chapter on 'development' view theory.

CIS-member ownership has a strong negative association with bank cost efficiency at 1% significance level compared to the banks that are not CIS-owned, while the CIS-owned banks are as profit efficient as non-CISs-owned banks. The high cost inefficiency can be a possible outcome of lack of competition; the fact that the CISs banks enter countries with less developed banking systems in the region and having highly valued product mix and revenue efficiency, they enjoy 'quiet life' not being pressured to reduce costs (Berger and Mester, 1997) .

Turning to our second group of variables, the findings show different impacts of risk behaviour on bank efficiency in the CIS countries. The coefficient on capital risk is negative and highly significant at the 1% significance level for cost efficiency, indicating that there is a positive association between capital level and cost efficiency, which means better manager motivation and control. This finding is in line with Brissimis et al. (2008) and Fiordelisi et al. (2011), who find that higher capital ratio positively influences cost efficiency. The result may imply that more capitalised banks are subject to more shareholders' control over costs and capital allocation. The results for profit efficiency are not statistically significant. The credit risk coefficient is positive and statistically significant at 1% significance level in profit efficiency estimates, revealing negative influence of credit risk on profit efficiency, which complies with other findings that higher credit risk exposure is associated with lower firm profitability (Miller and Noulas, 1997; Athanasoglou et al., 2008). This can be explained by considering the fact that exposure to high risk credits leads to a higher level of unpaid credits accumulated resulting in losses in returns to banks. When trading-off between risk and expected return by skimping on loans selection and monitoring, banks, which are poor at risk management and operations, end up with lower profit efficiency. Credit risk coefficient in the cost efficiency estimation is not statistically significant.

The liquidity risk coefficient is highly significant with a negative sing, though has a small magnitude, in the profit function estimates, which means it relates negatively to banks' profit efficiency in our model. The results are similar to Altunbas et al. (2007) and Fiordelisi and Molyneux (2010). This might be explained by the fact that more liquid banks are more efficient in the sense that, ceteris paribus, they produce more output, part of which includes liquid and other assets Altunbas et al. (2007). Our results for liquidity risk for cost efficiency estimates are statistically significant with positive sign, and show a positive impact of liquidity risk on cost efficiency. A possible explanation is that banks that produce more output including liquid assets encounter higher costs; a higher proportion of cash and liquid assets holdings represent a cost to banks, especially those that are required by financial authorities (Altunbas et al., 2000). Another explanation that could be made is that inefficient managers would hold more liquid assets encountering both costs from poor management and higher opportunity costs of these low-yield assets. The market risk ratio is highly significant with a positive sign for cost efficiency, which implies that the higher the market risk, the lower is bank's cost efficiency, which is consistent with Berger and Humphrey (1997). Indeed, borrowing from other banks results in higher costs and less cost efficiency; greater interbank markets exposure, which are highly volatile in times of uncertainty, can negatively affect bank performance.

Other control variables

Results for a set of remaining control variables are highly statistically significant, which signals the importance of including these factors to avoid bias of estimated efficiency scores. We discuss first bank specific controls. The results on diversification are mix. The signs of the coefficients suggest that the income diversification has a positive impact on cost but negative impact on profit efficiency, while asset diversification negatively influences cost but

positively profit efficiency. The results imply that asset diversification towards non-lending activities leads to higher profitability from other earning assets; however, this results in higher costs. This is in line with the study by Isik and Hassan (2003), who found that diversification significantly and negatively related to cost efficiency. This can happen, if specialisation of a bank on traditional activity pays off better than diversification, which requires extra resources to be diverted to these activities. Expansion of noninterest income-generating activities' possible positive influence on cost efficiency could be offset by less profitability of financial institution, which may arise due to higher revenue volatility from non-interest income activities (Demirguc-Kunt and Huizinga, 2010) or due to mistakes leading to losses in non-interest income (Liu and Wilson, 2010). Finally, coefficients for listed banks are not statistically different from unlisted banks either for cost or for profit efficiency in the CISs region.

The GDP growth coefficients have positive and negative signs in cost and profit regressions respectively. This means that GDP growth has negative and positive impact on cost and profit efficiency respectively. This reflects the fact that banks benefited from the GDP growth, which was significant in most of the CISs countries, but encountered higher costs. The coefficients on the 2007-2009 Global financial crisis are positive for cost and negative for profit efficiency estimates (both are significant at the 1% level). The crisis had a significant negative impact on banks cost efficiency when banks encountered high costs to borrow money in the international markets as well as increased losses from non-performing loans. The crisis positively influenced profit efficiency, which can be explained by the increased interest rate spreads as a result of a larger increase in lending rates than borrowing. As it was discussed in the previous chapter, the spread increased with different timing in the CISs countries in the wake of the crisis; in Russia the spread increased by 1.6 percentage points (pp), Tajikistan 2.3pp, Ukraine by 1.8pp in 2008; it continued to increase in 2009 Belarus by

1.0 pp, Kyrgyzstan by 3.3pp, Moldova by 2.5 pp, Russia by 0.3 pp, and Tajikistan by 0.8 pp (World Bank Financial Indicators)[38].

We find that integration among the CISs countries, namely the custom union establishment, had a positive effect on banks' costs, perhaps because of increased expectations of the entrance of competitors into their markets (World Bank Report, 2012). However, the custom union establishment led to a decrease in profit efficiency for banks most possibly due to increased competition: if reforms result in an increased competition, this can lead to lower profits and lower franchise values (Keeley, 1990), which in turn likely to lead to increased fragility. The decline in profitability was also likely due to worsened environmental (economic) conditions (at least in two out of the three member-countries of the custom union Belarus and Kazakhstan) such as: reduction in the real income, shift to the inefficient production, depression of real wages and decrease of the real return on capital (World Bank Report, 2012). Thus, efforts to establish the custom union should incorporate the harmonised competition policy excluding dumping/antidumping actions against member countries, and adequate strengthening of the prudential regulations and supervision for financial sectors.

4.4.3. Robustness tests

We drop Russia's banks to check the robustness of our input and output variables and of the environmental/firm-specific factors we used. We find that our environmental/firm-specific factors and input and output variables remain significant. We also tested the robustness of input and output variables by estimating specification without effects on inefficiency terms, which also showed significance of our input and output variables.

[38] Available at: http://data.worldbank.org/indicator/FR.INR.LNDP/countries. Accessed on 25.02.2015.

The robustness tests indicate the solid consistency of the results obtained using all countries in the sample for both cost and profit efficiency functions. Market risk became sensitive to the sample change in the cost function as the coefficient changed its sign. Custom Union Establishment and domestic private banks dummies become insignificant. The Custom Union Establishment dummy becoming insignificant can be explained by the fact that the main member of this integration Russia was excluded from the sample. Regarding profit function estimates, asset diversity factor became sensitive to the sample change. In general, the results of the base models remain robust when the sample size is changed.

4.4.4. Results of estimation of convergence of cost and profit efficiency scores

The main results of β-convergence and σ-convergence efficiency scores obtained from the cost and profit estimation are presented in the Table 4.8. The number of observations is 70. We have the expected signs for the convergence in cost and profit efficiency, which are negative signs, and the coefficients are statistically significant at 1% significance level. The results show that there are β-convergence and σ-convergence in cost and profit efficiency of banking sectors in the CIS countries.

To obtain the results on β-convergence we run the regression using the equation (4.9). The coefficient at $lnMFF_{i,t-1}$ represents the rate with which countries with the lowest efficiency scores improved to catch-up with advanced countries within the CISs, β-convergence. The results also show that countries are catching faster in β-convergence for profit efficiency (β = -0.618) than cost efficiency (β = - 0.616).

When estimating the σ-convergence, we use the equation (4.10). The σ-convergence results are reported in the second part of the Table 4.4. The σ-convergence indicates the pace with

Table 4.8: Tests of convergence of cost and profit efficiency scores

	Convergence in cost efficiency scores	Convergence in profit efficiency scores
β-convergence		
Intercept	-0.505***	-0.269***
lnMFF_{t-1}	-0.616 ***	-0.618***
Adjusted R-squared	0.2354	0.2856
σ-convergence		
Intercept	0.0694	-0.061
$E_{i,t-1}$	-0.574***	-0.558***
Adjusted R-squared	0.2252	0.2690

Note: (1) *, **, *** signifies significance level at 10 %, 5%, and 1%, respectively; (2) Belarus omitted to correct for collinearity; (3) In the test of β-convergence, the explained variable is ln$MFF_{i,t}$ – ln$MFF_{i,t-1}$. In the test of σ–convergence, the explained variable is $\Delta E_{i,t.}$

which each country's efficiency level is approaching to the CISs average efficiency level. The larger is σ in absolute value, the faster the banks' efficiency of each country approaches the average efficiency level. The results suggest the σ-convergence towards the CISs average efficiency level as the coefficient is negative and significant both for cost and profit efficiency scores. The CISs countries converge faster in their cost efficiency (σ = -0.574) than profit efficiency (σ = -0.558) scores.

Table 4.9 reports on the convergence test for cost and profit efficiency scores obtained from the robustness test. We report the efficiency scores for cost and profit efficiency from the robustness model with changed sample specification (without Russia), which were used for the convergence robustness check, in the Appendix C, Table C1.

The results of the robustness check on β-convergence show that there is convergence in cost and profit efficiency scores among the CISs countries. The coefficient is negative and statistically significant at 1% significance level. As in our main model the countries are converging faster in β-convergence for profit efficiency (β = -0.860) than for cost efficiency (β = -0.829). The results on σ-convergence further confirm convergence in cost and profit

efficiency scores among the CIS countries. The coefficient is negative and significant at 1% level of significance, indicating the decrease in cost (σ = -0.865) and profit (σ = -0.791) efficiency variations over time among the CIS countries. The CISs countries are converging faster in σ-convergence for cost efficiency.

Table 4.9: Tests of convergence of cost and profit efficiency scores

	Convergence in cost efficiency scores	Convergence in profit efficiency scores
β-convergence		
Intercept	3.605***	-0.082***
lnMFF_{t-1}	-0.829***	-0.860***
Adjusted R-squared	0.378	0.369
σ-convergence		
Intercept	-0.102	0.044**
$E_{i,t-1}$	-0.865***	-0.791***
Adjusted R-squared	0.501	0.26

Note: (1) *, **, *** signifies significance level at 10 %, 5%, and 1%, respectively; (2) Belarus omitted to correct for collinearity; (3) In the test of β-convergence, the explained variable is ln$MFF_{i,t}$ – ln$MFF_{i,t-1}$. In the test of σ–convergence, the explained variable is $\Delta E_{i,t.}$

The results also suggest that the CISs countries converges faster when excluding Russia's banks both in profit and cost efficiencies. It can indicate that the level of banking is lower in majority of the countries than in Russia that leads to a faster convergence among those CISs banking sectors.

4.5. Conclusion

This study has analysed banking sector performance in the CIS countries. Particularly it investigated the impact of ownership structure and different types of risks namely capital, credit, liquidity, and market risks on cost and profit efficiency in the CIS countries over the period from 2005 till 2012. The study uses the intermediation approach and estimates cost and alternative profit efficiency functions. Our main findings are generally robust to the alternative model and sample specifications as well as adding and dropping variables we used. The results are as follows.

From the estimation of the frontier model the average cost and profit efficiency of the CISs banks are estimated as 40% and 55% respectively. The higher profit efficiency scores compared to cost efficiency scores are consistent with other study of transition banking with similar model specification by Bonin et al. (2005a). The efficiency score by country revealed that Armenian banks are more cost efficient on average than other countries over the period and Ukrainian banks were the least efficient. The most profit efficient banks are in Azerbaijan while the least efficient are in Russia.

Turning to the results on the inefficiency effects, our findings suggest that *ownership structure* matters for banks' efficiency in the CISs. Firstly, our model distinguished impact of four ownership types on bank cost and profit efficiency. Our findings suggest that, taking state owned banks as a benchmark, privately owned banks are less cost efficient but as profit efficient as state-owned banks. State-owned banks have different activity mix from private banks due to 'development' objective (Megginson, 2005), which allows saving on project screening, risk evaluation and customer monitoring; state-owned banks have less costly access to deposits in terms of lower 'switching' costs and wider deposit base due to being widely trusted and long present in the markets.

We find that foreign banks are more profit efficient than state-owned banks, however, as cost efficient as state-owned banks. Foreign banks are more profitable possibly due to best-practice management and up-to-date banking technologies, which could be superior to the local banks. Even though foreign banks may be superior in the aforementioned expertise, they are no more cost efficient than state-owned, which might be due to the lack of 'soft' knowledge imposing a liability of foreignness.

CISs-member ownership has a strong negative impact on bank cost efficiency, which might be a result of a lack of competition; the CISs banks enjoy 'quiet life' (Berger and Mester, 1997) not being pressured to reduce costs. The CISs banks' going abroad strategy is to enter countries with less developed banking sectors in the region where local banks hardly can compete with newcomers. Moreover, the CISs-member countries are familiar with local markets and have better 'soft' knowledge[39] compared to the foreign banks.

Turning to our second group of variables, the findings show different impacts of risk behaviour on bank cost and profit efficiency in the CISs countries. Banks with a higher capital level are more cost efficient, which can be explained by the fact that banks with capital strength need less external funding, which results in lower costs. The other explanation resides in the fact that banks with higher capital ratios are subject to more shareholders' control over costs and capital allocation, thus more cost efficient. Credit risk has a negative influence on profit efficiency, which indicates that higher credit risk exposure is associated with lower firm profitability due to unpaid loans accumulation. Banks, which are poor at risk management and operations, trading-off between risk and expected return by skimping on loans selection and monitoring, turn out to be less profit efficient due to higher levels of unpaid credits accumulated and losses in returns to banks.

[39] This is the legacy of the soviet times and centralised policy to unify all the nations, which is very beneficial for Russia economic and other policies.

The liquidity risk coefficient indicates that more liquid banks are more profit efficient in the sense that, caeteris paribus, they produce more output, part of which includes liquid and other assets, which implies that the more liquid is the bank, the more profitable it is. However, liquidity is negatively associated with cost efficiency. This is more likely because banks that produce more output including liquid assets encounter higher costs. A different reasoning that could be made is that inefficient managers would hold more liquidity encountering both costs from poor management and higher opportunity costs of these low-yield assets. We find that the higher is the market risk the lower is bank's cost efficiency. Certainly, borrowing in interbank markets results in higher costs and implies less cost efficiency. Moreover, interbank markets can be highly volatile during financial turmoil and greater interbank market exposure can undermine banks' stability.

Various control variables shed light on bank level and economic environment impact on efficiency. Their inclusion is important to avoid bias in estimated efficiency scores. Income diversification has a positive impact on cost but negative impact on profit efficiency, while asset diversification negatively influences cost and positively profit efficiency scores. The result for assets diversification can suggest that the CISs banks, which extend towards non-lending activities increase their profits, however, encounter higher costs because these activities require extra bank resources. At the same time income diversification depresses profit efficiency, which could arise from higher income volatility stream, however, non-interest income activities could be beneficial for cost efficiency. Listed banks are not more cost or profit efficient than unlisted banks in the CIS countries.

Turning to our macro level indicators, the CISs banks benefited from the relatively high GDP growth in terms of profit efficiency; nevertheless they encountered higher costs as GDP grew. The 2007-2009 Global financial crisis had a significant negative impact on banks' cost

efficiency, which faced with credit crunch; banks encountered high costs borrowing money in the international markets. The crisis positively influenced profit efficiency mainly due to increased interest rates spreads in the wake of the crisis. Increased expectations of the entrance of competitors into the markets of the custom union-members resulted in a positive effect on banks' cost efficiency. However, the custom union establishment led to a decrease in banks profit efficiency due to increased competition and worsened economic conditions in two member-countries out of three of the custom union.

Lastly, drawing upon the process of cost and profit scores convergence among CISs commercial banks, the results clearly indicate a convergence in cost and profit efficiency scores of banks across the CISs countries implying an ongoing process of re-integration among CISs financial systems.

Concluding policy remark

The results offer some insights to inform financial authorities and improve managerial performance. The credit and liquidity risk negative association with bank profitability shows that the CISs banking system should encourage managers to adopt strategies improving credit and liquidity risk to enhance profit efficiency. At the same time the capital and market risks negative influence on cost efficiency can be addressed by improving capitalisation and discouraging excessive market risk. Also, our analysis of ownership structure in relation to bank efficiency detects the importance of competition to alleviate domestic banks cost inefficiency.

Although there is convergence in profit and cost efficiency scores among the CISs banking sectors, additionally can be stated for the custom union members that worsening economic conditions, which appeared to happen after taking steps towards the custom union

establishment, have to be tackled by corresponding regulation and economic policy towards improving this situation.

In general, financial integration should improve the financial flows as well as cross-border banking activities; it should decrease costs of investments and trade. However, financial integration facilitates importing financial and economic instability. Recently, the introduction of financial sanctions against Russia by the US and EU affected other countries of the CIS via different channels. Besides, Custom union led to the trade-diversion with countries outside the Custom union for Kazakhstan and Belorussia decreasing high-technologies imports from outside the Custom union. Although there is convergence in profit and cost efficiency scores among the CISs banking sectors, the above mentioned concerns have to be tackled by corresponding regulation and policy of each country concerned towards improving this situation.

Chapter 5

Bank Competition and Stability in the CISs market

Preamble

This chapter investigates the impact of competition on the stability of banks in the CIS transition countries.

5.1. Introduction

Banking sector stability plays a critical part in the ability of the financial system to resist and to reduce systemic risks, which are highly potent during financial crisis. In the wake of the recent financial crisis, and in a quickly changing environment, change in both the financial regulatory framework and the banking sector structure has raised questions of the relationships between competition and stability, which is the main focus of this study.

The banking sector in the CISs is subject to continuous changes, which started from the beginning of the banking sector transformation after the collapse of the Soviet Union. Banking in the CISs has undergone the processes of deregulation, liberalisation and privatisation in its historical development. The surge in the number of banks due to liberalisation with insufficient regulation at the beginning of 1990s gave way to consolidation of the banking industry as a result of improved regulation of capital requirements as well as mergers and acquisitions in the 2000s (Barisitz, 2008; see Appendix D: Table D1, D2).

The increase in integration of financial sectors[40] of the region started in the pre-crisis period of 2007-2009 due to economic growth and liberalisation of finance in many CIS countries[41]. Along with that, integration into the world financial markets and foreign banks actively entering the regional market raised the question of increased competition and its influence on financial stability in transition countries.

Moreover, the recent financial crisis brought to light that weak financial institutions and insufficient regulation and supervision were key factors of instability. As was discussed in chapter two, the crisis caused the CISs banking sector's growth rate to slowdown, banks experienced a liquidity crunch as they couldn't refinance borrowing from international markets. The after crisis consequences were a decrease in lending to households and enterprises by the banking sector, an increase in interest rates and a deterioration of banks' portfolios as bad loans increased by two to three times (Mitra et al 2010).

Troubled financial systems can destabilise financial intermediation, which in turn can damage monetary policy and macroeconomic growth, cause capital flight and exchange rate turbulence, and result in high fiscal costs to bail out problematic banks. Increased connections among banking firms and other financial institutions from different countries make the impacts of financial shocks rapidly spill over across countries. Therefore, resilient financial systems with efficient regulation and supervision are essential for economic stability.

[40] The integration process was more intensive in the banking sectors, which were the most developed segments of the financial systems. Banking sector integration took the form of expansion of the CIS banks to the other regional countries. Although in the beginning of the 2000s almost all banks in the region were operating in the national territory, with the integration processes many large financial institutions are operating in different CIS countries simultaneously. The main players in the region Russia and Kazakhstan have 19.8 and 3.4 billion dollars of foreign assets in the region respectively (Petrov, 2011).

[41] Integration processes are also politically supported. The Eurasian Economic Community's documents containing a programme of actions for 2007-2010 aims at the creation of a common financial market for the CIS countries, and the Strategy of economic development of the CIS countries till 2020 aims at currency and financial cooperation as a priority.

The relationship between competition and stability is tested using two different hypotheses competition-stability and competition-fragility. In support of the competition-fragility hypothesis is evidence from earlier studies, which find a negative relationship between competition and stability (Keeley, 1990; Gruben and McComb, 1999; Hellmann et al., 2000; Hauswald and Marquez, 2006). They hold that erosion of monopolistic profits due to increased competition and thus reduced franchise value give incentives for riskier behaviour in banking (Keeley, 1990). Franchise value is defined as the 'present value of the current and future profits that a bank is expected to earn as a going concern' (De Jonghe and Vennet, 2008). An alternative view is that for banks to be stronger the more competition is required to guarantee against market and regulatory failure. The competition-stability hypothesis was also empirically confirmed by more recent studies, which showed that higher level of competition leads to more stability (Boyd and De Nicolo, 2005; Schaeck, Cihak, and Wolfe, 2009; Allen, Carletti, and Marquez, 2011, Schaeck and Cihak, 2014).

One motive for the present study is that with complex interactions between market power and stability, theory makes ambiguous predictions and empirical studies provide mixed results regarding the relationships between competition and stability (Beck et al., 2013). This study seeks to contribute to the literature by empirically testing interaction between competition and stability for transition CIS countries. Another motivation for studying the competition-stability nexus is that the quickly changing environment and landscape of the banking sectors in transition countries raise a number of policy-related issues pertaining to the relationship between *competition* and *stability*. Moreover, both bank stability and competition issues are critical in the context of the recent world financial crisis 2007-2009 and particularly the vulnerability of transition countries to the crisis (Mitra et al., 2010).

Further, because regulation and supervision practices are important in promoting bank development and stability, we also examine the relationship between regulation and supervision practices and stability using environmental variables such as legal rights of borrowers and lenders (Legal rights) and supervisory power (Supervision). The project is likely to provide insights for policy makers and practitioners on what is important for financial stability and therefore lessen the possibility of systemic crisis.

To this end the research questions for this chapter are: Is there a trade-off between increasing competition and stability in the CISs banking systems? Do we need to promote competitive dynamics to improve financial stability? What forms of regulation enhance financial stability?

The objectives of this Chapter are: Explore relationship between stability and competition in the CIS countries; analyse the influence of environmental factors such as legal rights and supervision on financial stability in the CISs; and provide information for policy makers and financial sector authorities on whether the CIS countries need to encourage competition to maintain financial stability and which factors are most likely to support stability.

Regarding research methodology, which we used in the current chapter, it is as follows. An empirical model is used to assess the impact of competition on stability. The main dependent variable is overall bank stability measured by Z-score (Berger et al., 2009, Schaek and Cihak, 2014). The Z-score indicates how quickly profits of a firm would decrease before capitalisation of a bank is depleted (Boyd et al., 2006). We also use the ratio of nonperforming loans to total loans as an alternative measure of stability. The ratio is another key measure of the stability of a banking system and is known as a 'core financial soundness indicator' (IMF, 2004). Competition is measured as the Lerner index, which is our main independent variable. Following literature (Berger et al. 2009), we also include bank level

characteristics such as bank size (logarithm of total assets), portfolio mix measured by the gross loans to total assets ratio and assets composition ratio of fixed assets to total assets. A range of environmental variables, which can affect the soundness of the banking system and which were stressed in Beck et al. (2004); Barth et al. (2013), includes legal rights of borrowers and lenders, and supervisory power; and the GDP growth. The data for commercial banks of the CISs covers a nine years period from 2005 to 2013 and includes 333 commercial banks. We employ a generalised method of moments estimator for our main model to tackle the heteroskedasicity problem together with a possible endogeneity problem, which we address using instrumental variables. The endogeneity problem occurs due to the fact that competition and overall bank risk are jointly determined and may have reverse causation.

The contribution of the present empirical chapter to the literature is threefold. First, this study intends to contribute to the literature by explicitly concentrating on the competition-stability nexus in transition countries. There is no clear consensus in the literature on possible impacts of competition on stability. Some literature argues in favour of competition for financial stability (Caminal and Matutes, 2002; Beck et al., 2004; and Allen and Gale, 2004; Schaeck and Cihak, 2014), while other literature conjectures that there is a trade-off between competition and stability (Carletti and Hartmann, 2002; Beck et al., 2013). Therefore, secondly our research attempts to revisit these two competing views and empirically investigate whether competition good or bad for stability. Moreover, the dynamic changes of banking landscape and environment in which banks operate in transition countries are settings which directly influence the nature of the trade-off between competition and financial stability. This study provides analysis of environmental and bank level factors that influence stability and elaborates further on related policy issues. For that, we combine data on bank and country levels to explore the factors of banking sector policies that influence banks'

stability outcomes. Further our research benefits from dynamic panel data analysis, which provides comparisons across-country and across-time.

The remainder of this chapter is structured as follows. Section two provides a literature survey on the competition and stability nexus and the measurement of competition. Methodological outlines are presented in the third section, data issues are outlined in section four, while estimated results and analysis are in sections five and six respectively. We discuss the results in section seven and the last section concludes.

5.2. Survey of the literature

There is a developed literature on the competition and financial stability nexus. Two different views are developed in the academic literature. One strand supports the traditional 'competition fragility' or 'concentration stability' view and the other supports the 'competition stability' or 'concentration fragility' view. However, the two views on the impact of competition on financial system stability yield opposite results. This section discusses the two literature strands.

5.2.1. Competition-stability

More recent theoretical and empirical works report that competition positively affects bank soundness and therefore there is no trade-off between competition and stability. The 'competition-stability' argument is built on the '*risk shifting paradigm'*, which states that banks that had gained market power tend to charge high interest rates, which in turn impair borrowers' ability to repay debts due to moral hazard and adverse selection problems. This leads to an increase in non-performing loans in banks' portfolios and destabilises the financial system (Boyd and De Nicolo, 2005; Boyd et al., 2006, Schaeck et al., 2006).

Boyd and De Nicolo (2005) and Boyd et al. (2006) draw attention to the loan market, arguing that most works on financial stability take into account competition in the deposit market but not in the loan market. In their model competition in both loan and deposit markets is allowed. The existence of market power in the loan market may lead to destabilisation of the system and to financial instability. Banks also invest in loans; they have to decide on their asset allocation among bonds and other traded securities and their borrowers facing both portfolio decision and optimal contracting problems. When banks are price takers in portfolio decisions for bonds and other traded securities, they have to decide on the terms of the loans

to their borrowers. In turn, borrowers also decide on the riskiness of their projects financed by bank loans.

Less competition in deposit market leads to a decreasing banks' risk profile due to their less willingness to invest in high-risk-high-return projects. However, less competition in loan market converts into higher interest rates for borrowers. The higher expected rate of returns on assets, however, is offset by higher volatility of returns in a moral hazard and adverse selection setting. This is for the reason that higher interest rates charged for loans are harder to repay creating moral hazard incentives and forcing bank customers to shift into riskier investments. Consecutively riskier projects are likely to lead to a higher firms' default risk and increase banks' non-performing loans, which enhances the odds of bankruptcy for banks and bank instability. With higher interest rates the chances of adverse selection are also increased and more risk-loving borrowers are financed. Thus, competition resulting in lower loan rates to borrowers reduces moral hazard and adverse selection problems leading to financing less risky projects; it decreases default risk of bank customers and therefore bank's risk of failure.

A different argument in favour of competition is the 'too big to fail' view, which is centred on the Structure-Conduct-Performance (SCP) paradigm. Market structure with small number of large banks are likely to influence financial authorities to be reluctant in letting larger banks fail, which increases the incentives of risk taking for the banks. This happens because a failure of a larger bank may threaten the whole financial system stability by exposing it to a systemic risk. The concerns of financial authorities about the contagion and financial crisis make banks to expect that they will be bailed out in case of solvency problem and take on more risks. The 'too big to fail' standpoint by banks may lead to greater fragile banking systems (Mishkin, 1999; Beck, Demirgüç-Kunt and Levine, 2006b; Schaeck et al., 2006;

Levy Yeyati and Micco, 2007; Beck, 2008). Besides, this view causes fewer incentives for banks' monitoring by depositors, who also believe that they are likely to be protected by government insurance in case the bank is too risky. This leads to more risk-taking behaviour increasing probability of bank failure (Beck et al., 2006b; Levy Yeyati and Micco, 2007; Beck, 2008).

The competition-stability view is supported in Caminal and Matutes (2002), Beck et al. (2004) and Allen and Gale (2004), Beck et al. (2013). Boyd et al. (2006) empirical study concludes that the more the banking sector is concentrated the greater is the probability of failure.

5.2.2. Competition - fragility

The traditional literature conjectures a 'competition-fragility' or 'concentration-stability' nexus, which points to the negative impact of competition on bank soundness leading to greater instability and bank failures. Therefore, there is a trade-off between competition and stability. Opposite to this, market power decreases bank failures' probability and increases banking system stability (Carletti and Hartmann, 2002; Beck, 2008).

The competition-fragility paradigm analyses the association between market structure and banks risk-taking behaviour; it studies banks risk taking incentives and effects of competition on risk-taking allowing for deposit market competition but restraining loan market competition. Focusing on the liability side of the balance sheet, the paradigm explores the impact of franchise values on risk taking behaviour by banks (Carletti and Hartmann, 2002; Boyd and De Nicolo, 2005; Boyd et al., 2006; Martinez-Miera and Repullo, 2008).

The competition-fragility view is based on 'franchise value hypothesis', which states that competition increases banking system fragility because it decreases profit margins of banks

negatively affecting the banks' franchise value. Higher franchise value limits the risk-taking behaviour of banks by reducing incentive for banks risk exposure. This is because franchise value exists only when banks are going concerns, therefore they limit risk-taking to preserve their franchise values and avoid bankruptcy. Banks with market power earn monopoly rents, which divert banks from risk-taking behaviour because of higher profits, charter values, capitalization (Allen and Gale, 2004; Carletti, 2008), as well as better screening of customers which reduces risk exposure (Cetorelli and Peretto, 2000). Thus, with higher franchise value individual banks tend to hold more capital and less risky portfolios, which in turn make financial systems more stable (Keeley, 1990; Hellmann et al., 2000; Schaeck et al., 2006; Hauswald and Marquez, 2006; Jimenez et al., 2007; Levy Yeyati and Micco, 2007).

On the contrary, higher competition causes a decline in monopoly rents or banks' franchise values leading to reduction of incentives for prudential behaviour. It causes the adoption of more risk-taking strategies such as opting to lower quality portfolios, choosing lower capital level and taking higher credit risk. This is because in a competitive market banks have to compete for borrowers to compensate for profit margin loss and give loans to inferior borrowers leading to loan portfolio deterioration. This leads to an increase in the level of non-performing loans and bank failures in financial systems. Therefore, competition causes financial systems to be more fragile, while more concentrated markets are preferable for stability (Keeley, 1990; Carletti and Hartmann, 2002; Jimenez et al., 2007; Beck, 2008; Berger et al., 2008).

Carletti and Vives' (2008) overview of competition and stability studies of the European banking sector point out that, given the fragility of the financial system, there is a trade-off between competition and stability. Turk-Ariss' (2010) work supports the competition-

fragility view for developing countries showing that greater market power enhances bank stability and profit efficiency in spite of increased cost inefficiencies.

However, the two literature strands discussed above do not necessarily present opposite results on the competition stability nexus. Berger et al. (2009) show that the two views, competition-stability and competition-fragility, may not lead to opposite predictions and that in banking the link between concentration and competition is very weak. Greater market power although it increases credit risk may positively influence overall risk. Berger et al. (2009) state that with market power banks enjoy higher franchise value and tend to lend more thereby increasing loan portfolio risk. However, overall financial stability of banks with more market power is a result of other risk management methods, which may efficiently offset the loan risk. Another study (Martinez-Miera and Repullo, 2010) argues that the relationship between competition and bank stability is not linear. While limited competition reduces bank risk, a highly competitive market damages overall franchise value of the bank. More recent study by Beck et al. (2013) argues that the relationship between competition and stability depends on regulatory frameworks, market structure and levels of institutional development. They argued that an increase in competition will negatively impact banks' stability more in countries with better developed stock exchanges, lower systemic fragility, stricter activity restrictions, more generous deposit insurance and more effective systems of credit information sharing.

5.2.3. Measure of competition

Two types of banking sector competition measures have been commonly used in the literature; these are structural and non-structural indicators. The Structure-Conduct-Performance paradigm formed in the traditional industrial organisation theory conditions the competitive behaviour of a firm on the structural characteristics of an industry; it admits

different measures of market structure including concentration ratios of the largest three or five banks, market shares, and a Hirschman-Herfindahl index. The Structure-Conduct-Performance paradigm claims that a concentrated market structure is associated with higher prices and profits due to collusion (Bain, 1956). However, the established literature on the behaviour of competing oligopolies has long acknowledged that concentrated markets do not reduce competition among the major firms. Moreover, the competitive behaviour in contestable markets is set by entry and exit conditions (Baumol, 1982; Baumol et al., 1982). Concentrated markets are not necessarily less competitive (Beck et al., 2006a; Casu and Girardone, 2009a), and thus market structure may be irrelevant and cannot necessarily be used as a measure of the competitive features of a market (Carbo et al., 2009). In the review of the literature on bank concentration and competition Berger et al. (2004) separate different measures of competition and come to similar conclusions that competitiveness cannot be measured using concentration indicators.

The other type of competition indicators are non-structural indicators, which measure a firm's pricing behaviour. These measures are constructed as a monopoly power measure advanced by Lerner (1934). These indicators are embedded in the New Empirical Industrial Organisation approach and quantify competition between oligopolistic firms (Iwata, 1974) and firms operating in contestable markets (Panzar and Rosse, 1987). However, these proxies of the degree of bank competition stem from the static theory of the firm modelling and are criticised for imposing the condition that banking firms are required to be under long-run equilibrium (Shaffer, 2004). Though, a wide use of Panzar and Rosse H-statistics measure of competitiveness has been made for estimating competitive conditions (See for example: Molyneux et al., 1994; Carbo et al., 2003; Claessens and Laeven, 2004).

The Lerner Index uses the price mark-up and the higher is the mark-up, the greater is the attained market power. The Lerner Index is preferable to the other measures of competition as it permits the measurement of market power at a bank level as well as over time. It also makes it possible to distinguish a bank's market power in different markets such as loan market and deposit market, where banks can exert different degrees of market power (De Guevara and Maudos, 2007). A number of studies have used the Lerner index to examine the evolution of competitive behaviour over time, reporting the erosion of competitive conditions in European banking over the past two decades (Fernandez de Guevara and Maudos, 2004; Fernandez de Guevara et al., 2007; Maudos and Fernandez de Guevara, 2007). This conflicts the common understanding that competition in Europe has intensified (see Padoa-Schioppa, 2001; European Central Bank, 2003). The contradiction can be explained by the non-traditional activities explored by banks, which increase the return on assets and therefor push the Lerner index up, while in the traditional banking activities such as deposits and loans markets the competition may have increased. Another reason for increased margins and a higher Lerner index is that increased efficiency due to internet banking and opening ATMs instead of branch offices lower costs can affect the Lerner index and the return on assets ratio (Carbo et al. 2009). Hence, competitive behaviour measured using different approaches may require more thorough analysis of the results.

In this study the influence of competition on stability will be investigated using the Lerner index. The Lerner index is calculated as a ratio of the mark-up price over price (Berger et al., 2009). Marginal costs used for the Lerner Indices calculation are obtained by estimating a translog cost function. High values of the index indicate greater market power of banks and less competition in the banking sector (Berger et al., 2009).

5.3. Methodology and data

This part presents the methodology and the empirical model used to examine the impact of market power on bank stability. Measures of competition and stability are discussed.

5.3.1. Competition measure

This research uses a conventional Lerner index (Berger et al., 2009) to test the impact of market power on bank stability and efficiency in the CISs. Market power is proxied by the Lerner Index, which measures the excess of the price over marginal costs as a proportion.

The conventional Lerner index is measured as in Equation (5.1):

$$Lerner_{it} = \frac{P_{TA_{it}} - MC_{TA_{it}}}{P_{TA_{it}}} \quad (5.1)$$

where $MC_{TA_{it}}$ is the marginal cost for bank *i* in a particular year *t*, and $P_{TA_{it}}$ is output price, which is calculated as ratio of interest and non-interest income (total revenues) to total assets for *i* bank at time *t*, assuming that the non-homogeneous services of a bank are proportional to its total assets and where total assets are taken as the aggregate product of a banking firm[42].

To obtain marginal cost $MC_{TA_{it}}$ we first estimate of translog cost function for each country to better address differences in technology and obtain β_1, β_2, φ_k, and δ_3:

$$\ln C_{it} = \beta_0 + \beta_1 \ln Y_{it} + \frac{1}{2}\beta_2 \ln(Y_{it})^2 \sum_{k=1}^{2} \gamma_{kt}\, ln\ W_{k,it} + \sum_{k=1}^{2} \varphi_k \ln Y_{it} \ln W_{k,it} + \sum_{k=1}^{2}\sum_{j=1}^{2} \theta_{kj}\, lnW_{k,it} \ln W_{j,it} + \delta_1 T_t + \frac{1}{2}\delta_2 T_t^2 + \delta_3 T_t \times \ln Y_{it} + \sum_{k=1}^{2} \tau_k\, T_t \ln W_{k,it} + \varepsilon_{it} \quad (5.2)$$

[42] See: Angelini and Cetorelli, 2003.

where C_{it} is the total costs of a banking firm *i* in a certain year; Y_{it} is the output of bank in a certain year *t*, measured by total assets (See De Guevara et al., 2005; Berg and Kim, 1994; Berger et al., 2009); $W_{k,it}$ are input prices, where w_1 is the price of labour and capital, and w_2 is the price of borrowed funds. The labour and capital price is calculated as the ratio of non-interest expenses to total assets (Hasan and Marton, 2003; Bonin et al., 2005a), and the borrowed funds price is the ratio of interest expenses to total customer deposits (Berger et al., 2009); *T* is a time trend to capture changes of the cost function over time; ε_{it} is an error term. Homogeneity of degree one in inputs is imposed by dividing the input prices and costs by the last input price w_2 (price of borrowed funds).

The total costs are defined as the sum of interest expenses and non-interest expenses. The model in (5.2) is time-variant, which assumes flexibility in efficiency both over time and among banks. The quadratic term of the time variable allows for non-monotonic technical change (Coelli et al., 1998, p. 303).

Then the marginal cost $MC_{TA_{it}}$ is obtained as:

$$MC_{TA_{it}} = \frac{C_{it}}{Y_{it}} \left[\beta_1 + \beta_2 \ln Y_{it} + \sum_{k=1}^{2} \varphi_k \ln W_{k,it} + \delta_3 T_t \right] \quad (5.3)$$

We calculate the Lerner Index for each banking firm and then we include it in the main empirical model.

5.3.2. Stability measure

The Z-score is a widely used bank stability measure (Laeven and Levine, 2009; Berger et al., 2009; Foos et al., 2010; Demirguc-Kunt and Huizinga, 2010; Turk-Ariss, 2010). It represents the ratio of bank's buffers capital and profits to the risk of volatility of returns. The Z-score indicates how quickly profits of a firm would decrease before capitalisation of a bank is

depleted (Boyd et al., 2006). This is also a measure of the overall risk or the insolvency risk of a bank (Boyd and Runkle, 1993). The higher is the Z-score, the lower is the probability of insolvency, providing a complete evaluation of stability. The Z-score is used as the natural logarithm version due to skewedness. We tag the logarithmic version of the Z-score as the variable Z-score for simplicity in the remaining part of the chapter.

In our study the Z-score is calculated allowing it to vary over time for each bank following De Nicolo (2000). The Z-score presents the sum of the return on average assets of a bank and its equity to total assets ratio divided by the difference between the return on assets of a bank at a point in time and bank's average return on assets over the period under study (De Nicolo et al, 2003; De Nicolo, 2000). The higher the Z-score, the more stable is a bank.

$$Zscore_{it} = \frac{ROA_{it}+(\mathrm{E}/A)_{it}}{|ROA_{it}-\overline{ROA_i}|}, \quad (5.4)$$

where ROA_{it} is return on assets for bank *i* at time *t*, $(\mathrm{E}/A)_{it}$ is returns on equity[43] for bank *i* at time *t*, and $\overline{ROA_i}$ is period-average retun on assets for bank *i* for the period 2005-2013. This form of Z-score allows us to capture the dynamics of overall risk.

We also use the non-performing loans ratio (NPLs), which is another commonly used measure of stability (Jimenez and Saurina, 2006), for our alternative specification of stability. It is calculated as a ratio of nonperforming loans to total loans. This analysis allows us to understand whether competition has an impact on systemic risk, measured by the level of non-performing loans. The higher the value of the indicator the riskier is a portfolio of the bank.

[43] Returns on average assets for individual bank is calculated as a ratio of net income to average total assets and it looks at the returns generated from the bank's assets. Equity to total assets is a capital adequacy ratio, which measures the amount of protection afforded to the bank by the equity invested.

5.3.3. Data and variables issues

5.3.3.1. Sample statistics

This empirical study uses bank-level data for commercial banks of the CIS countries for the period between 2005 and 2013. The sample differs from those in the previous empirical chapters in the thesis by adding the data for 2013, which changed the number of banks and included more observations accordingly.

We use the unbalanced panel data, which, as in the previous empirical chapters, are obtained from the Bankscope data base, national central banks of the countries, the Financial Structure Dataset from the World Bank, and the websites of the commercial banks in the sample. However, for this research we used the data for the country level business environment, which we retrieved from the Doing Business World Bank database and from the Heritage Foundation. The data are in thousands of the US dollars and adjusted by the GDP deflator with the base year 2005. After thorough filtering and cleaning procedures to eliminate non-representative data and drop banks with less than 3 consecutive observations, our final sample for analysis was reduced: number of observations is 2535; the number of commercial banks is 333, with all commercial banks of the CIS countries available from Bankscope are included except for Russia. Russian banks include banks on the same basis as in the previous empirical chapters. Turkmenistan banks were excluded from the sample as there was only one bank left with only 5 observations. Moreover, in Turkmenistan banks operate as payment agents of the central bank to subsidise the economy, which make the efficiency and stability analysis meaningless. The sample breakdown by country and number of banks as well as average assets is presented in Table 5.1. The biggest banks by average assets are in Kazakhstan ($3,708,976), Ukraine ($3,509,457) and Russian Federation ($2,465,346), while the smallest banks are in Kyrgyzstan ($114,393).

Table 5.1: Sample description: number of banks and average assets size by country

Country/Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total by country	Total assets of average bank (th $)
Armenia	6	7	8	10	10	10	10	9	10	80	196,733
Azerbaijan	8	11	12	13	16	17	18	18	18	131	645,299
Belarus	6	6	7	8	8	12	12	11	10	80	1,214,096
Kyrgyzstan	2	2	3	3	2	2	3	3	3	23	114,393
Kazakhstan	10	10	14	16	15	15	17	18	16	131	3,708,976
Moldova	7	7	8	9	8	8	9	8	8	72	268,427
Russian Federation	150	187	200	201	218	229	227	219	216	1847	2,465,346
Tajikistan	2	2	2	2	1	4	4	4	3	24	231,185
Ukraine	7	7	10	11	11	12	13	12	11	94	3,509,457
Uzbekistan	3	3	3	5	6	7	9	9	9	54	970,329
Total by year	201	242	267	278	295	316	322	311	304	2536	2,226,563

The descriptive statistics of variables which are used for calculation of the Lerner index competition indicator, particularly in estimation of cost functions to obtain respective coefficients and calculate marginal costs as well as in estimation of our main dependent variable, the Z-score, and the alternative dependent variable, non-performing loans to assets ratio are shown in Table 5.2.

Table 5.2 Descriptive statistics of variables used in estimation of cost function, marginal cost and Z-score

Variable	Mean	Std. Dev.	Min	Max
Output price	0.21	0.23	-0.11	3.29
Cost*	179,694.6	329,329.9	2,578.61	1,759,445
Total assets*	2,222,630	10,063,000	994.81	230,877,808
Labour and capital price	13.56	17.26	1.58	84.06
Fund price	5.29	2.34	0.73	11.12
Return on assets	6.86	1.76	1	11.9
Return on equity	15.63	9.40	5.48	55.26
Non-performing loans	160,327	890,009	0.16	16,842,824
Gross loans	1,115,847	2,653,782	9,595.89	186,921,776

Note: (1) * Values are in thousands US dollars (2005 price level).

The statistics of the variables that are used in the main regression are reported in Table 5.3. The Lerner indices and Z-scores by country and year are presented later in this chapter in the Empirical results and discussion part because these variables were estimated for this study.

Table 5.3: Sample descriptive statistics of variables used in the main model (2005-2013)

Variable	Obs	Mean	Std. Dev.	Min	Max
Dependent variables					
Log of Z-score	2535	3.73	1.06	-0.0001	10.22
NPLs to total loans	2535	5.943	10.46694	0.1	63.22
Explanatory variables					
Lerner index	2535	0.263	0.27	-6.10	1.49
Loans to assets	2535	0.6243	0.315	0.02	9.65
Fixed assets to total assets	2535	0.037	0.035	0	0.35
Bank size	2535	13.05	1.53	6.9	19.26
Legal rights	2535	3.843	1.86	0	6
Supervision	2535	8.45	2.32	1	13
Log of GDP growth	2535	2.943	0.39	0	3.92
Instrumental variables					
Activity restriction	2535	6.37	1.59	5	11
Banking freedom	2535	3.82	1.07	1	9
Government banks assets share	2535	44.14	17.72	0	95.9

Note: The correlation matrix is presented in Appendix D, Table D3.

5.3.3.2. Definition of variables and hypotheses

The key variables are constructed following theoretical concepts found in the literature and enable us to estimate the competition-stability nexus for transition countries. Details of the variables are contained in the Table 5.4.

In our model we introduced bank-level controls. We calculate all bank-specific variables using the Bankscope database. We control for bank size expressed as the log of total assets. The control is needed because large banks are subject to 'too big to fail' policies (Mishkin, 1999). On one hand, managers of larger banks might be willing to take more risk, in case the government is prepared to bail-out large problematic banks (O'Hara and Shaw, 1990). On the other hand, the advantages of economies of scale allows larger banks to stay more stable than smaller banks (Berger, 1995). Also, large banks engaged in a variety of activities are likely to enjoy economies of scope and may be assumed to be less risky (Demsetz and Strahan, 1997). We expect that bank size will positively impact overall bank stability (Z-score) and have a negative association with the ratio of non-performing loans to total loans as in Berger et al.

Table 5.4: Variable definitions

Variables	Definition	Source
Dependent variables		
Z-score	The Z-score is a bank-level indicator. The Z-score indicates how quick profits of a firm would decrease before capitalisation of a bank is depleted. Higher values of the indicator means higher bank stability and less overall bank risk.	BankScope, 2015
Non-performing loans	The non-performing loans to total loans ratio at the bank-level. It measures the amount of total loans which are impaired or doubtful (BankScope). Higher values of the indicator mean a riskier loan portfolio and a greater instability.	BankScope, 2015
Explanatory variables		
Lerner Index	A bank competition indicator at the bank level measured by the Lerner index. The Lerner index is calculated as the proportion of excess of the price over marginal costs. The higher values of the index indicate less competition in the banking sector.	BankScope, 2015
Loans to assets	Ratio of loans to assets is an asset composition, which indicates the bank's credit exposure and used as bank control.	BankScope, 2015
Fixed assets to total assets	Fixed assets to total assets ratio is another asset composition ratio used as bank control.	BankScope, 2015
Bank Size	The logarithm of total assets of a bank measures banks size.	BankScope, 2015
Legal rights of borrowers and lenders [b]	Legal rights of borrowers and lenders [c] is an index, which measures rules and practices affecting the coverage, scope and accessibility of credit information available through either a credit bureau or a credit registry. The index ranges between 1 and 6. Higher values indicate availability of more credit information, from either a credit bureau or a credit registry, to facilitate lending decisions.	Djankov et al. (2007)[d]/WB
Supervision[b]	Supervision is and index, which shows whether the supervisory authorities have the authority to take specific actions to prevent and correct problems. The index ranges between 0 and 14 with higher values indicating greater power.	Barth et al. (2013)
Log of GDP growth	The log value of GDP growth used as environment control for each country.	WB-FSD[a], 2015
Instrumental variables		
Activity Restrictions	Activity restrictions is an index, which ranges between 3 and 12. Higher values of the index indicate greater restrictions on bank activities and ownership of non-financial organisations and control. Activities are qualified as unrestricted, permitted, restricted, and prohibited.	Barth et al. (2013)
Banking Freedom	Banking freedom is an index, which ranges from 1 to 10. Higher values of the index indicate more freedom. The index looks at whether foreign banks are exempted from restrictions, setting up a domestic banks is easy, and at government influence over the allocation of credit.	Heritage Foundation

continued

Percent of government banks	Government-owned banks share in the banking system of a country.	Barth et al. (2013), commercial banks websites

Notes: a) Financial Structure Dataset World Bank; b) The questionnaire used in construction of the indicators is presented in the Appendix D, Table D4. c) For the reforms implemented on getting credit in the CIS countries in 2008-2014 see Appendix D Table D5. d) The initial methodology was developed by Djankov, et al. (2007) and adopted with minor changes when reported by the Doing Business -World Bank Group.

(2009). The portfolio mix is measured by the bank loans to assets ratio; and assets composition is expressed by the fixed assets to total assets ratio. The portfolio mix measure may be negatively associated with stability because a high loan exposure results in a higher likelihood of default risk (Liu et al., 2011). We expect negative association between portfolio mix and overall bank stability Z-score and a positive association with the non-performing loans to total loans ratio.

We also include GDP growth in logarithmic form to better control for differences in economic development of the countries. Economic environment variables were included in Berger et al. (2009) and Shcaeck and Cihak (2014) who found that GPD per capita is positively associated with higher bank soundness and less bank fragility. Though, the GDP growth may tend to make bank lending more pro-cyclical (Berger and Udell, 2004; Dell'Ariccia and Marquez, 2006), which can impact asset quality over time, a positive contribution of higher GDP growth to competition among other factors was named for the UK and the USA economies between 1985 and 2007 (OECD, 2010). Thus, we expect a positive sign for the GDP growth and overall bank stability.

The importance of regulation and supervision for banking system stability has been established in many previous studies (Barth et al., 2007, 2013; Beck et al, 2013). We use control variables that provide information on the wider regulatory and supervisory environment affecting the stability of the financial system. We control for the regulatory and

supervisory environment with two variables, the Legal rights of borrowers and lenders and Supervision for the following reasons.

Theoretically, stronger powers given to supervisory authorities may compensate for market failure as banks are costly and problematic to supervise. Market failure in this case would lead to under-monitoring of banks and may result in inefficiency of bank performance and thus instability. Moreover, official supervision, which can be implemented by an independent agency, may prevent riskier behaviour by banks as a result of deposit protection schemes which have been introduced in many countries. However, powerful supervisors are prone to corruption, which leads to inefficiency and instability in the banking sector (Shleifer and Vishny, 1998; Djankov et al., 2002). Also, when there is uncertainty about the supervisor's ability to monitor banks, there may be a motive for the supervisor to acquire the status of a proficient supervisor. Protecting this image the supervisor would be reluctant to execute a bank closure policy and therefor might let problems accumulate (Boot and Thakor, 1993). In this case, a greater supervisory power would lead to bank instability. Empirically the relationships between regulatory and supervisory practices and banking sector fragility were assessed by Barth et al. (2004, 2006) using the wide range of countries in a survey conducted by the World Bank. They showed that policies that include regulations that force accurate information disclosure, empower private-sector corporate control of banks, and foster incentives for private agents to exert corporate control facilitate bank development, performance and stability (Barth et al., 2004).

The indicator, which we use in this study to control for supervisory power, is constructed to capture the features that may compensate for market failure, and higher values reflect better supervision to promote bank development and stability (Barth et al., 2013). We expect a

positive association between Supervision and stability, and a negative association between Supervision and the non-performing loans to total loans ratio.

We further test for the effect of the Legal rights of borrowers and lenders indicator, which highlights rules and practices of secured transactions by one part of the indicator and the availability of credit information by another. One part captures certain feature of the collateral and bankruptcy laws facilitating lending, and the other measures credit information coverage, scope and accessibility. Protection of creditor rights proved to be linked to the financial sector development. Particularly, creditor rights protection is crucial for financial contracting (La Porta et al., 1998). The strength of the legal rights of borrowers and lenders has an influence on the way banks manage their risks. Thus, facilitation of secure transactions and accessibility to information flow is another important element of financial system sustainability. Following the literature, we use the Legal rights indicator to reflect the institutional environment in which banks operate (Berger et al., 2009). The indicator ranges between 1 and 6. Higher values indicate availability of certain collateral and bankruptcy laws or credit information better facilitating lending decisions. We hypothesise that overall stability measured by the Z-score will be higher in a more favourable institutional environment, correspondingly the non-performing loans to assets ratio will be negatively related to the indicator.

5.3.3.3. Instrumental variables

We instrument the endogenous Lerner index by using three instruments, namely activity restrictions, banking freedom and the government ownership share[44] of the banking sector following Schaeck and Cihak (2007). These variables can be used as instruments because

[44] In Barth et al. (2006) identified that regulatory restrictions on bank activities, regulatory barriers to the entry of new domestic or foreign banks, greater state ownership of banks, are not linked to a greater bank development, efficiency and stability. Barth et al. (2008) followed their previous studies and found that banking activity restrictions increase bank fragility measured as a probability of crisis.

they immediately impact competition. Claessens and Laeven (2004) and Claessens (2009) found that banking systems' competition is determined by allowing bank entry (banking freedom in our case) and reducing activity restrictions on banks. Countries with fewer activity and entry restrictions are likely to have stronger competition (OECD, 2010).

Theoretical forecasts of the relationships between regulation and supervision practices and stability are as follows. *Activity restrictions* is a key measure of permissible bank activities or the scope of activities of a bank that affect competitiveness. Regulation restricting bank activity has its theoretical support from different perspectives. Some theoretical reasoning supports a broad range of bank activities for the following reasons. With more options for banks' activities, banks may realise both scale and scope economies (Claessens and Klingebiel, 2000); banks engage in less risker activities due to increased franchise value; banks are more stable because of their income diversification, thus contributing to financial stability. However, other theoretical considerations do not support much freedom in banks activities. First, conflict of interests may arise when banks have more freedom to engage in diverse activities such as securities and insurance underwriting, and participation in the real estate markets. They may attempt to assist firms which have taken out loans by selling low quality securities to insufficiently informed investors (John et al., 1994, Saunders, 1985). The other reasons are that such banks may become 'too big to fail'; they are difficult to monitor; they are engaged in a riskier operations having more options of activities (Boyd et al., 1998); large banks weaken competition and decrease efficiency.

This indicator captures information on four categories, which split activities into whether banks can engage in securities, insurance, and real estate activities and whether they can hold stakes in nonfinancial institutions (Barth et al., 2008). Higher values stand for more restrictions on bank activities and on nonfinancial ownership and control.

Banking freedom reflects the openness of a banking system, which covers a broad range of characteristics. Different views on the regulation of entry of foreign banks as well as domestic banks into a banking system lead to different predictions. On the one hand, less competition, due to better screening and/or restrictions on bank entry, ensure a greater franchise value resulting in less risk-taking behaviour (Keeley, 1990). On the other hand, restrictions on bank entry and less competition might be damaging (Shleifer and Vishny, 1998). The indicator signifies whether foreign banks are allowed to operate freely, whether it is difficult to set up domestic banks and whether the government exercises control over the allocation of credit. Higher values of the indicator reflect fewer restrictions and more banking freedom that promote competition. The bank freedom indicator is obtained from the Heritage Foundation database for 2005-2013 years.

Finally, the share of the *government ownership* in a banking system is the last instrumental variable for competition. Economists have different theories on state ownership of banks. According to one theory, the state can directly finance socially desirable projects, utilise externalities and help to avoid failures in the capital market (Gerschenkron, 1962). The other theory holds that the state assists in politically desirable investments rather than in socially or economically proved allocation of resources (Shleifer and Vishny, 1998). Empirically it was reported in La Porta et al. (2002) that state ownership hinders financial development and leads to sluggish economic growth. Government presence in the banking system directly influences competition. A bank is considered government-owned when more than 50% of the shares are controlled by the state. State ownership here is presented by a dummy variable which takes the values of 1, if a bank is government-owned and 0 otherwise.

The data for activity restriction and government ownership share are taken from the updated database provided by Barth et al. (2013), which we tracked back to 1999.

5.3.4. Empirical model: competition-stability nexus

The core of our analysis is to investigate the nexus between competition and stability. To assess the magnitude of the impact of competition on stability the empirical model (5.5) is estimated. We use the quadratic term of the Lerner index following the literature (Berger at al., 2009; Turk-Ariss, 2010). The reason is that the relationship between competition and bank risk may take a U-shape (Martinez-Miera and Repullo, 2010)[45]. We follow Berger et al. (2009) methodology; however, our model is different from Berger et al. (2009) in a way that they estimated a cross-section model, while we estimate a dynamic panel data model, which is the following:

$$Zscore_{it} = \alpha + \beta Competition_{it} + \theta Competition_{it}^{2} + \gamma Bank\ Controls_{it} + \delta Business\ Environment_{kt} + \varepsilon_{it}, \quad (5.5)$$

where $Zscore_{it}$ measures bank stability for bank *i* in time *t*; *Competition* is the main independent variable measured by the Lerner Index for bank *i* at time *t*; *Bank Controls* characteristics include banks size, which is measured by the logarithm of the total assets of bank *i* at time *t*, bank's asset composition measured by gross loans to total assets for bank *i* in time *t*, and fixed assets to total assets ratios for bank *i* in time *t*; *Business Environment* variables for each country *k* are: the logarithm of GDP growth; the Legal rights measured as an index between one and six; and Supervision is represented by an index ranging from zero to fourteen; and β, θ, γ, and δ are coefficients to be estimated. In the robustness checks the relationship between stability and competition is estimated by replacing the Z-score with the NPLs to total loans ratio in (5.5).

[45] They found that competition lessens the likelihood of loan defaults, which is known as a 'risk-shifting effect', but also lessens revenue or interest income from loans that is used to compensate for loan losses. The second effect is known as a 'margin effect'. The outcome depends on whether the 'risk-shifting effect' or the 'margin effect' dominates in the market. They also state that the 'risk-shifting effect' prevails in concentrated markets, while the 'margin effect' prevails in very competitive markets (Martinez-Miera and Repullo, 2010).

We control for possible endogeneity of the market power measure and employ the instrumental variables technique with a Generalised Method of Moments (GMM) estimator. A set of instruments we use includes activity restrictions, banking freedom, and the percent of government-owned banks. Endogeneity problem can arise when variables are simultaneously identified or there is a reverse causality. Market power can be influenced by the bank's overall risk (Z-score) and loan risk. For instance, if a banking firm increased its overall risk and its loan portfolio risk, the incentives for gaining more market power such as pursuing a growth strategy and merges with another banks, may be caused by expectations of higher future returns. As was stated above, the possible endogeneity problem is addressed by using an instrumental variable technique following Berger et al. (2009).

The problem of heteroskedasticity is a common one when empirical data are used and the studied objects have different characteristics. When using the instrumental variables technique, while the estimated coefficients are consistent in the presence of heteroskedasticity, they are inefficient because of the standard error estimates are inconsistent. In the presence of heteroskedasticity the tests for endogeneity of variables and overidentifying restrictions are also invalid. This problem can be addressed by using the robust standard error option, but when the heteroskedasticity has an unknown distribution, the GMM estimator created by Hansen (1982) is a better tool to use (Roodman, 2009). In our study we use the GMM estimator to address the heteroskedasticity problem and avoid spurious results.

We use two-step estimation, which allows for robust standard error with Windmejer correction. The robust option provides robust standard errors for heteroskedasticity and arbitrary autocorrelation patterns within individuals in dynamic panel data analysis (Roodman, 2009). The two-step GMM estimator has advantages over a traditional

instrumental variables estimator in the way that it is derived using the optimal weighting matrix and relaxing the 'independently and identically distributed' assumption.

We choose estimation of the regression with the *noconstant* option; and *small* option, which give the t-test statistics instead of z-test and F-test for overall fit; the orthogonal option allows for orthogonal transformation of data (preserving the number of observations) instead of differencing, which leads to the loss of observations if the panel data are unbalanced. Consistent with the studies on dynamic panel data (Blundell and Bond, 1998; Roodman, 2009) and works on bank competition and stability (Schaeck and Cihak, 2014), a set of instruments are used based on lagged values of the explanatory variables (lags 1 and 2) to treat the endogeneity problem, the other set of instruments includes variables that serve to explain measures of the degree of competition (activity restrictions, banking freedom and government ownership). Our analysis differs from Schaeck and Cihak (2007; 2014) studies in the technique of addressing heteroskedasticity; where they used a 2SLS estimator while we use a GMM estimator.

Following the literature, we use activity restrictions, banking freedom, and the percent of government-owned banks as instruments (Schaeck and Cihak, 2007; Berger et al., 2009). We test for validity of the instruments by conducting Hansen's J test (Hansen, 1982) for overidentification and to check for autocorrelation we use AR(1) and AR(2) tests.

5.4. Empirical results and discussion

5.4.1. Lerner index and Z-score

Table 5.5 presents the estimates of average marginal costs by country and year used for the calculation of the Lerner Index. Marginal costs were calculated using coefficients β_1,β_2, φ_k and δ_3 obtained using individual translog cost functions (See Appendix D, Table D6). Estimated marginal costs indicate a sharp increase in marginal costs during the period of the financial crisis 2007-2009 in all of the countries and subsequently a decrease after 2010.

Table 5.5: Marginal costs: average by country and year, 2005-2013

Country/Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	Average by country
Armenia	0.064	0.074	0.076	0.094	0.094	0.100	0.101	0.113	0.105	0.093
Azerbaijan	0.074	0.064	0.066	0.080	0.078	0.076	0.070	0.071	0.070	0.072
Belarus	0.124	0.095	0.088	0.103	0.129	0.102	0.248	0.148	0.149	0.139
Kyrgyzstan	0.041	0.045	0.048	0.103	0.069	0.059	0.092	0.093	0.077	0.072
Kazakhstan	0.041	0.038	0.040	0.046	0.047	0.042	0.038	0.035	0.038	0.040
Moldova	0.089	0.089	0.079	0.095	0.099	0.087	0.083	0.077	0.072	0.085
Russia	0.106	0.087	0.091	0.292	0.453	0.175	0.176	0.169	0.175	0.196
Tajikistan	0.196	0.132	0.092	0.156	0.122	0.171	0.157	0.161	0.164	0.155
Ukraine	0.094	0.085	0.082	0.099	0.115	0.110	0.101	0.096	0.096	0.099
Uzbekistan	0.090	0.080	0.072	0.080	0.097	0.088	0.087	0.095	0.091	0.089
Average by year	0.100	0.084	0.085	0.234	0.359	0.150	0.154	0.145	0.149	0.166

Table 5.6 presents the resulting estimates of the evolution of the conventional Lerner index of market power by country. The figures indicate varying degrees of market power in the CIS countries. The evidence from other studies also show that competition varies across countries, which depends on data sets used and period analysed (Claessens and Laeven; 2004; Bikker and Spierdijk, 2007). On average, market power slightly decreased in the region over the period 2005-2013. However, at the end of the studied period some individual countries such as Azerbaijan, Belarus, Kazakhstan and Ukraine faced an increase in the market power of their banking sectors. The highest Lerner Index corresponds to Kazakhstan (63.53) and Azerbaijan (41.47), and the Belarus, Kyrgyzstan and Ukraine market power indices are above

the region's average. At the opposite extreme are Armenia and Tajikistan, for which Lerner indices are negative. Average market power over the period for all countries was highest in

Table 5.6: Lerner index: by country and year, 2005-2013

Country/Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	Average by country
Armenia	33.69	31.77	30.06	14.48	6.73	4.76	2.81	-6.32	-5.69	10.49
Azerbaijan	31.79	45.94	43.55	46.83	42.89	38.92	37.10	38.84	41.47	40.86
Belarus	12.01	24.23	30.82	25.95	32.27	30.15	23.48	16.94	25.99	24.86
Kyrgyzstan	62.21	57.50	53.35	28.52	36.08	29.42	18.00	18.98	33.18	35.93
Kazakhstan	56.68	58.87	66.63	50.31	57.39	49.40	50.30	61.61	63.35	57.04
Moldova	31.61	36.67	36.45	36.25	39.50	27.03	24.16	25.40	23.18	31.03
Russia	23.64	29.41	30.52	15.40	18.91	19.60	20.88	21.74	21.92	22.25
Tajikistan	1.75	19.43	32.96	16.21	26.41	-28.81	-30.49	-9.94	-6.91	-5.44
Ukraine	16.51	24.24	25.55	33.46	28.69	19.76	20.54	25.18	26.48	24.70
Uzbekistan	27.62	25.13	27.47	26.54	21.31	23.78	21.28	18.09	17.99	21.93
Average by year	25.81	31.47	33.23	20.88	23.11	21.72	22.30	23.74	24.39	24.90

2006-2007 just before the world financial crisis. One conclusion emerges from the finding is that there was a weak market competition before the crisis that led to an increase in non-performing loans in bank's portfolios due to high interest rates charged, which impaired borrower's ability to repay debts. This implies the 'risk shifting' mechanism's presence, which may affect the financial system stability described in Boyd and De Nicolo (2005), Boyd et al. (2006), Schaeck et al. (2006). Turk-Ariss (2010) reported the Lerner index for some of the CISs countries measured using cross-section data averaged over the period

Table 5.7: Z-scores* average by country and year

Country/ Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	Average by country
Armenia	4.55	3.93	4.02	4.11	4.11	4.24	4.62	3.95	3.76	4.14
Azerbaijan	3.18	3.12	3.56	3.27	3.56	3.29	3.45	3.66	3.64	3.44
Belarus	3.35	3.14	3.31	3.68	3.16	3.59	2.57	3.65	3.53	3.33
Kyrgyzstan	4.20	4.03	3.32	4.80	3.57	2.87	4.01	4.39	4.97	4.08
Kazakhstan	3.05	3.17	3.30	3.71	3.10	3.28	3.96	3.25	2.99	3.34
Moldova	3.36	3.44	3.10	4.10	3.05	3.85	4.18	3.96	3.86	3.68
Russia	3.74	3.68	3.76	3.76	3.64	3.81	3.91	3.84	3.87	3.78
Tajikistan	2.99	3.20	4.06	4.40	2.43	3.84	4.09	3.43	3.80	3.69
Ukraine	3.22	2.95	2.81	3.63	3.09	3.63	3.57	3.84	3.29	3.38
Uzbekistan	4.24	3.67	3.57	3.89	4.00	3.73	4.08	4.37	3.68	3.95
Average by year	3.67	3.59	3.67	3.77	3.58	3.75	3.86	3.81	3.78	3.73

Note: * Z-score is in the log-transformation form

1999-2005. The results are similar to our results obtained for the year 2005.

Our empirical results on Z-score (overall risk) indicated that on average Armenia has the lowest risk potential in the region, while Belarus and Kazakhstan are at the opposite end of the overall risk scale. There was also a decrease in the average ratio of the region during the crisis period 2007-2009 (Table 5.7). Though the ratio does not consider the actual failure of banks (Beck, 2008), the results imply that there was an increase in the likelihood of banks failure in that period, i.e. there was an increase in return on assets volatility.

We also report the mean Lerner index, which is obtained using equation (5.1) and averaged by country over all periods under study (2005 – 2013), together with other mean values of competition characteristics for the CIS countries in Table 5.8, Panel A and their correlation coefficients in Panel B. Thus, we used the average values of the activity restriction indicator and government ownership indicator reported in the four surveys by Barth et al. (1999-2013) and averaged bank freedom indicator. These characteristics tend to be consistent with each other in average levels of competition characteristics in the countries. For instance, the lower Lerner index in Armenia comparative to other countries corresponds to higher banking freedom index in this country.

On the other hand the relatively high Lerner index in Belarus corresponds to a lower banking freedom index. In general the correlation coefficients of the competition characteristics have the expected signs. For instance the negative correlation sign indicates that where there is less banking freedom there is an increase in the Lerner index; and also that where there is higher government ownership there is less banking freedom. At the same time there is positive correlation between market power and activity restriction, which means that in more restrictive environment banks have more market power.

Table 5.8: Lerner index and other characteristics of competition, average by country

Variable	Lerner Index	Activity restriction (3-12)	Bank freedom (1-10)	Government ownership
Panel A: Mean values				
Armenia	0.02	8.16	7.15	0
Azerbaijan	0.4	10.43	3.66	41.07
Belarus	0.36	7.48	1.3	70.61
Kyrgyzstan	0.33	6	5	13.76
Kazakhstan	0.55	9.15	5.34	13.26
Moldova	0.25	9.39	5	8.37
Russia	0.25	5.64	3.7	49.51
Tajikistan	0.3	8.17	3.67	11.54
Ukraine	0.21	5	3.86	15.38
Uzbekistan	0.21	8	1.26	93.54
Panel B: Correlation				
	Lerner Index	Activity restriction	Bank freedom	Government ownership
Lerner Index	1			
Activity restriction	0.31	1		
Bank freedom	-0.22	0.11	1	
Government ownership	0.10	-0.035	-0.88	1

5.4.2. Main results and discussion

The present section analyses the relationships between stability and market power together with bank level and country level environmental variables. Table 5.9 represents the results of the main model estimation: the influence of the market power on bank stability measured as an overall bank risk, Z-score (columns (1), (3)) and the results for an alternative measure of stability as a dependent variable (Table 5.10, columns (2), (4)); and here we discuss the key results.

Our discussion will emphasise the main model results with the dependent variable Z-score in Table 4.5 column (1), which are robust to a broad set of checks. The coefficient for the Lerner index provides the expected negative sign at the 1% significance level. The result implies that more market power is associated with lower overall stability in the CISs countries. The finding is in line with the competition-stability view and confirms the '*risk shifting paradigm*' for the CIS countries revealing the effect of market power on moral

hazard and adverse selection problems on the part of borrowers. The findings are similar to those, which also supported competition-stability view, such as Boyd et al. (2006), Schaeck et al. (2009), Allen et al. (2011), and Schaeck and Cihak (2014). However, these results do not agree with those of Berger et al. (2009) and Turk-Ariss (2010).

Table 5.9: Estimation results of the main model, dependent variables: Z-score, NPLs

	Main model	Model with NPLs	Main model (collapsed number of instruments)	Model with NPLs(collapsed number of instruments)
	(1)	(2)	(3)	(4)
VARIABLES	Z-score	NPLs	Z-score	NPLs
Lerner index	-0.923***	6.526***	-0.702**	9.940***
Lerner index squared	-0.273*	3.586***	-0.0160	5.207***
Bank size	0.130***	0.0846	0.255***	-0.414
Loans to assets	-0.241	9.815***	-0.403	10.83***
Fixed assets to total assets	2.884*	8.751	2.561	36.22**
Legal rights	0.0714***	0.232	-0.00179	0.518**
Supervision	0.0548***	-0.0721	0.0179	-0.0295
Log GDP growth	0.343***	-2.704***	0.107	-2.033***
Lag of NPLs		0.724***		0.729***
Lag of Z-score	0.158***		0.0769**	
Observations	2,167	2,167	2,167	2,167
Number of banking firms	333	333	333	333
Arellano-Bond test for AR(1) in first differences	0.00	0.00	0.00	0.00
Arellano-Bond test for AR(2) in first differences	0.356	0.474	0.962	0.442
Hansen test of overidentification restrictions χ^2	0.565	0.153	0.909	0.512

*** p<0.01, ** p<0.05, * p<0.1

In the other model (column (2)) we use the non-performing loans to total loans ratio as a measure of stability. This analysis allows us to decide whether there are measurement issues in our main finding of significant and negative association between Z-score and the Lerner index, and to examine whether competition in the banking sector is associated with higher portfolio risk undermining financial stability in transition countries. The results in column (2) corroborate those obtained from the main regression. The findings indicate that with a rise in competition the non-performing loans decrease, thus mitigate the risk of financial instability. This finding may well be consistent with the view that it is more likely that in uncompetitive

markets banks pursue high-risk profile with negative consequences for systemic stability (Caminal and Matutes, 2002).

We now discuss the impact of the other control variables on bank stability. Larger banks have a more positive impact on bank stability than smaller ones. The result agrees with our expectations because larger banks tend to be more diversified and engage in non-traditional banking activities giving rise to economies of scope. This diversification is also justified by our finding that the loans to total assets ratio, which represents traditional banking, negatively influences banks' stability and increases the amount of non-performing loans, which in turn has negative consequences for the overall risk position. Although in our main regression the coefficient for loans to total assets ratio is not significant it is yet negative, and this result is mirrored in our regression with non-performing loans as a dependent variable where an increase in loans exposure in the CISs increases the non-performing loans undermining systemic stability.

Our results on environmental variables are all highly significant, which is consistent with the views expressed in previous studies that showed that institutional and regulatory environment affects financial system stability (Beck et al., 2004, 2013; Barth et al., 2007, 2013). The result on Legal rights of lenders and borrowers as presented in the Table 5.5 is that the improvement of these rights enhances stability. Our finding indicates that countries with more efficient legal systems in facilitating legal rights have greater stability in their financial systems. The institutional and regulatory environment is important in influencing financial stability in the region. Most countries made efforts to advance their business regulation and particularly in to introduce credit legislation between 2008 and 2014 (See Appendix D, Table D4), and this may contribute to the reduction of overall bank risk exposure. Countries in the region improved their credit information systems, strengthened secured creditor rights, and

strengthened their secured transactions systems, which significantly improved borrowers and lenders rights. Thus, the financial authorities in these countries believe that the presence of clear collateral and bankruptcy laws are the key element in the institutional environment that affects banking system soundness.

The supervision indicator has a positive and significant relation to stability in transition countries as expected. It can be argued that supervisory power has a significant impact on bank stability and consequently on financial system resilience. The expectation, therefore, is that supervision may compensate for market failure in monitoring and may prevent riskier behaviour by banks. The supervisory practices, which force accurate information disclosure, and foster incentives for private agents to exert corporate control, lead banks to reduce risk-taking behaviour. Accordingly, most of the countries gave the positive answers to the questions: 'Does the Banking Law give authority to the supervisory agency to intervene – that is, suspend some or all ownership rights – in a problem bank?' and 'Can the supervisory agency order the bank's directors or management to constitute provisions to cover actual or potential losses?' This supervisory power gives the supervisory agency the right to intervene swiftly in a problem bank and strengthens the institutional environment and thus the stability of the banking system.

The theoretical framework for assessing bank supervision is provided by the general theories of regulation and supervision policies. If private agents' abilities and incentives to monitor banks are motivated by government policies, and by information and transaction costs, then proper official supervision of banks can enhance the corporate governance of banks (Stigler, 1971). This view of 'supervisory power' stresses the market failures in banking and presumes that private agents often do not have enough incentives and capabilities to survey powerful banks. In this light a powerful agency with supervision and regulation authority, which is able

to directly control and discipline non-compliant banks, can improve the corporate governance of banks, decrease corruption in lending and so encourage banks' intermediation and stability (Beck et al., 2006c).

Taking into account that the banking system in the CISs went through different stages of development including periods when the law on the regulation and supervision of the banking sector were underdeveloped or practically non-existent, our finding also indicates the necessity for transition countries to strengthen their supervision authorities so as to enhance bank discipline and mitigate market failures, with positive implications for the stability of the banking sector.

Finally, bank stability is positively correlated with the GDP growth, which means that the GDP growth increases bank stability in the CISs. As the economy grows, banks have more investment projects to screen and fund more feasible ones. Moreover, improved economic conditions contribute to the creditworthiness of business borrowers. This result is also robust when the non-performing loans to total loans measure is used as an alternative indicator of bank soundness. The negative sign of the GDP growth coefficient illustrates an inverse relation between GDP growth and the non-performing loans to total loans ratio. Our finding is consistent with Berger et al. (2009) and Schaek and Cihak (2009).

The main results are robust to a number of sensitivity checks with alternative samples, alternative dependent variable, inclusion of alternative regulatory and institutional variables, and, finally dropping and adding control variables.

5.5. Robustness tests

We perform our first robustness check by reducing the number of instruments. The similar findings to our main model findings obtain (Table 5.9, columns (2) and (4)).

Table 5.10: Robustness tests: different sample specification, dependent/independent variables

	No big banks in the sample				Without Lerner index quadratic term		Time dummies	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	Z-score	Z-score (collapsed)	NPLs	NPLs (collapsed)	Z-score	NPLs	Z-score	NPLs
Lerner index	-0.663**	-0.518	3.922	10.74***	-0.775***	4.688**	-0.479**	6.922***
Lerner index squared	-0.173	0.0246	2.210	5.574***			-0.158	3.809***
Bank size	0.184***	0.248***	-0.110	-0.531	0.145***	0.149	-0.128***	0.536**
Loans to assets	0.0863	-0.257	5.940*	10.38**	-0.202	9.496***	-0.638**	12.12***
Fixed assets to total assets	0.396	0.193	15.84**	39.03**	2.871*	8.402	-1.458	8.930
Legal rights	0.0416*	0.00921	0.381*	0.622**	0.0616**	0.148	0.00657	-0.0476
Supervision	0.0352**	0.0123	0.0474	-0.0464	0.0405**	-0.0265	-0.00904	-0.0528
Log GDP growth	0.236***	0.174*	-1.344**	-1.642***	0.303***	-2.571***	-0.00633	-0.627
2006							5.632***	-14.43**
2007							5.739***	-14.24**
2008							5.795***	-12.46**
2009							5.578***	-9.804*
2010							5.759***	-10.44*
2011							5.860***	-11.97**
2012							5.849***	-13.25**
2013							5.834***	-13.00**
Lag of NPLs			0.684***	0.677***		0.728***		0.695***
Lag of Z-score	0.111***	0.0664*			0.153***		0.0810***	
Observations	1,788	1,788	1,788	1,788	2,167	2,167	2,167	2,167
Number of banking firms	297	297	297	297	333	333	333	333
Arellano-Bond test for AR(1) in first differences	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arellano-Bond test for AR(2) in first differences	0.610	0.985	0.342	0.279	0.333	0.508	0.897	0.479
Hansen test of overidentification restrictions χ^2	0.760	0.804	0.596	0.428	0.487	0.0443	0.719	0.165

*** p<0.01, ** p<0.05, * p<0.1

Note: 2005 time dummy is omitted due to collinearity.

Furthermore, we ran a number of other robustness tests (Table 5.10). We changed sample specification and ran the regression on a subsample omitting large sized banks (Table 5.10, column 1-4). We excluded the Lerner Index's quadratic term from specifications following the literature (Turk-Ariss, 2010) (Table 5.10, columns 5-6); added time dummies into the equation (Table 5.10, columns 7-8); in each case the main results are largely unchanged. We also did other checks (not reported here) by including other business environment variables such as strength of legal rights, which were provided by the World Bank database Doing Business, and entry restriction as calculated in Barth et al. (2007), also foreign ownership dummies available from our database, and a deposit protection scheme dummy, a dummy variable set to 1 when a country introduced deposit insurance scheme based on information obtained from national central banks' websites. The results remain robust to those from estimation of the main model.

We also tested the competition stability nexus by using another measure of competition, Boone's indicator (for calculation and Boone's indicators see Appendix D1, Table D7). The results are comparable with our main regression showing a positive relationship between competition and stability in the CIS banking sectors.

5.6. Conclusion

The complex relationships between competition and stability are relatively untested and different theoretical approaches lead to contradictory implications concerning the impact of competition on stability. This study empirically examines interaction between competition and stability for the banks which operate in the quickly changing environment of the transition countries. Using bank level data of 333 banks from CIS countries over the period 2005-2013, we constructed competition indicator, stability ratio and bank level control variables, while we used country level environmental data to account for the regulation and supervision environment and differences in economic growth. We instrumented the competition indicator with three instruments namely activity restriction, banking freedom and government ownership to deal with the endogeneity problem, and used a GMM estimator.

We found that competition has a highly significant positive affect on bank stability in the CIS countries. This result contributes to the competition-stability nexus literature for transition countries. In support of our finding in the main regression, the negative relationship between the non-performing loans to total loans ratio as a measure of systemic risk and market power also verifies competition-stability nexus.

We also find that the coefficients on environmental variables are significant for the variables representing borrowers' and lenders' legal rights and bank supervision. We find these variables contributing to banking system stability. These results provide suggestions for policy makers and practitioners in transition countries on what is important for financial stability and how to reduce the risk of systemic crisis. Again, we found that there is no trade-off between increasing competition among CIS banks and stability. The CIS countries financial authorities need to take competition in banking sectors seriously to promote financial stability, and strive to improve environmental conditions through enhancing the

legal rights of lenders and borrowers. Additionally we may conclude that supervision policies have benefits for financial stability if they drive imprudent banks out of business in an orderly manner. Moreover, the findings may have important policy implications for developing countries where bank stability and competition issues are critical in a quickly changing banking sector environment, and where the banking sector is vulnerable to the stresses on the international level such as the recent financial crisis of 2007-2009.

Concluding policy remark

The challenge for financial regulators is to develop and apply a regulatory framework that would support financial system stability and would not impede competition. On one hand, tight regulation may shrink competition and lead to a drop in financial system efficiency and profitability, which in turn may contribute to instability. On the other hand, if the financial sector remains inadequately supervised, it can become unstable mainly because banks are themselves inherently fragile due to having short-term liabilities, which can be withdrawn on demand, and long-term risky assets. The instability can be contagious and lead to financial crises, which have high fiscal and social costs. However, certain degree of risk-taking is necessary for economic growth. In attempt to preserve stability and soundness of the financial systems, policymakers need to design somewhat that would balance between financial institutions and markets operating as intended and together not allowing critical problems to accumulate. This balance is the key issue in banking sector regulation, which also affects competition (OECD, 2011).

With that in mind, we tentatively conclude that well-tailored policies facilitating competition among banks can contribute to financial system stability in the CIS banking systems. As well, financial authorities have to send financial market participants including bank's owners, managers and investors, a clear message that fraudulent, inefficient and indiscipline financial

institutions will be effectively closed. Additional instruments of financial supervision authorities could be enforcement of accurate information disclosure and encouragement of private-sector corporate control of banks.

Chapter 6

Conclusion

Chapter 2 focused on issues related to banking in transition countries such as the massive changes in the financial systems of the former soviet bloc countries in the last decade of the 20th century and their influence on the countries' banking system landscape at the present time. After more than 20 years of transition the financial systems in the CIS countries have features to different extents, which are the legacy of the former system of finance. Banking sectors remain the key form of financial intermediation in the CIS countries. The CISs' banking sectors can be distinguished into the most developed, medium developed and underdeveloped groups. The first group includes the Russian, Kazakh and Ukrainian banking systems, while the last group consists of Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan. However, even in Russia, Kazakhstan and Ukraine, the banking sectors remain underdeveloped.

Nevertheless, there were achievements of the banking sectors in the CISs. In general, the banks in the CISs were transferred into commercial banks and adopted the concept of conventional banking though to different degrees across countries. Most of the CIS countries introduced international standards of financial statements, which contributed to transparency and a better monitoring of risks. Introduction of Basel standards had a positive impact on the capitalisation of banking sectors of the CISs (Kazakov, 2007). Banking sectors in the CISs had very high growth rates of their assets and credits to the economy before the world financial crisis 2007-2009 and slowly recovered after that (Banks of the CISs, 2008-2014). We note a continuous consolidation of the banking sectors in the CISs. There has been a net decrease in the number of commercial banks in the region by 280 (18.8%) banks between 2007 and 2014 (Banks of the CISs, 2008-2014). The consolidation in the number of banks

takes place against a drop in concentration, which is the regional tendency over the period from 2005 to 2013. The decline in concentration despite the consolidation process suggests that consolidation has not involved many mergers among very large banks.

The most important changes in the CISs banking sectors are in ownership structure, which differs across countries and provides fertile testing grounds for the analysis of ownership impact on efficiency; in the transformation of banks' risk-taking behaviour; and in stability which is another concern of our study.

There is a trend of financial integration among the CIS countries, which is most intensive in the banking sector. The priority for banks cross-border entry is towards those CIS countries with a relatively lower level of financial intermediation, where banks can compete and realise their economies of scope and scale. This is because the level of development even of the most developed banking sectors in the CISs does not permit competition on an equal basis with the financial institutions in developed countries; and the CIS region became one of the most attractive locations for the CIS own banks expansion.

Chapter 3 investigated the impact of bank ownership and risk taking behaviour as well as environmental variables on bank performance in the CIS countries taking a technical efficiency perspective.

Our findings provide empirical evidence that ownership structure matters for banks technical efficiency in the CISs. Using state-owned banks as a benchmark we found that private banks are less technically efficient than state-owned banks in the CIS countries. State-owned banks in the CISs may encounter wider and less costly access to deposits; the former is because state-owned banks have been present in the market for a long time and are usually trusted and the latter is due to lower switching costs. Besides, the state-owned banks may invest in large scale government projects due to the 'development' objective, thus having high output levels.

Banks with foreign majority ownership are also less technically efficient than state-owned banks, which supports the home field advantage hypothesis (Berger et al., 2000; 2005). Foreign-owned banks may have difficulties in processing 'soft' information about the host country market conditions, which may result in comparative disadvantages in technologies involving this kind of information (Berger, 2007). The CIS-owned banks are more efficient than other banks in the region. In contrast to the foreign banks from out of the region, the CIS-owned foreign banks are familiar with the environment and can more easily process the 'soft' information regarding the market conditions in the country of entry[46]. The CIS-owned banks, which pursue policy of expansion abroad, enter other CIS countries with less developed financial sectors. This provides them with more advantageous environment conditions (limited advantage hypothesis). Risks-taking behaviour has different impact on performance in the CISs countries. There is positive association between capital, credit and market risk and performance, but a negative association of liquidity risks with bank performance in the CISs. Technically inefficient banks hold more capital (low capital risk). Credit risk-taking behaviour results in higher efficiency because riskier loans produce higher interest income. Moreover, 'skimping' on selection and monitoring of loans allows banks to economise time and other resources resulting in higher output of asset loans. More efficient banks can produce more output of liquid and other assets, thus they can be considered as 'liquidity efficient' banks (lower liquidity risk). Higher market risk (borrowing from other banks) results in higher technical efficiency, which suggests that the CIS banks that rely more on interbank loans may produce more output, are subject to more market discipline and able to observe other banks. By monitoring and screening market risk they enhance technical efficiency.

[46] This is the legacy of the soviet times and centralised policy to unify all the nations, which is very beneficial for Russia economic and other policies.

Chapter 4 extended efficiency analysis of the CISs banking sector by investigating the impact of banking sector ownership, risk-taking behaviour and environmental factors on bank cost and profit efficiency.

Regarding the influence of ownership on profit and cost efficiency, we again took the state-owned banks as a benchmark. We found that privately owned banks are less cost efficient than state-owned banks. State-owned banks in the CISs have different activity sets than private banks and save on project screening, risk evaluation and customer monitoring costs, which make up most of private banks' costs. Another reason that private banks are less cost efficient is that private banks are mostly 'de novo' compared to long present state-owned banks and encounter higher switching costs. Moreover, private banks are less trusted due to dishonesty in business and fraudulent behaviour compared to the public banks associated with 'government's stable hands'.

Foreign banks are more profitable than state-owned banks. On the one hand, foreign banks have best-practice management and up-to-date banking technologies, which could be superior to those of the local banks. On the other hand, state-owned banks are less profitable than foreign banks because state-owned banks pursue developmental and economy industrialisation goals but not profit maximisation like privately owned banks. Although foreign banks may be superior in the above-mentioned expertise, they are no more cost efficient than the state-owned banks, which might be due to the lack of 'soft' knowledge imposing a liability of foreignness. The CIS-owned banks are less cost efficient than other banks. Again, entering the CIS countries with less developed banking sectors where local banks hardly can compete with newcomers, CISs-owned foreign banks face a weak competitive environment and enjoy a 'quiet life' not being pressured to reduce costs.

There are different impacts of risk-taking behaviour on bank cost and profit efficiency in the CISs countries. Banks with lower capital risk (high capital) are more cost efficient due to more shareholders' control over costs and capital allocation; banks with capital strength need less external funding and this results in lower costs. Higher credit risk taking is associated with lower profitability of a bank due to unpaid loans accumulation, which could be a result of trading-off between risk and expected return by skimping on loans selection and monitoring. Banks taking lower liquidity risk are more profit efficient. This implies that the more liquid is the bank, the more profitable it is, because efficient banks, which may produce more output, also produce more liquid assets as a part of output. However, higher liquidity is negatively associated with cost efficiency. This is because holding more liquidity results in higher opportunity costs of these low-yield assets and costs from poor management. On the other hand, banks that produce more output including liquid assets encounter higher costs. Higher market risk is associated with less cost efficiency, which possibly can be a result of borrowing in interbank markets increasing costs for banks. Interbank markets volatility during financial turmoil can undermine the performance of banks with greater interbank market exposure.

Various control variables shed light on the economic and institutional environment impact on efficiency. The CIS banks benefited from the relatively high GDP growth in terms of profit efficiency; nevertheless they encountered higher costs as GDP grew. The 2007-2009 Global financial crisis and credit crunch had a significant negative impact on banks' cost efficiency as banks encountered high borrowing costs. At the same time, there was a positive association between the crisis and profit efficiency, which mainly can be explained by the increased interest rate spreads in the wake of the crisis. The establishment of a custom union positively affected cost efficiency possibly because the increased expectations of the entrance of competitors into the markets pushed banks to reduce costs; it led to a decrease in banks'

profit efficiency due to increased competition and worsened economic conditions in two customs union member-countries.

Finally, there is a convergence in the cost and profit efficiency scores of banks across the CIS countries suggesting an ongoing process of re-integration among CIS financial systems.

Chapter 5 examined the competition-stability nexus in the CIS countries. The literature provides different views on possible impacts of competition on stability. There has been a conventional wisdom that there is a trade-off between competition and stability (Keeley, 1990; Carletti and Hartmann, 2002). However, the counter-argument states that competition contributes to financial stability (Caminal and Matutes, 2002; Beck et al., 2004; Allen and Gale, 2004; Schaeck and Cihak, 2014).

We concluded that competition is good for stability in the CIS countries and verified the competition-stability nexus. This is in line with other studies supporting competition-stability nexus (De Nicolo et al., 2004; Boyd et al., 2006; and Schaeck et al., 2009; Allen et al., 2011; Schaeck and Cihak, 2014). This study also confirmed that the improvement of legal rights of borrowers and lenders and bank supervision in the CISs would contribute to banking system stability.

Policy implications

The global financial crisis of 2007-2009 created high fiscal and social costs. It called into question the sustainability of the western financial system, which now cannot be simply taken as a model for transition countries.

The results from empirical estimations offer some insights on micro and macro level policies. On micro level, the results might inform bank managers and financial regulators on improving technical and allocative efficiency. Banks may improve technical efficiency by

increasing their liquidity levels (Chapter 3). The credit and again liquidity risk's negative association with bank profit efficiency show that managers need to adopt strategies improving credit and liquidity risk management (Chapter 4). At the same time cost efficiency (Chapter 4) can be improved if bank managers would reduce capital and market risks, i.e. improve capitalisation and borrow less in interbank markets.

On macro level, regarding banking sector ownership structure, the analysis show that private banks are less technical and cost efficient than public banks indicating that state ownership in the CISs banking sectors is not necessarily the only reason for lower levels of financial intermediation or relative inefficiency. Because the main inefficiency is inherent in domestic private banking, the banking systems' efficiency may be enhanced via increased competition in financial sectors of the CISs. At the same time, drawing on the conclusion of competition-stability nexus analysis that competition is good for stability (Chapter 5), it can be concluded that financial policies facilitating competition can contribute to both efficiency and financial system stability in the CISs.

Policymakers need to design regulatory framework that would support financial system stability and would not hinder competition. On one hand, tight regulation may reduce competition and lead to a decline in financial system efficiency and profitability, and this in turn may contribute to instability. On the other hand, if the financial sector remains inadequately supervised, it can become unstable. That is the regulatory framework should balance between financial institutions and markets operating as intended and not allowing critical problems to accumulate (OECD, 2011). This balance is the key issue in banking sector regulation.

Additionally, although we found that there is convergence in profit and cost efficiency scores among the CISs banking sectors (Chapter 4), concerns about financial integration such as

importing financial and economic instability, and trade-diversion with high-technologies exporters have been raised. In this regards, it is important to ensure that each country can defend its interest and efforts should be directed towards mutually beneficial policies and regulations in the region.

Appendix A

Appendix to Chapter 2

Table A1: Assets, credits and their growth rates (10 largest banks in each country)

Panel A: Assets, bln. US$

	2005	2006	2007	2008	2009
Armenia	293.8	1114.8	1907.5	2511.7	2711.6
Azerbaijan	1733.6	3582.4	5905	9801.9	10833.2
Belarus	8981.4	13027.1	18609.9	28482.9	27937.2
Kazakhstan	30492.01	63527.7	88948.5	89062.5	68847
Kyrgyzstan	338.1	564.5	872.5	1092.9	1253.2
Moldova	1311.2	1609.1	2590.8	3418.2	3083.8
Russia	155750.1	254955.5	411328.9	520593.7	524482
Tajikistan	789.5	993.8	1208.8	1096.2	845.3
Ukraine	20057.8	33581.4	57078.7	62193.7	58177.7
Uzbekistan	3214.4	4652.3	5749.2	6199.2	6641.7
Average assets, bln US$	222.96	377.61	594.20	724.45	704.81

Panel B: Credits, bln. US$

	2005	2006	2007	2008	2009
Armenia	107.3	399	1038.9	1504.5	1375.1
Azerbaijan	1110.1	1796	4043.2	6934.8	8065.7
Belarus	5867.2	8845.9	13835.4	21132.1	22222.9
Kazakhstan	21097.2	45074.7	64168.8	61677.6	36133.5
Kyrgyzstan	121.3	270.6	470.2	580.9	457.9
Moldova	705.1	941.3	1634.4	2079.8	1570.2
Russia	102462.4	166116.6	281783.6	339135.9	318725.1
Tajikistan	290.7	459.2	622	688.1	455.7
Ukraine	12013.8	24503.5	40939.2	49165	44240
Uzbekistan	2317.8	2488.7	2985.6	3578.4	3764
Average credits, bln US$	14.61	25.09	41.15	48.65	43.70

Panel C: Growth rates of assets and credits by country, %

	Assets' growth rate				Credits' growth rate			
	2006	2007	2008	2009	2006	2007	2008	2009
Armenia	279.44	71.11	31.67	7.96	271.85	160.38	44.82	-8.60
Azerbaijan	106.65	64.83	65.99	10.52	61.79	125.12	71.52	16.31
Belarus	45.05	42.86	53.05	-1.92	50.77	56.40	52.74	5.16
Kazakhstan	108.34	40.02	0.13	-22.70	113.65	42.36	-3.88	-41.42
Kyrgyzstan	66.96	54.56	25.26	14.67	123.08	73.76	23.54	-21.17
Moldova	22.72	61.01	31.94	-9.78	33.50	73.63	27.25	-24.50
Russia	63.70	61.33	26.56	0.75	62.12	69.63	20.35	-6.02
Tajikistan	25.88	21.63	-9.32	-22.89	57.96	35.45	10.63	-33.77
Ukraine	67.42	69.97	8.96	-6.46	103.96	67.07	20.09	-10.02
Uzbekistan	44.73	23.58	7.83	7.14	7.37	19.97	19.86	5.19
Average growth rate, %	83.09	51.09	24.21	-2.27	88.61	72.38	28.69	-11.88

Source: Banks of the CISs (2008 - 2014), in Russian, own calculations

Table A2: Total assets, equity and their growth rates of the CISs banking system (2008-2014)

Panel A: Total assets, mln. US$

Country/Year	2007	2008	2009	2010	2011	2012	2013	1st half 2014
Russia	824,611	953,400	973,100	1,109,200	1,292,900	1,630,100	1,758,300	1,813,800
Ukraine	118,692	126,400	110,200	118,300	132,000	141,000	159,900	98,400
Kazakhstan	97,119	98,400	77,900	81,700	86,400	92,000	100,700	94,700
Belarus	19,991	28,809	29,467	43,729	30,823	37,124	41,286	42,305
Azerbaijan	7,957	12,826	14,525	16,657	18,130	22,476	25,985	27,306
Uzbekistan	7,191	8,649	10,373	12,646	15,057	18,016	19,935	20,723
Moldova	2,825	3,762	3,245	3,481	4,072	4,833	5,835	5,700
Armenia	2,470	3,339	3,509	4,292	5,357	6,122	7,257	7,167
Tajikistan	1,635	1,785	1,121	1,552	1,912	2,210	2,650	2,548
Kyrgyzstan	1,185	1,393	542	1,244	1,436	1,699	2,245	2,362
Total by year	1,088,205	1,244,079	1,224,982	1,392,801	1,588,087	1,955,580	2,124,092	2,115,010

Panel B: Equity, mln. US$

Country/Year	2007	2008	2009	2010	2011	2012	2013	1st half 2014
Russia	108,835	129,700	152,800	155,300	154,100	194,600	203,000	198,800
Ukraine	13,842	15,800	17,000	17,300	19,500	21,200	24,100	12,600
Kazakhstan	11,860	12,300	–6600	9,000	8,800	13,300	13,500	11,500
Belarus	3,036	5,143	5,178	5,843	4,308	5,329	5,764	5,731
Azerbaijan	1,300	2,128	2,497	2,719	3,087	3,255	4,319	4,358
Uzbekistan	1,165	1,509	2,048	2,500	2,970	3,137	2,952	2,849
Moldova	488	641	561	565	649	582	876	865
Armenia	536	768	738	877	925	975	1,124	1,160
Tajikistan	191	315	246	247	420	482	543	441
Kyrgyzstan	252	325	316	267	289	287	380	360
Total by year	142,428	169,540	174,784	194,619	195,048	243,147	256,558	238,664

Panel C: Annual growth of total assets, %

Country/Year	2008	2009	2010	2011	2012	2013	1st half 2014
Russia	15.6	2.1	14.0	16.6	26.1	7.9	3.2
Ukraine	6.5	-12.8	7.4	11.6	6.8	13.4	-38.5
Kazakhstan	1.3	-20.8	4.9	5.8	6.5	9.5	-6.0
Belarus	44.1	2.3	48.4	-29.5	20.4	11.2	2.5
Azerbaijan	61.2	13.2	14.7	8.8	24.0	15.6	5.1
Uzbekistan	20.3	19.9	21.9	19.1	19.7	10.7	4.0
Moldova	33.2	-13.7	7.3	17.0	18.7	20.7	-2.3
Armenia	35.2	5.1	22.3	24.8	14.3	18.5	-1.2
Tajikistan	9.2	-37.2	38.4	23.2	15.6	19.9	-3.8
Kyrgyzstan	17.6	-61.1	129.5	15.4	18.3	32.1	5.2
Total by year	14.3	-1.5	13.7	14.0	23.1	8.6	-0.4

Panel D: Annual growth of equity, %

Country/Year	2008	2009	2010	2011	2012	2013	1st half 2014
Russia	19.2	17.8	1.6	-0.8	26.3	4.3	-2.1
Ukraine	14.1	7.6	1.8	12.7	8.7	13.7	-47.7
Kazakhstan	3.7	-153.7	-236.4	-2.2	51.1	1.5	-14.8
Belarus	69.4	0.7	12.8	-26.3	23.7	8.2	-0.6
Azerbaijan	63.7	17.3	8.9	13.5	5.4	32.7	0.9

Uzbekistan	29.5	35.7	22.1	18.8	5.6	-5.9	-3.5
Moldova	31.4	-12.5	0.7	14.9	-10.3	50.5	-1.3
Armenia	43.3	-3.9	18.8	5.5	5.4	15.3	3.2
Tajikistan	64.9	-21.9	0.4	70.0	14.8	12.7	-18.8
Kyrgyzstan	29.0	-2.8	-15.5	8.2	-0.7	32.4	-5.3
Total by year	19.0	3.1	11.3	0.2	24.7	5.5	-7.0

Source: Banks of the CISs (2008 - 2014), in Russian, own calculations

Table A3: Percentage change of the state ownership

	Year to Year								Over the period
Country/Year	*2006*	*2007*	*2008*	*2009*	*2010*	*2011*	*2012*	*2013*	*2005-2013*
Armenia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Azerbaijan	0.0	-28.0	0.0	0.0	0.0	-19.0	0.0	0.0	-41.7
Belarus	0.0	1.6	0.0	5.1	-10.1	-5.6	-3.0	-3.1	-14.9
Kazakhstan	0.0	-60.0	2900.0	143.3	28.8	22.9	0.0	-13.4	3900.0
Kyrgyzstan	0.0	-70.0	0.0	112.5	1.0	97.1	0.0	0.0	26.9
Moldova	0.0	-41.2	-70.0	0.0	208.3	68.9	0.0	0.0	-8.1
Russia	-3.7	1.6	2.2	17.7	-15.8	13.0	1.9	3.8	18.5
Tajikistan	0.0	110.9	11.3	10.2	8.4	8.5	0.0	0.0	204.3
Turkmenistan	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ukraine	0.0	0.0	0.0	41.7	0.0	0.0	5.9	0.0	50.0
Uzbekistan	0.1	0.1	0.1	-15.3	18.5	0.6	0.2	0.2	1.7
Average by year	-0.4	-8.5	284.4	31.5	23.9	18.6	0.5	-1.3	413.7

Source: Barth et al. (2007, 2009, 2013), Banks of the CISs (2010), in Russian

Table A4: Percentage change in concentration ratio, %

	Year to year								Over the period
Country/Year	2006	2007	2008	2009	2010	2011	2012	2013	2005-2013
Armenia	-8.0	-9.6	-16.2	-11.0	-0.1	-5.6	6.1	31.6	-18.3
Azerbaijan	-3.5	9.4	-12.4	1.8	9.3	47.9	-10.9	-12.8	18.1
Belarus	-13.1	17.4	-5.2	0.1	-4.4	0.6	-13.8	0.2	-19.6
Kyrgyzstan	7.5	-7.9	4.6	3.8	0.0	-18.3	-1.7	0.0	-13.7
Kazakhstan	9.6	-5.8	-7.5	7.4	-5.7	-10.5	-1.2	-13.5	-25.9
Moldova	-0.5	-17.9	6.9	3.7	2.6	8.8	-0.4	-15.4	-14.7
Russia	-8.9	-3.4	30.6	1.6	-6.0	14.8	9.8	31.1	81.4
Tajikistan	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.8
Ukraine	-5.8	-9.6	6.0	-4.2	7.0	4.4	-38.9	-15.1	-49.9
Uzbekistan	6.8	0.7	12.0	-4.6	-8.1	4.1	-17.2	-20.4	-27.4
Region average	-1.2	-2.4	0.3	-0.2	-1.2	1.8	-8.2	-2.8	-13.3

Source: World Bank Financial Indicators (August 2014), Bankscope (2015), own calculations

Table A5: List of active banks, size of total assets and their ranks by country as of 01.01.2014

Banks/Countries	Assets, millions US$	Place by total assets	Banks/Countries	Assets, millions US$	Place by total assets
Azerbaijan			**Belarus**		
AccessBank	1,026.7	4	Абсолютбанк	39.27	25
AFB Bank	298.7	18	Альфа банк	671.58	9
Amrahbank	191.3	21	Банк ВТБ (Беларусь)	958.02	8
Atabank	523.6	10	Белагропромбанк	6795.60	2
Azerbaijan Credit Bank	24.9	28	Беларусбанк	16835.38	1
Azerbaijan Industry Bank	432.3	13	Белвнешэкономбанк	2137.42	5
Azerigazbank	595.8	9	Белгазпромбанк	1626.02	7
Bank Avrasiya	103.9	26	Белинвестбанк	2655.97	4
Bank BTB	174.5	22	Белорусский банк малого бизнеса	37.99	26
Bank Respublika	613.8	8	Белорусский народный банк	204.40	17
Bank Silk Wey	279.0	19	БелСвиссБанк	145.90	20
Bank Standard	1,289.3	3	БИТ Банк	27.35	29
Bank Technique	664.9	7	БПС-Сбербанк	4329.48	3
Bank VTB Azerbaijan	265.6	20	БТА Банк (Беларусь)	234.38	16
Demirbank	516.5	11	Дельта Банк	301.35	12
IBA	9,791.2	1	Евробанк	16.14	31
Kredobank	161.3	23	Евроторгинвестбанк	28.83	28
Melli Iran Bank Baku Branch	91.3	27	Идея Банк	287.68	13
Muganbank	427.5	14	ИнтерПэйБанк	31.90	27
NBC Bank	149.4	25	Минский транзитный банк	473.98	11
Nikoil Bank	339.5	15	Москва-Минск	658.77	10
Pasha Bank	897.5	6	Норд Европеан Банк	20.66	30
Rabitabank	310.4	17	Паритетбанк	164.76	18
Transcaucasus Development Bank	160.3	24	Приорбанк	1906.93	6
TuranBank	311.5	16	РРБ-Банк	129.97	21
Unibank	956.7	5	Технобанк	148.99	19
Xalq Bank	1,613.7	2	ТК Банк	262.74	14
Zaminbank	514.0	12	Трастбанк	86.46	23
Armenia			Франсабанк	99.30	22
ArmSwissBank	172.2	14	Хоум Кредит Банк	234.38	15
HSBC Bank Armenia	614.9	5	Цептер Банк	62.30	24
UniBank	380.2	8	**Kazakhstan**		
АКБА-Кредит Агрикол Банк	659.9	4	Delta Bank	1,238.6	16
Америабанк	776.7	1	ForteBank	249.4	30
Анелик Банк	147.2	16	KASPI BANK	5,539.3	8
Араратбанк	308.8	10	Kassa Nova	366.0	25
Ардшининвестбанк	667.8	3	Qazaq Banki (б. Сеним-Банк)	316.7	29
Армбизнесбанк	542.5	7	АзияКредит Банк	600.6	23
Армянский банк развития	172.7	13	Альянс Банк	3,658.8	10
Арцахбанк	216.2	12	Астана-финанс	517.9	24
Арэксимбанк	575.7	6	АТФБанк	5,828.1	7
Банк ВТБ (Армения)	738.9	2	Банк RBK	1,450.3	15
Библос Банк Армения	105.1	18	Банк Позитив Казахстан	139.1	32
Всеармянский Банк	17.9	20	БТА Банк	9,875.4	3
ИНЕКОбанк	321.9	9	ДБ HSBC Банк Казахстан	1,220.4	17
Конверс Банк	300.0	11	ДБ Сбербанк	6,743.2	5
Меллат Банк	46.8	19	ДБ ТАИБ Казахский банк	138.6	33

Banks/Countries	Assets, millions US$	Place by total assets	Banks/Countries	Assets, millions US$	Place by total assets
Прокредитбанк	130.1	17	ДБ PNB - Казахстан	89.9	37
Прометей	154.9	15	ДБ RBS (Kazakhstan)	338.2	27
ДБ Альфа-Банк	1,113.4	18	Energbank	151.4	10
ДБ Банк Китая в Казахстане	681.6	21	Eurocreditbank	24.6	14
ДБ КЗИ БАНК	169.9	31	Eximbank	349.9	6
ДБ НБ Пакистана в Казахстане	36.2	38	Fincombank	150.2	11
ДО Банк ВТБ (Казахстан)	937.2	19	Mobiasbanca	341.8	7
Евразийский Банк	3,824.2	9	Moldindconbank	981.9	2
Жилстройсбербанк Казахстана	2,312.1	11	Moldova Agroindbank	1,026.7	1
Заман-Банк	94.8	36	ProCredit Bank	225.7	9
Исламский Банк Al Hilal	110.9	35	Unibank	554.9	5
Казинвестбанк	604.4	22	Victoriabank	892.1	3
Казкоммерцбанк	16,281.4	1	**Russian Federation**		
Народный Банк Казахстана	15,895.9	2	Абсолют банк	3,538.9	51
Нурбанк	1,645.7	14	Авангард	3,072.7	60
Ситибанк Казахстан	2,114.2	12	Аверс	1,159.8	111
ТЕМІРБАНК	1,970.0	13	АвтоВАЗбанк	867.4	141
ТПБ Китая	322.0	28	Автоградбанк	170.8	369
Хоум Кредит Банк	764.3	20	Автоторгбанк	317.4	260
ЦентрКредит	6,981.4	4	Агрокредбанк	87.3	495
Цеснабанк	6,013.1	6	Агропромкредит	953.8	131
Шинхан Банк Казахстан	113.8	34	Агророс	89.4	489
ЭКСИМБанк Казахстан	358.7	26	Агросоюз	232.7	302
Kyrgyzstan			Адмиралтейский	289.0	269
Айыл Банк	150.1	5	Азиатско-Тихоокеанский Банк	3,485.2	53
Аманбанк	60.6	11	Азия-Инвест банк	182.4	353
Бай-Тушум и Партнеры	132.9	8	Айви банк	80.8	505
Банк Азии	29.9	18	АйМаниБанк	592.6	177
Банк-Бакай	51.3	13	АйСиАйСиАй Банк Евразия	138.4	415
Бишкекский филиал НБП	51.1	14	Ак Барс	10,979.7	21
БТА Банк (Кыргызстан)	72.8	9	АкадемРусБанк	42.3	647
Демир Кыргыз Интернэшнл банк	234.3	3	Акибанк	779.2	150
Дос-Кредобанк	35.2	15	Аккобанк	109.7	455
Казкоммерцбанк Кыргызстан	25.1	19	Акрополь	47.2	625
Капитал Банк	8.2	22	Аксонбанк	102.2	466
КБ Кыргызстан	139.2	7	Актив банк	177.4	358
КИКБ	284.6	2	Активкапитал Банк	590.2	179
КыргызКредит Банк	9.7	21	Акцент	46.2	628
Манас Банк	10.3	20	Акцепт	389.0	229
Оптима Банк	317.7	1	Александровский	469.4	205
Росинбанк	144.0	6	Алеф-банк	574.0	183
РСК Банк	219.7	4	Алмазэргиэнбанк	635.9	168
Толубай	30.5	17	Алор Банк	71.2	539
ФинансКредитБанк	34.1	16	Алтайкапиталбанк	100.9	467
Халык Банк Кыргызстан	55.7	12	Альба Альянс	209.6	325
ЭкоИсламикБанк	61.6	10	Альта-банк	683.8	162
Moldova			Альфа-банк	45,144.2	7
Banca de Economii	653.5	4	АМБ Банк	868.7	140
Banca Sociala	340.3	8	Американ Экспресс Банк	53.8	603
BCR Chisinau	66.5	13	Анкор Банк Сбережений	186.0	350
Comertbank	75.2	12	Анталбанк	376.0	235

Banks/Countries	Assets, millions US$	Place by total assets	Banks/Countries	Assets, millions US$	Place by total assets
Апабанк	78.5	513	Булгар банк	43.5	641
Аресбанк	626.6	170	Бум-банк	59.4	584
Аспект	65.4	562	Бумеранг	50.5	613
Ассоциация	215.2	322	БФГ-Кредит	976.1	127
АФ Банк	198.9	336	БыстроБанк	1,061.8	119
Байкалбанк	426.0	220	Ваш личный банк	115.2	445
БайкалИнвестБанк	138.9	413	ВБРР	2,548.9	67
Балтийский банк	2,794.9	65	Вега-банк	243.5	291
Балтика	620.4	171	Век	165.7	376
Балтинвестбанк	1,947.1	80	Венец	92.4	481
Банк БФА	2,673.0	66	Верхневолжский	124.5	430
Банк БФТ	163.6	380	Веста	138.3	416
Банк БЦК-Москва	188.3	348	Викинг	50.1	614
Банк ВТБ	160,617.6	2	Витабанк	105.0	463
Банк ВТБ 24	61,931.3	4	Витязь	86.4	496
Банк Интеза	1,976.6	78	ВКАбанк	76.3	522
Банк Казани	191.0	344	Владбизнесбанк	61.6	578
Банк Китая (Элос)	410.8	224	Владпромбанк	90.8	486
Банк Москвы	50,736.5	6	Внешпромбанк	5,094.6	39
Банк Натиксис	616.3	174	Возрождение	6,309.9	33
Банк ПСА Финанс Рус	343.9	249	ВОК-Банк	203.1	332
Банк Санкт-Петербург	12,677.6	14	Волга-Кредит	225.5	307
Банк Сбережений и Кредита	465.9	206	Вологжанин	83.9	500
Банк СГБ	888.0	137	Воронеж	83.0	502
Банк Уралсиб	11,418.7	17	Восточный экспресс банк	6,883.5	30
Банк Фининвест	517.4	191	Востсибтранскомбанк	153.7	394
Банк24.ру	346.9	248	ВПБ	776.3	151
Банкирский дом	65.3	563	ВУЗ-банк	367.4	239
Банк-Т	202.0	333	Выборг-банк	67.8	554
Банкхаус Эрбе	139.9	411	Вэлтон Банк	54.6	594
Башкомснаббанк	321.2	258	Вятка-банк	530.4	189
ББР Банк	848.3	143	Гагаринский	83.4	501
Белгородсоцбанк	237.1	295	Газбанк	911.7	134
Бенифит-банк	254.8	289	Газнефтьбанк	56.7	591
Бизнес для Бизнеса	46.3	627	Газпромбанк	108,859.8	3
Бизнес-Сервис-Траст	56.7	590	Газстройбанк	133.0	423
БИНБАНК	6,557.4	31	Газтрансбанк	74.5	528
БКС-ИнвестБанк	680.1	163	Газэнергобанк	473.7	203
БКФ	218.7	317	Гаранти банк-Москва	484.5	199
БМВ Банк	698.6	160	Гарант-Инвест	266.1	281
БНКВ	185.9	351	Геленджик-банк	52.9	605
БНП Париба	2,977.3	62	Генбанк	238.4	293
Богородский	77.9	517	Глобус	50.0	615
Богородский МБ	75.2	525	Глобэкс	7,849.4	26
Братский АНКБ	78.9	510	Голдман Сакс Банк	234.9	300
БРиС	250.1	290	Горбанк	136.7	421
БРТ	138.7	414	Город	462.7	207
БТА-Казань	634.9	169	ГПБ-Ипотека	531.3	188

Banks/Countries	Assets, millions US$	Place by total assets	Banks/Countries	Assets, millions US$	Place by total assets
Гринкомбанк	45.1	631	Зенит	7,841.7	27
Гринфилдбанк	84.8	499	Зенит Сочи	172.6	363
ГУТА-Банк	652.1	165	Зернобанк	141.7	407
Дагэнергобанк	166.4	374	Зираат банк	85.1	497
Далена	54.6	596	Златкомбанк	51.1	611
Дальневосточный банк	803.2	147	И.Д.Е.А Банк	114.5	446
Данске Банк	365.8	240	Иваново	75.0	526
Девон-Кредит	749.3	154	Ижкомбанк	229.8	305
ДельтаКредит	3,020.4	61	Инбанк	159.7	386
Денизбанк Москва	387.5	230	Инвесткапитал	503.3	195
Держава	617.8	172	Инвестрастбанк	155.6	391
Джей энд Ти Банк	237.5	294	Инвестсоцбанк	82.6	504
ДжиИ Мани Банк	875.6	139	Инвестсоюз	192.8	341
Дземги	112.5	447	Инвестторгбанк	3,782.5	46
Диг-банк	82.9	503	ИНГ банк (Евразия)	7,079.1	29
Дил-Банк	323.8	257	Инкаробанк	85.0	498
ДНБ банк	191.1	343	Инресбанк	235.0	299
Дойче банк	4,432.0	42	Интерактивный Банк	99.6	470
Долинск	116.5	443	Интеркапитал-банк	47.2	624
Дом-банк	62.0	577	Интеркоммерц	1,443.7	98
Доninвест	95.8	476	Интеркредит	110.6	450
Донкомбанк	174.1	361	Интерпрогрессбанк	1,062.0	118
Донхлеббанк	68.8	550	Интерпромбанк	1,002.6	124
Евразийский банк	64.1	566	Интехбанк	617.3	173
ЕвроАксис Банк	87.7	494	Интрастбанк	425.3	221
Евроальянс	109.8	454	Йошкар-Ола	76.5	521
Еврокоммерц	208.6	326	ИпоТек Банк	70.3	546
Еврокредит	118.7	439	Ирс	72.1	538
Евромет	231.6	304	ИС банк	77.4	519
Европейский	240.3	292	ИТБ	124.7	429
Европлан	157.4	389	Итуруп	121.0	435
Евроситибанк	284.2	272	Ишбанк	215.4	321
Евротраст	524.4	190	Кавказпромстройбанк	66.3	558
Еврофинанс-Моснарбанк	1,644.8	90	Калуга	45.1	632
Единственный	61.4	579	Камский коммер. банк	172.3	365
Екатеринбург	340.7	250	Камчаткомагропр. банк	110.2	453
Екатерининский	62.8	572	Камчатпрофитбанк	193.0	340
Енисей	88.3	492	Канский	56.0	592
Енисейский объединенный	139.8	412	Капитал	73.4	534
Ермак	124.0	432	Капитал-Москва	118.5	440
ЕСБ	63.6	568	КБР	89.2	490
Жилкредит	51.9	609	Кедр	882.5	138
Жилфинансбанк	307.9	263	Кемсоцинбанк	46.2	629
Замоскворецкий	182.0	354	Кетовский	42.8	645
Западный	897.0	135	КИБ	109.7	456
Запсибкомбанк	2,805.7	64	Кивибанк	380.7	233
Заречье	122.9	434	Кизлярский	67.3	555
Земельный	44.1	635	КИТ-Финанс	2,260.1	72
Земский банк	119.6	436	Клиентский	387.1	231
Кольцо Урала	1,067.1	117	МБА-Москва	997.6	125

Banks/Countries	Assets, millions US$	Place by total assets	Banks/Countries	Assets, millions US$	Place by total assets
Коммерцбанк (Евразия)	1,295.3	104	МБО Оргбанк	135.5	422
Консервативный КБ	123.2	433	МБР	302.3	265
Констанс-банк	75.8	523	МБСП	1,597.8	92
Конфидэнс Банк	116.8	442	МБФИ	49.8	617
Кор	54.2	600	МДМ Банк	9,010.8	24
Королевский Банк Шотландии	1,284.3	105	Мегаполис	88.0	493
Костромаселькомбанк	90.3	487	Международный комбанк	165.0	377
Кошелев-Банк	78.6	511	Межрегионпочтабанк	151.0	396
Крайинвестбанк	1,122.2	114	МежСтройБанк	41.7	649
Кранбанк	174.6	360	Межтопэнергобанк	1,396.8	101
Креди Агриколь КИБ	1,509.7	96	Межтрастбанк	152.1	395
Кредит Европа Банк	4,613.2	41	Межфинансклуб	1,962.6	79
Кредит Свисс	1,039.0	122	Мерседес-Бенц Банк Рус	644.9	166
Кредит Урал банк	718.3	158	Металлинвестбанк	1,995.6	77
Кредит Экспресс	60.5	583	Меткомбанк	1,442.7	99
Кредит-Москва	265.2	282	Меткомбанк	1,265.6	108
Кредпромбанк	61.3	580	Метробанк	400.0	226
Кремлевский	149.5	397	МИА	496.7	196
КРК	334.4	251	Милбанк	111.5	449
Крокус-банк	78.5	512	Миллениум Банк	313.4	261
Крона-Банк	70.6	541	МИнБ	6,381.5	32
Кросна-банк	69.1	547	Мир Бизнес Банк	237.0	296
Кроссинвестбанк	175.3	359	Мираф-банк	100.2	468
Крыловский	145.9	405	Михайловский ПЖСБ	47.2	623
Кс-банк	276.1	278	МКБ им. С. Живаго	99.5	471
КУБ	63.3	570	МНХБ	205.8	330
Кубань Кредит	1,720.7	88	Мой Банк	547.3	185
Кубаньторгбанк	66.2	559	Мой Банк. Ипотека	146.7	404
Кузнецкбизнесбанк	198.7	337	Монолит	350.0	246
Кузнецкий	130.3	426	Мордовпромстройбанк	140.5	409
Кузнецкий мост	185.6	352	Морской банк	580.0	182
Курскпромбанк	482.2	200	Мосводоканалбанк	45.0	633
Лайтбанк	105.8	462	Москва-Сити	158.1	387
Ланта-банк	591.7	178	Московский вексельн.	62.2	576
Левобережный	967.9	129	Московский кред. банк	13,591.2	13
Легион	589.4	180	Московско-париж. банк	52.2	607
Леноблбанк	106.4	460	Москомбанк	119.5	437
Лесбанк	124.4	431	Москоммерцбанк	600.5	175
Лето Банк	932.3	133	Москомприватбанк	1,518.5	95
Липецккомбанк	797.5	148	Мособлбанк	1,816.1	84
Локо-банк	2,400.9	69	Мосстройэкономбанк	783.8	149
М2М Прайвет Банк	735.2	156	Мострансбанк	73.7	531
МАБ	283.9	273	Мосуралбанк	155.2	392
Майкопбанк	48.4	619	МСП Банк	3,892.8	45
Мак-банк	232.2	303	МТС Банк	5,231.9	37
Максима	49.8	618	МФБанк	69.0	548
Маст-банк	417.6	222	Навигатор	224.8	309
Мастер-Капитал	116.0	444	Нальчик	54.1	601

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Наратбанк	59.0	586	ОРБанк	67.1	556
Народный банк	43.3	644	Оренбург	325.6	256
Народный Доверительный банк	95.6	477	Открытие	6,084.7	35
Народный Кредит	1,270.8	107	ОТП Банк	4,311.1	43
Нацбанк Сбережений	64.2	565	ОФК-банк	426.6	219
Нацбизнесбанк	358.6	244	Первобанк	1,722.9	87
Национальный космический	376.4	234	Первомайский	478.0	201
Национальный стандарт	1,613.8	91	Первый инвест. банк	90.9	485
НацКлирингЦентр	12,533.2	16	Пересвет	3,101.4	59
Нацкорпбанк	65.8	560	Пермь	68.8	551
Наш дом	105.8	461	Петрокоммерц	7,232.5	28
НБ ТРАСТ	5,899.0	36	Платина	213.1	323
НБВК	59.4	585	Плюс-банк	427.0	218
НБД-банк	490.9	197	Пойдем!	488.7	198
НБК Банк	99.3	472	Почтобанк	52.5	606
НВКБ	235.7	297	ПРБ	1,170.7	109
Невский нарбанк	172.1	366	Преодоление	98.4	473
Нейва	137.8	417	Приморье	735.1	157
Нерюнгрибанк	43.4	643	Примсоцбанк	1,163.2	110
Нефтепромбанк	260.9	286	Приобье	54.6	595
Нефтяной Альянс	320.7	259	Прио-Внешторгбанк	288.6	270
НЗ банк	167.4	373	Приоритет	93.6	478
Нико-банк	277.1	277	Приско Капитал Банк	53.7	604
НИПБ	440.8	213	Пробизнесбанк	3,144.9	58
Новация	65.6	561	Проинвестбанк	77.9	516
Новикомбанк	5,159.2	38	Проминвестбанк	111.6	448
Новобанк	118.1	441	Проминвестрасчет	216.1	319
Новое Время	108.6	458	Промрегионбанк	127.1	428
Новопокровский	205.0	331	Промсбербанк	273.2	279
Новосибирский МБ	257.5	287	Промсвязьбанк	22,536.0	10
Новый кредитный союз	43.4	642	Промсельхозбанк	110.4	451
Новый московский банк	177.7	357	ПромСервисБанк	137.7	418
Новый символ	70.6	542	Промтрансбанк	262.8	285
Нокссбанк	76.6	520	Промэнергобанк	159.7	385
Номос-банк	28,463.9	8	Профессионал Банк	88.7	491
Нордеа Банк	8,383.0	25	Профит банк	131.5	425
НОТА-Банк	2,907.6	63	Профкредитбанк	73.9	529
НРБ	664.3	164	ПСКБ	512.9	193
НС-банк	1,298.2	103	ПТБ	47.1	626
НФК	456.5	210	Пульс столицы	68.9	549
Нэклис-банк	163.9	378	Пурпе	71.1	540
ОБПИ	163.8	379	ПЧРБ	773.8	152
Образование	956.8	130	Радиотехбанк	77.5	518
Объединенный капитал	434.4	217	Развитие	215.7	320
Огни Москвы	600.2	176	Развитие-Столица	411.2	223
Океан Банк	106.9	459	Райффайзенбанк	21,093.8	11
Окский	149.0	399	Расчетно-кредит. банк	444.0	212
Онего	41.2	650	РБА	98.3	474
ОПМ-банк	278.4	275	Региональный	43.9	637

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Региональный кредит	809.6	146	Русюгбанк	477.4	202
Регионбанк развития	157.9	388	РФК	72.6	536
Резерв	70.6	543	РЭБ	50.0	616
Резервные финансы	48.0	622	С.-Петербургский ИАБ	397.2	227
Ренессанс	221.9	314	Саратов	42.6	646
Ренессанс-Кредит	3,271.4	55	Саровбизнесбанк	1,095.9	115
РЕСО Кредит	167.6	372	Сбербанк России	499,065	1
РИА	144.6	406	Сберинвестбанк	79.3	509
Риал Кредит	67.0	557	СВА	191.4	342
Ринвестбанк	73.7	530	Связной Банк	2,093.1	74
РКА	43.8	638	Связь-банк	10,617.6	22
РН Банк	169.8	370	СДМ-банк	1,141.6	112
РНКБ	58.4	587	Северный Кредит	190.4	345
Росавтобанк	356.8	245	Северный народ. банк	171.5	368
Росбанк	20,929.2	12	Сервис-резерв	44.3	634
Росбизнесбанк	80.0	508	Сетелем Банк	1,878.2	83
Росгосстрахбанк	3,500.6	52	Сибнефтебанк	160.3	384
Росдорбанк	461.8	208	Сибсоцбанк	161.5	382
Росевробанк	3,780.4	47	Сибэс	54.2	599
Росинтербанк	1,325.3	102	Синко-банк	131.9	424
Роспромбанк	255.8	288	Система	68.5	552
Россельхозбанк	55,495.1	5	Сити Инвест банк	78.3	514
Российский капитал	3,430.7	54	Ситибанк	11,183.5	19
Российский кредит	2,199.4	73	СКА-банк	119.0	438
Россита-банк	68.1	553	СКБ-банк	3,696.5	49
Россия	12,633.0	15	Славия	234.7	301
РОСТ Банк	2,071.2	76	Славянский кредит	223.0	312
РостФинанс	48.2	621	Смартбанк	89.9	488
Росэксимбанк	363.9	241	СМП	4,711.0	40
Росэнергобанк	971.6	128	Снежинский	221.6	315
РСКБ	61.1	582	Собинбанк	1,656.8	89
РТС-Банк	92.8	479	Советский	996.5	126
Рублев	439.5	215	Совинком	42.2	648
Руна-банк	54.0	602	Совкомбанк	3,777.5	48
Рускобанк	224.9	308	Соколовский	43.7	640
Руснарбанк	293.1	268	Солид Банк	330.8	254
Руснацбанк	73.5	533	Солидарность	538.2	187
Русский земельный банк	386.4	232	Солидарность	367.9	238
Русский ипотечный банк	372.3	236	Софрино	218.3	318
Русский международный	1,059.5	120	Социнвестбанк	394.2	228
Русский стандарт	11,211.4	18	Социум-Банк	50.9	612
Русславбанк	1,034.4	123	Союз	2,473.6	68
Руссобанк	201.0	334	Союзный	127.4	427
Русстройбанк	840.8	144	Союзпромбанк	43.7	639
Русторгбанк	211.5	324	СПб банк инвестиций	51.7	610
РусТрастБанк	147.2	403	Спецсетьстройбанк	189.5	347
Русфинанс Банк	3,210.1	56	Спиритбанк	63.9	567
Русь	195.4	339	Спурт	636.9	167
Русьуниверсалбанк	281.0	274	ССБ	54.5	597

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Ставрополье	219.0	316	Унифондбанк	75.5	524
СтарБанк	460.1	209	Уралприватбанк	45.4	630
Старооскольский АПБ	54.4	598	Уралпромбанк	80.6	506
Стелла-банк	55.8	593	Уралтрансбанк	506.6	194
Столичный Кредит	72.4	537	Уральский капитал	222.9	313
Стратегия	301.5	266	Уральский фин. дом	770.5	153
Стройкомбанк	48.3	620	Ури Банк	189.6	346
Стройкредит	688.8	161	Уссури	102.9	464
Стройлесбанк	154.0	393	ФБИиР	208.5	327
Судостроительный банк	1,936.4	81	ФДБ	165.9	375
Сумитомо Мицуи Рус Банк	851.7	142	Ферробанк	110.4	452
Сургутнефтегазбанк	1,770.3	86	Фиа-банк	581.7	181
СЭБ Банк	331.1	253	ФИНАМ	223.0	311
Таатта	206.7	329	ФинансБизнесБанк	147.4	402
Таврический	1,416.5	100	Финансовый капитал	95.9	475
Тагилбанк	56.9	589	Финансовый стандарт	181.2	355
Тамбовкредитпромбанк	99.8	469	Финпромбанк	939.3	132
Татагропромбанк	62.2	575	Финсервис	888.9	136
Татинвестбанк	62.4	573	Финтрастбанк	52.2	608
Татсоцбанк	278.2	276	Фольксваген Банк Рус	836.3	145
Татфондбанк	3,677.5	50	Фондсервисбанк	2,088.5	75
Таурус Банк	74.8	527	Фора-банк	1,127.4	113
Тверской городской банк	91.7	483	Форбанк	65.0	564
Тверьуниверсалбанк	178.8	356	Форус Банк	91.0	484
Темпбанк	298.5	267	Форштадт	473.5	204
Тендер-банк	63.4	569	ФПК	92.1	482
Тихоокеанский ВТБ	264.7	283	Фьючер	70.6	544
ТКС Банк	3,206.3	57	Хакасский МБ	148.1	401
Тойота Банк	1,572.8	93	Ханты-Мансийс. банк	11,163	20
Тольяттихимбанк	371.0	237	ХКФ Банк	9,931.9	23
Томскпромстройбанк	224.8	310	Хлынов	440.2	214
Торжокуниверсалбанк	62.9	571	Хованский	313.2	262
ТПБ Китая	735.7	155	Холмск	61.2	581
Транскапиталбанк	4,154.0	44	Центр-Инвест	2,299.0	71
Транснациональный банк	516.9	192	Центркомбанк	358.7	243
Транспортный	704.0	159	Центрокредит	2,392.2	70
Трансстройбанк	200.8	335	Церих	148.9	400
Траст Капитал Банк	73.5	532	Чайна Констракшн Банк	197.2	338
Тройка Диалог	264.3	284	Челиндбанк	1,051.0	121
ТСБ	136.7	420	Челябинвестбанк	1,083.1	116
Тульский промышленник	57.2	588	Чувашкредитпромбанк	163.4	381
Тусар	347.1	247	Шумерлинский	108.8	457
ТЭМБР-банк	410.3	225	Эйч-Эс-Би-Си Банк (РР)	1,806.6	85
Тюменьагропромбанк	149.1	398	Экономбанк	359.2	242
УБРР	6,127.9	34	Экономикс-банк	173.6	362
Углеметбанк	272.1	280	Экономический союз	140.0	410
УМБ	187.0	349	Экопромбанк	331.3	252
Универсальный кредит	92.8	480	Экси-банк	137.4	419
Унифин	303.0	264	Эксперт Банк	156.9	390

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Экспо Капитал	70.3	545	Аксиома	129.5	108
Экспобанк	1,446.7	97	АктаБанк	599.3	42
Экспресс-Волга	1,272.7	106	Актив-банк	474.9	51
Экспресс-кредит	226.5	306	Акцент Банк	268.7	76
Эл банк	172.5	364	Альпари Банк	16.2	178
Элита	102.4	465	Альфа-Банк	3,664.9	11
Эллипс банк	548.1	184	Альянс	22.7	170
Эльбин	77.9	515	Апекс-Банк	159.2	100
Энергобанк	435.7	216	Аркада	262.2	80
Энергомашбанк	287.7	271	Артем Банк	54.5	150
Энергопромбанк	62.3	574	АСБИО Банк	59.4	147
Энерготрансбанк	545.9	186	Астра Банк	126.4	110
Эргобанк	168.8	371	Банк "Рыночные технологии"	71.1	131
Эсидбанк	44.0	636	Банк 3/4	536.4	49
Ю БИ ЭС Банк	171.7	367	Банк Богуслав	66.4	138
Юг-Инвестбанк	207.1	328	Банк Восток	384.6	58
Югра	1,571.4	94	Банк ВТБ (Украина)	3,163.5	14
Юниаструм банк	1,922.4	82	Банк инвестиций и сбережений	336.3	64
Юникор	141.6	408	Банк Кипра	325.3	67
ЮниКредит Банк	27,599.4	9	Банк Первый	362.0	61
Юнистрим	80.4	507	Банк Петрокоммерц-Украина	154.4	103
Япы Креди Москва	235.2	298	Банк Портал	19.6	174
Ярбанк	327.9	255	Банк СИЧ	59.8	144
Яринтербанк	72.7	535	Банк Юнисон	168.9	95
Tajikistan			БМ Банк	334.9	65
AccessBank Tajikistan	48.5	4	Брокбизнесбанк	3,617.4	12
Амонатбанк	234.7	3	БТА Банк	765.2	33
Бонки рушди Точикистон	39.3	5	ВАБ Банк	2,634.9	17
Ориенбанк	342.9	2	Велес	19.0	175
Сохибкорбанк	20.9	6	Вернум Банк	60.1	143
Точиксодиротбанк	587.6	1	ВиЭс Банк	277.4	75
Uzbekistan			Восточно-промышленный банк	21.0	172
InFinBank	223.4	8	Всеукраинский банк развития	818.0	32
ORIENT FINANS	123.8	9	Гефест	15.1	180
Азия Альянс Банк	505.5	6	Глобус	172.0	94
Алокабанк	313.6	7	Городской коммерческий банк	589.6	44
Асака	2,062.8	3	Грант	99.1	119
Ипотекабанк	1,331.4	4	Грин Банк	70.9	132
Народный банк	1,231.6	5	Даниэль	134.7	106
Нацбанк ВЭД	5,125.0	1	ДБ Сбербанка России	4,390.7	8
Туркистон	38.9	10	Дельта	6,918.4	4
Узпромстройбанк	3,101.4	2	Демарк	278.7	74
Универсал Банк	31.6	11	Держзембанк	18.4	177
Ukraine			Диамант	598.1	43
Авангард	46.7	156	Диви Банк	748.6	36
Авант-Банк	473.9	52	Дойче Банк ДБУ	231.4	84

Banks/Countries	Assets, millions US$	Place by total assets	Banks/Countries	Assets, millions US$	Place by total assets
АвтоКразБанк	194.8	90	Евробанк	164.1	99
Агрокомбанк	76.8	129	Еврогазбанк	457.4	56
Аккордбанк	83.2	128	Европромбанк	108.4	116
Захидинкомбанк	98.3	120	Омега Банк	90.8	125
Земельный капитал	38.0	161	ОТП Банк	2,342.3	18
Златобанк	949.1	29	Ощадбанк	12,957.3	2
Золотые ворота	206.4	87	Первый инвестиционный банк	155.6	102
Идея Банк	358.6	62	Пивденкомбанк	938.8	30
Имэксбанк	1,379.7	23	Пивденный	1,406.2	22
Инвестбанк	69.5	134	Пиреус Банк	315.0	69
Инвестиционно-трастовый банк	23.5	169	Платинум Банк	725.0	38
ИНГ банк (Украина)	1,209.2	25	Поликомбанк	69.1	135
Индустриалбанк	328.2	66	Полтава-банк	172.4	93
Интеграл	116.5	112	Порто-Франко	164.8	98
Интербанк	66.3	139	Правэкс-Банк	563.5	46
ИнтерКредитБанк	55.8	148	Прайм-Банк	46.1	157
Камбио	289.7	72	Премиум	105.9	117
Капитал	262.5	79	Приватбанк	26,834.8	1
Киев	265.1	78	ПроКредит Банк	310.9	70
Киевская Русь	1,047.3	28	Проминвестбанк	4,971.5	7
Классикбанк	146.0	104	Промфинбанк	29.1	165
Клиринговый дом	489.4	50	Промэкономбанк	121.2	111
Коминвестбанк	126.7	109	Профинбанк	50.3	154
Коммерческий индустриальный банк	27.8	167	ПУМБ	4,154.6	9
Конкорд	20.7	173	Радабанк	44.4	160
Контракт	95.5	121	Радикал Банк	228.7	85
Креди Агриколь Банк	1,769.4	19	Райффайзенбанк Аваль	5,437.3	5
Кредит Европа Банк	194.6	91	Расчетный центр	54.8	149
Кредит Оптима	32.9	163	Реал банк	559.1	47
Кредитвест Банк	63.8	141	Регион банк	53.9	152
Кредит-Днепр	737.1	37	Ренессанс Капитал	166.8	96
Кредитпромбанк	135.7	105	Родовид-Банк	1,105.4	26
Кредобанк	548.2	48	Русский стандарт	456.9	57
КСГ Банк	44.9	159	СЕБ Корпоративный банк	115.3	113
Легбанк	101.8	118	Ситибанк (Украина)	752.2	35
Львов	113.7	115	Софийский	64.3	140
Марфин Банк	316.6	68	Союз	579.3	45
Мегабанк	680.3	40	Стандарт	90.2	126
Международный Инвестбанк	217.1	86	Старокиевский банк	90.9	124
Мелиор Банк	54.2	151	Столичный	69.8	133
Меркурий	246.8	82	Таскомбанк	336.8	63
Метабанк	93.3	122	Терра Банк	606.4	41
Мисто Банк	197.7	89	ТК Кредит	198.0	88
Михайловский	59.8	145	ТРАСТ	68.2	136
Морской	158.9	101	Траст-Капитал	59.5	146
Мотор Банк	48.6	155	Укоопспилка	36.3	162
Надра	3,892.9	10	Украинский банк реконструкции и развития	16.1	179
Народный капитал	29.6	164	Украинский капитал	60.2	142
Национальные инвестиции	473.3	53	Украинский профессиональный банк	462.5	54

Banks/Countries	Assets, millions US$	Place by total assets	Banks/Countries	Assets, millions US$	Place by total assets
Национальный кредит	280.6	73	Украинский стр.-инв. банк	45.6	158
ОКСИ Банк	52.4	153	УкрБизнесБанк	722.0	39
Укргазбанк	2,976.8	16			
Укргазпромбанк	166.4	97			
Укринбанк	754.2	34			
Укркоммунбанк	68.0	137			
УкрСиббанк	3,016.6	15			
Укрсоцбанк	5,386.8	6			
Укрэксимбанк	11,804.0	3			
Универсал Банк	822.1	31			
Уникомбанк	114.8	114			
Фамильный	22.3	171			
Фидо Банк	1,429.4	21			
Финанс Банк	28.9	166			
Финансовая инициатива	1,629.6	20			
Финансовый партнер	131.5	107			
Финансы и Кредит	3,218.1	13			
Финбанк	370.4	59			
ФинексБанк	25.3	168			
Финростбанк	249.6	81			
Фортуна-банк	365.7	60			

Source: Banks of the CISs (2013), in Russian

Appendix B

Appendix to Chapter 3

Table B1: Mean technical efficiency by country and by year (2005-2012), models (2 - 4)

Panel A: Output distance function without country dummies in the frontier, model (2)

Country/ Year	2005	2006	2007	2008	2009	2010	2011	2012	Average by country
Armenia	0.823	0.870	0.831	0.848	0.890	0.886	0.881	0.883	0.866
Azerbaijan	0.891	0.874	0.862	0.830	0.906	0.914	0.862	0.911	0.884
Belarus	0.927	0.900	0.872	0.885	0.885	0.876	0.865	0.879	0.882
Kyrgyzstan	0.850	0.820	0.814	0.837	0.870	0.872	0.865	0.840	0.847
Kazakhstan	0.884	0.874	0.841	0.870	0.757	0.856	0.846	0.812	0.839
Moldova	0.921	0.900	0.856	0.868	0.918	0.905	0.898	0.909	0.895
Russia	0.881	0.877	0.878	0.906	0.905	0.906	0.903	0.904	0.896
Tajikistan	0.915	0.898	0.899	0.910	0.906	0.918	0.927	0.890	0.909
Ukraine	0.928	0.919	0.916	0.859	0.906	0.924	0.926	0.920	0.912
Uzbekistan	0.920	0.912	0.900	0.889	0.909	0.908	0.886	0.914	0.903
Average by year	0.885	0.879	0.873	0.893	0.895	0.902	0.896	0.897	0.891

Panel B: Hyperbolic distance function with country dummies in the frontier, model (3)

Country/Year	2005	2006	2007	2008	2009	2010	2011	2012	Average by country
Armenia	0.888	0.908	0.879	0.894	0.928	0.938	0.937	0.940	0.916
Azerbaijan	0.940	0.924	0.915	0.899	0.958	0.961	0.909	0.960	0.935
Belarus	0.960	0.940	0.911	0.928	0.944	0.934	0.931	0.935	0.934
Kyrgyzstan	0.923	0.909	0.917	0.931	0.952	0.954	0.954	0.945	0.938
Kazakhstan	0.912	0.905	0.883	0.905	0.800	0.890	0.886	0.867	0.878
Moldova	0.955	0.940	0.910	0.924	0.960	0.956	0.954	0.959	0.944
Russia	0.920	0.914	0.915	0.941	0.950	0.948	0.947	0.949	0.937
Tajikistan	0.960	0.945	0.951	0.958	0.958	0.961	0.963	0.945	0.955
Ukraine	0.948	0.940	0.937	0.884	0.943	0.961	0.962	0.960	0.943
Uzbekistan	0.971	0.969	0.964	0.965	0.970	0.972	0.964	0.975	0.969
Average by year	0.924	0.917	0.913	0.932	0.941	0.946	0.942	0.945	0.934

Panel C: Output distance function with country dummies in the frontier, model (4)

Country/Year	2005	2006	2007	2008	2009	2010	2011	2012	Average by country
Armenia	0.828	0.871	0.835	0.851	0.897	0.898	0.895	0.897	0.874
Azerbaijan	0.896	0.880	0.870	0.838	0.917	0.923	0.871	0.920	0.892
Belarus	0.930	0.904	0.873	0.889	0.896	0.884	0.875	0.887	0.889
Kyrgyzstan	0.891	0.872	0.872	0.885	0.912	0.913	0.910	0.896	0.895
Kazakhstan	0.888	0.880	0.842	0.869	0.767	0.859	0.850	0.816	0.842
Moldova	0.924	0.903	0.857	0.870	0.924	0.913	0.907	0.917	0.900
Russia	0.880	0.876	0.876	0.906	0.909	0.909	0.906	0.907	0.898
Tajikistan	0.910	0.891	0.894	0.904	0.906	0.916	0.925	0.884	0.905
Ukraine	0.917	0.903	0.900	0.822	0.888	0.915	0.918	0.911	0.897
Uzbekistan	0.932	0.927	0.918	0.908	0.927	0.928	0.913	0.932	0.923
Average by year	0.885	0.879	0.873	0.893	0.900	0.906	0.900	0.902	0.894

Appendix C

Appendix to Chapter 4

Table C1: Mean cost (Panel A) and profit (Panel B) efficiency by country and by year without Russia in the sample (2005-2012)

Panel A	2005	2006	2007	2008	2009	2010	2011	2012	Average by country
Armenia	0.80	0.82	0.86	0.95	0.87	0.92	0.93	0.90	0.88
Azerbaijan	0.83	0.80	0.88	0.93	0.88	0.89	0.89	0.92	0.88
Belarus	0.88	0.91	0.95	0.96	0.94	0.92	0.84	0.87	0.91
Kyrgyzstan	0.74	0.77	0.73	0.78	0.73	0.71	0.70	0.72	0.74
Kazakhstan	0.87	0.84	0.90	0.93	0.85	0.86	0.84	0.86	0.87
Moldova	0.80	0.85	0.90	0.89	0.89	0.85	0.86	0.87	0.86
Tajikistan	0.97	0.90	0.93	0.99	0.97	0.89	0.89	0.88	0.93
Ukraine	0.92	0.97	0.98	0.99	0.99	0.97	0.97	0.96	0.97
Uzbekistan	0.83	0.71	0.68	0.88	0.78	0.78	0.81	0.78	0.78
Average by year	0.85	0.84	0.87	0.92	0.88	0.86	0.86	0.86	
Panel B									
Armenia	0.92	0.92	0.93	0.90	0.89	0.93	0.94	0.94	0.92
Azerbaijan	0.93	0.95	0.94	0.86	0.92	0.92	0.92	0.91	0.92
Belarus	0.65	0.74	0.79	0.78	0.83	0.81	0.46	0.62	0.71
Kyrgyzstan	0.93	0.95	0.76	0.78	0.96	0.96	0.89	0.87	0.89
Kazakhstan	0.88	0.90	0.86	0.85	0.89	0.84	0.88	0.82	0.87
Moldova	0.89	0.86	0.88	0.89	0.82	0.91	0.92	0.91	0.89
Tajikistan	0.67	0.83	0.85	0.75	0.89	0.85	0.87	0.91	0.83
Ukraine	0.84	0.88	0.89	0.78	0.70	0.87	0.89	0.87	0.84
Uzbekistan	0.81	0.89	0.92	0.85	0.92	0.93	0.92	0.92	0.89
Average by year	0.83	0.88	0.87	0.83	0.87	0.89	0.85	0.86	

Appendix D

Appendix to Chapter 5

Table D1: Banking sector development in five CIS countries (2000-2006)

Year	Belarus	Kazakhstan	Russia	Ukraine	Uzbekistan
2000	New Banking Code enacted; September: unification of official with non-official exchange rates	Credit boom; Minimum capital requirements raised	–	Economic recovery; Credit boom gathers momentum; Rehabilitation plan for Oshchadbank launched; New government strengthens macro- stabilization, presses ahead with structural reforms	–
2001	April–September IMF Staff-monitored Program carried out: directed credits phased	October: privatization of majority stake of Halyk bank; November: RZB, EBRD, IFC a.o. purchase minority stake in Bank TuranAlem	End-2001: post- crisis profitability of sector restored	January: Law on Banks and Banking Activity effective July: NBU shuts down Bank Ukraina; September: Fund for Guarantee of Deposits of Natural Persons created	Government somewhat curtails loan guarantees; December: CBU officially terminates directed credits
2002	January: minimum capital requirements raised, banking supervision tightened; Directed credits re-emerge; December: RZB acquires majority stake of Priorbank	–	–	–	April: Deposit Guarantee Fund introduced
2003	Early 2003: revocation of one bank's license due to non-fulfilment of capital requirements; Mid-year: NBRB instructs banks to cut	January: asset classification and loss provisioning rules tightened, IAS compulsory for all banks, minimum capital adequacy lifted to 12%	December: limited deposit insurance scheme enacted; All banks applying for participation in scheme undergo special BR	–	Banks asked to provision for guaranteed credits; State sells minority shares in seven medium-sized banks; October: reunification of exchange

	non-performing loans to 5% of total loans		inspections		rates, current account convertibility, but new administrative trade barriers set up
2004	Early 2004: NBRB instruction on cutting bad credits reportedly fulfilled, but largely through "evergreening"; Some large SOBs continue to flout regulations; Late 2004: liquidity crunch, subsequently defused	January: limited household deposit insurance mandatory, banking supervision shifts from NBK to Agency of the Republic of Kazakhstan on Regulation and Supervision of Financial Markets and Institutions; Kazakhstani banks buy stakes in IAS Russian, Ukrainian, Belorussian and Kyrgyz banks	April: revised general regulation "On banks' mandatory norms" enters into force; July: banking mini-crisis, Gutabank illiquid, sold to VTB, interim guarantee for all existing private deposits granted, foreigners acquire some medium-sized Russian banks; introduced alongside RAS (for banks)	March: NBU raises minimum capital adequacy ratio from 8% to 10%; Nov.–Dec.: mini-banking panic triggered by political instability related to government change	–
2005	–	From mid-2005: to rein in banks' foreign borrowing capital adequacy regulations and reserve requirements repeatedly tightened; Late 2005: Consolidated supervision of financial-industrial conglomerates introduced	June: law on credit bureaux enters into force; September: BR announces that 924 banks (holding 99% of private deposits) have passed inspections, are admitted to deposit insurance; Late 2005: Deposit insurance scheme starts operations	Early 2005: mini-panic overcome; October: RZB takes over Bank Aval for EUR 850 million; December: BNP Paribas purchases 51% of Ukrsibbank	March: Biznesbank shut down; April: policy driven merger of Uzzhilsberbank and Zaminbank creates Ipotekabank
2006	July: amendments to Banking Code strengthen NBRB supervisory authority and streamline licensing procedures	–	February: Raiffeisen purchases Impeksbank	February: Banca Intesa buys Ukrsotsbank for EUR 900 million; June: OTP acquires Raiffeisenbank Ukraine	–

Note: The table is based on Barisitz (2008), pp.150-152.

Table D2: Macroeconomic and banking sector-related indicators (1991–2005)*

Indicator/Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Belarus															
GDP growth (real, %)	–	9.6	7.6	12.6	10.4	2.8	11.4	8.4	3.4	5.8	4.7	5.1	6.9	11.4	9.2
CPI inflation (%)	–	1,559.0	1,996.00	1,960.0	244	39.3	63.4	181.7	251.3	107.5	46.2	34.8	25.4	14.4	8
Exchange rate**	–	–	–	–	–	–	–	–	295.1	739.2	1,271.90	1,704.6	2,346.6	2,685.5	2,677.0
Broad money (M2, % of GDP)	–	–	–	39	15	14.8	15.8	30.9	16.5	17.7	15.2	15.1	16.9	17.8	19.7
Number of banks (of which foreign-owned)	–	–	–	48	42 (1)	38 (2)	38 (2)	37 (2)	36 (4)	31 (6)	29 (9)	28 (12)	30 (17)	32 (19)	30 (18)
Financial intermediation (assets/GDP %)	–	–	–	–	–	–	–	–	–	29.5	25.5	25.7	27.7	29.5	32.2
Asset share of state-owned banks (%)	–	–	–	69.2	62.3	54.1	55.2	59.5	66.6	65.2	63.9	61.9	61.6	70.2	75.2
Asset share of foreign-owned banks (%)	–	–	–	–	–	–	–	–	2.9	4.5	7.5	8.1	20.4	19.9	16.2
Deposit rate (% p.a.)	–	–	65.1	89.6	100.8	32.3	15.6	14.3	23.8	37.6	34.2	26.9	17.4	12.7	9.2
Lending rate (% p.a.)	–	–	71.6	148.5	175	62.3	31.8	27	51	67.7	47	36.9	24	16.9	11.4
Domestic credit (% of GDP)	–	–	–	17.6	6.2	6.7	8.3	16.1	9.3	8.9	–	–	–	–	–
Deposits (volume of deposits/GDP %)	–	–	–	–	–	–	–	–	–	–	11.9	12.1	13.6	14.9	16.3
Credit (credit volume/GDP %)	–	–	–	–	–	–	–	–	–	18.6	15.9	14	15.3	18.4	19.6
Return on equity (ROE, %)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Capital adequacy (capital/risk-weighted assets %)	–	–	–	–	–	–	–	–	–	24.4	20.7	24.2	26	25.2	26.7
Kazakhstan	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
GDP growth (real, %)	13	2.9	9.2	12.6	8.2	0.5	1.7	1.9	2.7	9.8	13.5	9.8	9.3	9.6	9.4
CPI inflation (%)	137	2,984.0	2,169.0	1,158.0	60.4	28.6	11.2	1.9	17.8	9.8	6.4	6.6	6.8	6.7	7.5
Exchange rate**	–	–	–	–	–	–	–	–	127.9	130.9	131.6	144.6	169.1	169	165.3
Broad money (M2, % of GDP)	–	–	27.9	13.1	11.4	9.5	10.3	8.6	13.6	15.3	17.1	19.2	20.3	27.1	36.6
Number of banks (of which foreign-owned)	72 (1)	155 (1)	204 (5)	184 (8)	130 (8)	101 (9)	81 (22)	71 (20)	55 (18)	48 (16)	44 (15)	38 (17)	36 (16)	35 (15)	34 (14)
Financial intermediation (assets/GDP %)	–	–	–	–	–	–	–	–	16.9	20.3	25.1	30.6	37.7	45.8	60.6
Asset share of state-owned banks (%)	–	–	–	–	24.3	28.4	44.8	23	19.9	1.9	3.5	5.2	5.1	3.7	3.1
Asset share of foreign-owned banks (%)	–	–	–	–	–	–	–	–	–	–	–	–	5.5	7.3	–
Deposit rate (% p.a.)	–	–	–	–	44.4	29.3	12	14.5	13.5	15.6	12.8	11	10.9	9.3	9.1
Lending rate (% p.a.)	–	–	–	–	58.3	53.6	22.8	17	20.8	18.8	15.3	14.1	14.9	13.7	13

Domestic credit (% of GDP)	–	–	49.3	26.6	7.1	6.3	4.3	5.4	7.4	10.6	–	–	–	–	–
Deposits (volume of deposits/GDP %)	–	–	–	–	–	–	–	–	8.5	11.3	13.5	16	15.9	22.6	–
Credit (credit volume/GDP %)	–	–	–	–	–	–	–	–	7.6	10.9	15.3	18.1	21.3	25.9	35.6
Return on equity (ROE, %)	–	–	–	–	–	–	–	–	13.8	7.9	5.4	13.8	14.2	11.2	14.1
Capital adequacy (capital/risk-weighted assets %)	–	–	–	–	–	–	–	–	27.6	25.7	18.6	17.2	16.9	15.9	15
Russian Federation	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
GDP growth (real, %)	5.0	14.5	8.7	12.7	4.1	3.6	1.4	5.3	6.4	10	5.1	4.7	7.3	7.2	6.4
CPI inflation (%)	161	2,506.0	840	204.4	128.6	21.8	10.9	84.5	36.8	20.1	18.6	15.1	12	11.7	10.9
Exchange rate**	–	–	–	–	–	–	–	–	–	–	26.13	29.65	34.69	35.81	35.22
Broad money (M2, % of GDP)	68	37	21.4	16	13.9	14.4	16	17	14.6	15.7	18	19.6	24.3	26	27.9
Number of banks (of which foreign-owned)	1,360	1,747	2,009	2,456	2,297 (21)	2,029 (22)	1,697 (26)	1,476 (30)	1,349 (32)	1,311 (33)	1,319 (35)	1,329 (37)	1,329 (41)	1,299 (42)	1,253 (52)
Financial intermediation (assets/GDP %)	–	–	–	–	–	–	30.1	39.8	33.3	33.4	35.3	38.3	42.3	42.6	45.1
Asset share of state-owned banks (%)	–	–	–	–	–	–	37	41.9	–	–	–	37.5	36	38.1	–
Asset share of foreign-owned banks (%)	–	–	–	–	–	–	–	6.7a	10.6	9.5	8.8	8.1	7.4	7.6	11.2
Deposit rate (% p.a.)	–	–	–	–	102	55.1	16.8	17.1	13.7	6.5	5.2	4.3	4.4	3.8	3.6
Lending rate (% p.a.)	–	–	–	–	320	146.8	32	41.8	39.7	24.4	16.5	15	12.4	10	11.1
Domestic credit (% of GDP)	–	–	11.8	12.1	8.7	7.4	9.5	12.6	10.9	11.9	–	–	–	–	–
Deposits (volume of deposits/GDP %)	–	–	–	–	–	–	–	–	–	–	10.7	12.6	14.5	15.6	17.7
Credit (credit volume/GDP %)	–	–	–	–	–	–	–	–	–	–	16.5	17.7	21.7	23.1	25.7
Return on equity (ROE, %)	–	–	–	–	–	–	–	–	–	24.9	19.4	18	17.8	20.2	23.9
Capital adequacy (capital/risk-weighted assets %)	–	–	–	–	–	–	23.4	19.8	26.7	–	24.3	22.2	19.1	17	16
Ukraine	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
GDP growth (real, %)	11.6	13.7	14.2	22.9	12.2	10	3	1.9	0.2	5.9	9.2	5.2	9.4	12.1	2.6
CPI inflation (%)	161	2,730.0	10,155	401	181.7	39.7	10.1	20	19.2	25.8	6.1	–0.6	8.2	12.3	10.3
Exchange rate**	–	–	–	–	–	–	–	–	4.393	5.029	4.814	5.03	6.024	6.609	6.389
Broad money (M2, % of GDP)	–	–	33.9	26.7	12.6	11.5	13.4	15.3	16.6	18.5	22.1	28.5	35.3	36.4	43.4
Number of banks (of which foreign-owned)	–	133	211	228 (1)	230 (1)	229 (6)	227 (12)	175 (12)	161 (15)	154 (14)	152 (16)	157 (15)	158 (19)	160 (19)	164 (23)
Financial intermediation (assets/GDP %)	–	–	–	–	–	–	–	–	19.6	21.8	23.3	28.3	37.9	43.5	51.1
Asset share of state-owned banks (%)	–	–	–	–	–	–	13.5	13.7	12.5	11.9	11.8	12	9.8	8	–

Asset share of foreign-owned banks (%)	–	–	–	–	–	–	–	10.5	11.1	12.1	12.3	12.1	13	21.4	–
Deposit rate (% p.a.)	–	–	160	209	70	33.6	18.2	22.3	20.7	13.7	11	7.9	7	7.8	8.5
Lending rate (% p.a.)	–	–	184	250	123	79.9	49.1	54.5	55	41.5	32.3	25.4	17.9	17.4	16.2
Domestic credit (% of GDP)	–	–	–	–	1.5	1.4	2.5	7.8	8.6	11.2	–	–	–	–	–
Deposits (volume of deposits/GDP %)	–	–	–	–	–	–	–	–	9.6	11.4	12.8	16.9	23.4	24.1	31.7
Credit (credit volume/GDP %)	–	–	–	–	–	–	–	–	9	12.4	14.5	19.4	26.6	27.1	35.3
Return on equity (ROE, %)	–	–	–	–	–	–	–	–	8.7	0.5	7.5	8	7.6	8.4	10.4
Capital adequacy (capital/risk-weighted assets %)	–	–	–	–	–	–	–	–	19.6	15.5	20.7	18	15.2	16.8	15

Uzbekistan	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
GDP growth (real, %)	0.5	11.1	2.3	4.2	0.9	1.6	2.5	4.3	4.3	3.8	4.1	3.1	1.5	7.4	7
CPI inflation (%)	169	910	885	1,281.0	116.9	64.3	27.6	26.1	26	28.2	26.4	24.4	7.7	15.5	18.8
Exchange rate**	–	–	–	–	–	–	–	–	274	332.3	578.9	833.4	1,124.40	1,231.90	1,333.70
Broad money (M2, % of GDP)	–	69.4	53.5	34.7	18.2	21	17.5	15.4	13.6	12.2	12.4	10.6	10.3	12.2	15.1
Number of banks (of which foreign-owned)	–	21	21 (1)	29 (1)	31 (1)	29 (2)	30 (4)	33 (4)	35 (5)	34 (6)	38 (6)	35 (6)	33 (5)	31 (5)	29 (4)
Financial intermediation (assets/GDP %)	–	–	–	–	–	–	–	–	–	39.7	48.7	44	37.8	–	30
Asset share of state-owned banks (%)	–	21.7	15.9	46.7	38.4	75.5	70.6	67.3	65.8	77.5	80.4	73.7	70	67.6	–
Asset share of foreign-owned banks (%)	–	–	–	–	–	–	–	–	2	2.2	2.4	3.2	4.3	4.4	3.4
Deposit rate (% p.a.)	7	10	30	60	90	28	14.8	13.1	13.5	18.8	21.2	26	20.3	16.1	15.5
Lending rate (% p.a.)	–	–	–	100	105	49.7	28	33.1	32.7	27.6	27.6	33.4	23.9	21.2	19.9
Domestic credit (% of GDP)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Deposits (volume of deposits/GDP %)	–	–	–	–	–	–	–	–	–	8.6	9.1	8	7.8	8	–
Credit (credit volume/GDP %)	–	–	–	–	–	–	–	–	22	28.4	36.9	34	27.5	24.5	20.4
Return on equity (ROE, %)	–	–	–	–	–	–	–	–	–	12.5	9.4	7	7.3	8.2	–
Capital adequacy (capital/risk-weighted assets %)	–	–	–	–	–	–	–	–	–	44.5	40.5	38.6	32.7	28	–

Note: *The table is based on Barisitz (2008). Sources: various EBRD Transition Reports, IMF, Raiffeisen Zentralbank, Bank Rossii, WIIW (Wiener Institut für internationale Wirtschaftsvergleiche (Vienna Institut for International Economic Studies)； **National currency/EUR, annual average.

Table D3: Correlation matrix of the variables used in the main regression

	Lerner Index	Bank size	Loans to assets	Fixed assets to total assets	Depth of credit information	Log GDP growth	Supervisory power	Activity restriction	Banking freedom	Government banks assets share
Lerner Index	1									
Bank size	0.1948	1								
Loans to assets	-0.4983	-0.046	1							
Fixed assets to total assets	-0.0594	-0.2249	-0.0059	1						
Depth of credit information	-0.0576	0.1884	-0.066	-0.0136	1					
Log GDP growth	0.0962	-0.071	0.013	0.0011	-0.2545	1				
Supervisory power	0.0878	-0.2104	0.0489	-0.0371	-0.6244	0.1119	1			
Activity restriction	0.1717	-0.1426	0.0474	0.1201	-0.0912	0.1879	0.2496	1		
Banking freedom	-0.0391	-0.0211	-0.0112	-0.0164	0.2286	-0.119	0.0699	0.2251	1	
Government banks assets share	-0.0477	0.0286	-0.0677	0.0003	0.1673	-0.0179	-0.3899	-0.386	-0.74	1

Table D4: The questionnaire used in construction of the Legal rights and Supervision indicators

Indicator/ Description	Description	Questions
Supervision (Higher values indicate greater power.) Range: 0—14 Source: Barth et al. (2013)	Whether the supervisory authorities have the authority to take specific actions to prevent and correct problems.	1. Can supervisors meet external auditors to discuss report without bank approval? 2. Are auditors legally required to report misconduct by managers/directors to supervisory agency? 3. Can legal action against external auditors be taken by supervisor for negligence? 4. Can supervisors force banks to change internal organizational structure? 5. Are off-balance sheet items disclosed to supervisors? 6. Can the supervisory agency order directors/management to constitute provisions to cover actual/potential losses? 7. Can the supervisory agency suspend director's decision to distribute: 1. dividends. 2. bonuses. 3. management fees 8. Can the supervisory agency supersede bank shareholder rights and declare bank insolvent? 9. Does the Banking Law give authority to the supervisory agency to intervene-that is, suspend some or all ownership rights-a problem bank? 10. Regarding bank restructuring & reorganization, can supervisory agency or any other govt. agency do the following: 1. supersede shareholder rights. 2. remove and replace management. 3. remove and replace directors
Depth of credit information (Higher values indicate better access to credit information.) Range: 1-6 Source: Doing Business-World Bank, http://www.doingbusiness.org/Methodology/getting-credit#legalRights	The depth of credit information index measures rules and practices affecting the coverage, scope and accessibility of credit information available through either a credit bureau or a credit registry	1. Are data on both firms and individuals distributed? 2. Are both positive and negative credit data distributed? 3. Are data from retailers or utility companies - in addition to data from banks and financial institutions - distributed? 4. Are at least 2 years of historical data distributed? (Credit bureaus and registries that distribute more than 10 years of negative data or erase data on defaults as soon as they are repaid obtain a score of 0 for this component.) 5. Are data on loan amounts below 1% of income per capita distributed? 6. By law, do borrowers have the right to access their data in the credit bureau or credit registry?

Source: World Bank

Table D5: Business reforms for Getting credit in the CISs (2008-2014)

Country	Year	Business Reforms	✔/ ✗*
Armenia	2012	Armenia improved its credit information system by introducing a requirement to collect and distribute information from utility companies.	✔
	2010	Armenia improved its credit information system through a new law establishing a legal and regulatory framework for the activities of credit bureaus, including collecting credit information and preparing credit reports.	✔
	2008	In Armenia a private credit bureau started operating that distributes credit information on firms and individuals, has no minimum threshold for loans included in its database and guarantees all borrowers access to their credit reports.	✔
Azerbaijan	2011	Azerbaijan improved access to credit by establishing an online platform allowing financial institutions to provide information to, and retrieve it from, the public credit registry.	✔
	2010	Azerbaijan's public credit registry improved the credit information system by providing banks with online access to its database, increasing the data available on borrowers and introducing penalties for banks that send information that is late or incorrect.	✔
	2009	Azerbaijan improved access to credit information by eliminating the minimum threshold for loans reported to the public credit registry.	✔
Belarus	2011	Belarus enhanced access to credit by facilitating the use of the pledge as a security arrangement and providing for out-of-court enforcement of the pledge on default.	✔
	2009	Belarus improved access to credit information by eliminating the minimum threshold for credits reported to the public credit registry's database and guaranteeing borrowers' right to inspect their own data in the credit registry.	✔
Kazakhstan	2013	Kazakhstan strengthened secured creditor rights by introducing new grounds for relief from an automatic stay during rehabilitation proceedings.	✔
	2009	Kazakhstan's private credit bureau increased its sources of credit information by adding retailers such as furniture companies and utilities such as the gas company.	✔
Kyrgyz Republic	2010	The Kyrgyz Republic strengthened its secured transactions system through amendments to its civil code and pledge law making secured lending more flexible, allowing a general description of encumbered assets and of debts and obligations and providing for the automatic extension of a security right to proceeds of the original asset.	✔
Moldova	2014	Moldova strengthened its secured transactions system by introducing new grounds for relief from an automatic stay during insolvency and restructuring proceedings.	✔
	2012	Moldova improved its credit information system by establishing its first private credit bureau.	✔
	2009	Moldova improved its credit information system through a new credit bureau law to facilitate the creation of a private credit bureau.	✔
Russian Federation	2008	In Russia access to credit information was improved by the launch of a private credit bureau, the National Bureau of Credit Histories (NBKI), and by a requirement that banks submit credit data to the credit bureau.	✔
Tajikistan	2015	Tajikistan improved access to credit information by beginning to provide credit scores.	✔
	2014	Tajikistan improved access to credit information by establishing a private credit bureau.	✔
	2012	Access to credit using movable property in Tajikistan became more complicated because the movable collateral registry stopped its operations in January, 2011.	✗
	2010	Tajikistan improved its credit information system through a new law allowing the creation of a private credit bureau.	✔
Ukraine	2014	Ukraine improved access to credit information by collecting data on firms from financial institutions.	✔
	2009	Ukraine improved access to credit information by creating a new private credit bureau.	✔
Uzbekistan	2014	Uzbekistan improved access to credit information by expanding the scope of credit information and requiring that more than 2 years of historical data be collected and distributed.	✔
	2013	Uzbekistan improved access to credit information by guaranteeing borrowers' right to inspect their personal data.	✔

2009	In Uzbekistan a private credit bureau (Inter Bank Kredit Bureau) started collecting information on the repayment patterns of individual borrowers as well as firms.	✔

Source: World Bank. Note: * ✔ means positive developments in rules on regulation and supervision, and ✗ means worsening of regulation and supervision legislation. Source: http://www.doingbusiness.org/reforms/overview/topic/getting-credit

Table D6: Coefficients estimated and used for estimation of marginal costs by country

Coefficient/ country	Armenia	Azerbaijan	Belarus	Kyrgyzstan	Kazakhstan	Moldova	Russia	Tajikistan	Ukraine	Uzbekistan
β_1	-4.036	-0.0159	1.413	-17.29	1.98	1.5	0.125	4.399	1.535	1.109
β_2	0.43	0.089	-0.037	1.748	-0.076	-0.0421	0.0672	-0.299	-0.0379	-0.00711
ϕ	0.11	-0.0751	-0.00266	0.0499	-0.161	-0.0336	-0.00495	0.0391	-0.00557	-0.0335
σ_3	-0.0258	-0.0156	0.00534	-0.361	0.00698	0.00897	-0.0114	0.0468	-0.00475	0.0107
Obs	80	131	80	23	130	72	1,847	24	94	54
R-sq	0.877	0.989	0.990	0.993	0.979	0.992	0.975	0.999	0.989	0.998
N. banks	10	18	12	3	18	11	234	4	14	9

***** p<0.01, ** p<0.05, * p<0.1**

D1: Boone indicator

Boone indicator of competition (Boone, 2008) calculated using Schaeck and Cihak (2014) specification for banking firms.

$$\pi_{it} = \alpha_i + \sum_{k=1}^{T} \beta_{k1}\, d_{kt} \ln(c_{it}) + \sum_{k=1}^{T-1} \beta_{k2}\, d_{kt} + u_{it}$$

where π_{it} are the profits of banking firm i at time t divided by total assets, T is the total number of years under consideration; d_{kt} are time dummies, where $d_{kt} = 1\ if\ k = 1$ and 0 otherwise; c_{it} are average variable costs; and u_{it} is the error term. Average costs are calculated as a ratio of interest and non-interest expenses over total interest and non-interest income. The larger the $ß$ in absolute terms, the stronger is competition. I.e., the lower the marginal cost ($\beta < 0$) the more profitable is a bank, which leads to higher profits for more efficient banks. Table A2.1 shows the Boone's indicators obtained by year and country.

Table D7: Boone indicator by country and year

	2005	2006	2007	2008	2009	2010	2011	2012	2013
AM	-0.290***	-0.282***	-0.200***	-0.130***	-0.143***	-0.981	-0.214*	0.0263	0.0750**
AZ	.	-0.142	-2.123	-7.744	-0.618	-0.811***	-1.031***	-1.031***	-0.964***
BY	.	-0.249	-0.145	-0.0640	0.0226	0.970	1.515	1.988	0.348
KG	.	.	-0.170	-0.130**	.	.	.	-0.0132	.
KZ	14.14*	-0.776***	0.398***	-0.706***	-0.788***	-2.072*	0.687	-0.756***	-0.655**
MD	-0.617***	-0.144***	0.00560	0.0639**	0.0847	-0.0779***	-0.0546***	-0.0378**	-0.0411
RU	-1.049***	-0.937***	-0.830***	-1.022***	-0.917***	-0.918***	-0.870***	-0.896***	-0.921***
TJ	.	.	.	-0.0553	.	.	0.184	-0.0907**	-0.127***
UA	0.0343	0.512***	1.803***	1.004***	0.795***	-0.306**	0.393	-0.203	0.971***
UZ	.	.	0.0351***	0.0866**	0.166***	0.259***	-1.880***	-1.000***	0.150***

*** p<0.01, ** p<0.05, * p<0.1

Note: AM - Armenia; AZ – Azerbaijan; BY – Belarus; KG – Kyrgyzstan; KZ – Kazakhstan; MD- Moldova; RU –Russia, TJ – Tajikistan; UA – Ukraine; UZ – Uzbekistan.

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