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**TRANSITION OF BANKING SYSTEM FROM
ONE-TIER TO TWO-TIER SYSTEM IN
VISEGRAD COUNTRIES**

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DECLARATION

The thesis conforms to the requirements for a Master's thesis

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The thesis is 20,424 words in length, excluding Appendices (20,584 including Appendices).

I have written the Master's thesis independently. All works and major viewpoints of the other authors, data from other sources of literature and elsewhere used for writing this paper have been referenced.

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ABSTRACT

The aim of this dissertation is to provide a detailed quantitative and qualitative assessment of the banking system currently in place in the Visegrad countries, as well as its transition from the Soviet system to a capitalist market-oriented system. Information was collected on banks in Slovakia, the Czech Republic, Hungary, and Poland, relating to the period from 1995 to 2016, and further divided them into four periods based on key historical events: 1995 to 2004, marking the beginning of the second period of economic transition up until the year all four countries joined the European Union; 2005 to 2008, when the global financial crisis started followed by the post-crisis and recession period - 2009 to 2013; and 2014 to 2016. The empirical part of this study focuses on estimating the stability of the banking system, the impact of regulations and supervision on the stability of this system the performance and effectiveness (productivity) of the system, and the impact of banking sector performance on economic growth, by testing the following three hypotheses:

1. The Polish banking system was the most stable across all periods.
2. The Czech banking system was the most profitable across all periods.
3. Transition in Slovakia occurred more smoothly than the transition in other countries.

Two different methods are used for the data analysis. For the first hypothesis, I have used panel data regression with random effect model. For the second and third hypotheses, I used traditional ratio analysis based on DuPont formula and other financial ratios, which were constructed using historical data taken from Bank Scope, together with random-effects GLS regression.

The results suggest that, as measured by z-score, Slovakia had the most stable banking sector in most years, followed by Poland, Hungary, and the Czech Republic. Additionally, according to the regression analysis, the imposition of strict requirements for banks applying for licenses in Visegrad countries has led to greater banking system stability, while prohibiting additional banking activities—such as real estate, insurance, securities, or other non-financial services—leads to lower stability in the overall system.

When testing the second and third hypotheses, we determined that, between 1995 and 2008, Hungarian banks were the best performing based on ROAE and net interest margin. After the global financial crisis, the best performing banking sector was seen in Poland (based on the ROAA). The Czech Republic showed the highest level of efficiency in almost all periods except for the first period (1995 to 2004), during which it was outperformed by Poland.

We also found that, based on our analysis, it cannot be concluded that the banks' performance has had significant impact on the economic growth of the Visegrad countries in the years from 1995 to 2015; on the other hand, in the Czech Republic, ROAA has been positively correlated with national economic growth of the country.

Keywords: Banking system, transition, Visegrad group

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ABSTRAKT

Cieľom tejto diplomovej práce je vypracovanie detailného pohľadu ako na kvantitatívnu, tak aj na kvalitatívnu stránku bankového systému ako aj jeho prechodu zo Sovietskeho systému na kapitalistický, trhovo orientovaný systém vo Vyšehradských krajinách. Informácie o bankách na Slovensku, v Českej Republike, Maďarsku a Poľsku boli zozbierané od 1995 do 2016 a ďalej som toto obdobie rozdelila na 4 časové úseky podľa hlavných historických udalostí: začína sa to rokom 1995, ktorý je označený ako začiatok druhej vlny ekonomického prechodu až do 2004 kedy všetky 4 krajiny vstúpili do Európskej Únie, ďalej od 2005 do 2008 kedy vypukla globálna finančná kríza, ďalej obdobie krízy a recesie 2009 až 2013 a nakoniec 2014 až 2016. Empirická časť tejto štúdie sa zameriava na meranie stability bankového systému a skúma aký majú prísnejšie regulácie a dohľad vplyv na stabilitu bankového systému, ďalej skúma výkonnosť a efektivitu (produktivitu), a vplyv výkonnosti bánk na celkový rast ekonomiky testovaním týchto troch hypotéz:

1. Bankový systém v Poľsku bol najstabilnejší počas celého obdobia.
2. Bankový systém v Českej Republike bol výkonnejší počas celého obdobia.
3. Prechod (z komunistického na kapitalistický bankový systém) na Slovensku bol plynulejší než prechod v ostatných krajinách.

Použila som dva typy metód na analýzu. Ako metódu na prvú hypotézu som použila regresiu panelových dát s „random“ efektom. Na druhú a tretiu hypotézu som použila tradičné meranie na základe pomerov s použitím Du Pontovej formuly a iných finančných ukazovateľov skonštruovaných z historických dát z Bank Scope spolu s „random“ efekt GLS regresiou. Podľa výsledkov z-skóre, Slovenská Republika má najstabilnejší bankový systém vo väčšine skúmaných rokov, za ňou nasleduje Poľsko, Maďarsko a Česká Republika.

Naviac, podľa výsledkov regresnej analýzy, prísne požiadavky na vstup na trh a získanie bankovej licencie vo Vyšehradských krajinách vedú k vyššej stabilite bankového sektoru kým zákaz alebo obmedzovanie bankových aktivít ako napríklad nehnuteľnosti,

poisťovníctvo, akcie, alebo iné nefinančné operácie vedie k nižšej stabilite bankového systému celkovo.

Keď sme testovali druhú a tretiu hypotézu, tak sme zistili, že v období od 1995 do 2008, mali Maďarské banky najvyššiu ziskovosť podľa ROAE a NIM. Po globálnej finančnej kríze, najvyššiu výkonnosť malo Poľsko (na základe ROAA). Česká Republika mala najvyššiu efektívnosť počas väčšiny času, okrem prvej periódy (1995 – 2004) kedy Poľsko bolo efektívnejšie.

Taktiež sme zistili, že na základe našej analýzy nemôžeme dospieť k záveru, že výkonnosť bánk má významný dopad na rast ekonomiky vo Vyšehradských krajinách od roku 1995 do roku 2015, no v Českej Republike sme našli, že ROAA je pozitívne korelovaná s rastom ekonomiky v krajine.

Kľúčové slová: Bankový systém, prechod, transformácia, Vyšehradská skupina

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1. INTRODUCTION

In the second half of the 1980s, Mikhail Gorbachev came to power in the Soviet Union. With the economic situation in all Soviet countries being poor, he introduced a number of reforms known as ‘perestroika’ and ‘glasnost’. As it turned out, however, the reforms had a negative effect, and economic and political conditions continued to worsen.

In 1989, the Polish movement against communism, named ‘Solidarity’, formed a new government, a move considered to be the first step towards the independence of former Soviet Union countries. Following its electoral victory, numerous revolutions took place in other countries in the Soviet Union, starting in the summer of 1989 and ending in autumn 1991. Together with unfavourable economic and political conditions and the fall of the Berlin Wall, these events led to the dissolution of the Soviet Union, the end of the Cold War, and the emergence of 24 new independent states (European Commission, 2014).

The transition from communism took place relatively quickly, bringing about significant changes, especially in Central and Eastern Europe. The consequences of these changes were similar in every state, though each country dealt with them differently. For instance, in the initial period, economic activity in some countries declined temporarily, the huge political changes caused chaos, and the privatisation of state-owned companies did not always proceed in accordance with national laws. Aside from this, a large number of social and economic reforms took place, the unemployment rates increased¹, significant changes occurred in the financial sector, and new alliances and institutions were established. One such alliance was the Visegrad Triangle. It was formed in February 1991 and initially had three members: Czechoslovakia, Hungary, and Poland. The purpose of this alliance was to promote European integration and enhance cooperation among member countries. Two years later, following the dissolution of Czechoslovakia, the number of states increased to four² and the alliance changed its name to the Visegrad Four. Furthermore, some of the newly formed states joined influential international organisations

¹ This was caused also by the fact that unemployment was illegal in the Soviet era.

² After the dissolution of Czechoslovakia in 1993, two new states were formed: the Czech Republic and the Slovak Republic.

such as the World Bank, the Organisation for Economic Co-operation and Development (OECD), the International Monetary Fund (IMF), and the North Atlantic Treaty Organisation (NATO).

Together with the evolving political reforms, economic reforms played the most important role in the transition. The main principles of the economy during communism were state and public ownership, and the national economy was based on central planning (usually five-year plans) set by Gosplan³.

The banking system in the Soviet Union, an important pillar of the economy, was based on the state bank, known as Gosbank (central bank), and three other financial institutions that reported directly to the central bank. The first of these was called Sberbank, and it was in charge of household deposits. The second, known as Stroibank, was lending money to companies and other businesses to finance their long-term investments. The third bank was called Vneshtorgbank, and it was responsible for import and export transactions (Lieberman, 1992).

After the collapse of the Soviet Union, the traditional system of central economic planning had to transform into a market-oriented economy based on the principles of supply and demand, private ownership, and free competition (European Commission, 2014).

A crucial part of the transition was related to banking reforms that were implemented after the fall of communism. In fact, during the final years of the Soviet Union, Gorbachev adopted a few changes in the banking system. In 1988, he legalised private banks, and the basic functions of commercial banks were thus transferred from the state bank to newly formed commercial banks⁴. Following this, he transformed several functions of the state bank so that it performed functions similar to central banks in capitalist countries (Lieberman, 1992). Due to the new reforms and economic changes, the banking systems in post-Soviet countries grew rapidly and became sophisticated a few years after the fall of the Soviet Union. From their original starting point as socialist and

³ Gosplan was the department formed in 1921 and acted as a creator and supervisor over the plans set by the state authorities

⁴ Namely Agroprombank, Promstroibank and Zhilsotsbank

centrally planned economies, nearly all of the countries in the region now have banks and institutions that provide high quality financial products and services. The process of transition was, however, neither smooth nor easy. In fact, it posed great challenges, as from their original starting point differences between the Soviet one-tier banking system and the Western two-tier banking system and thus all newly established banks in these countries needed to start from scratch. Therefore, this dissertation is aimed at analysing and providing a detailed overview of the banking system and its transition from the communist system, specifically in the Czech Republic, Slovakia, Hungary, and Poland.

Despite the fact that all four countries were under the same Soviet system, they dealt with the transition differently, and some states adopted reforms earlier than others. Therefore, the empirical analysis looks closely at how these countries adopted banking reforms, regulations, policies, and banking supervision by measuring the stability, performance (profitability), and effectivity (productivity) of the banks.

The first section is theoretical and focuses on various theories relating to the transition of the banking system; it formulates three main hypotheses, each of which is subsequently tested in the empirical section. This section also includes a literature review, which offers a comparison between Soviet and capitalist banking systems, and further summarises the most important academic articles, research papers, and books written on this topic. It shows how the banking system transformed from a one-tier, or centrally planned, banking system to a market-oriented two-tier banking system resembling Western counterparts.

The second section is empirical, and it analyses the banking system from 1995 up until 2016 (subject to data availability). It begins with a description of the methodology, the presentation of data, and the formulation of hypotheses, and moves into the application of a ratio-based method and regression model to test the hypotheses mentioned in the abstract. The research has been conducted country by country and, to enable better comparability, separated into four time periods (specifically in the section testing performance and efficiency). Stability is measured by the z-score and the percentage of non-performing loans (NPL); to measure the impact of reforms, we use indices constructed from responses given on a World Bank Regulation and Supervision survey. These

measures are then utilised in the regression analysis, which reveals the influence of bank supervision and private monitoring on the stability of the banking system in each country⁵. Performance (profitability) is measured by return on average equity (ROAE), return on average assets (ROAA), and net interest margin. Effectivity is measured by cost-to-income ratio and non-interest expenses to revenue. We also assess the impact of the banks' performance aggregate economic growth by running generalised least squared regression. Moreover, this section further expands the author's previous empirical research, especially in the area of banking stability.

The final section summarises all of the findings from the first and second sections and discusses the implications. It also considers and provides recommendations for the future research of the banking sector in the Visegrad Four and limitations of this study. Moreover, it attempts to offer recommendations and suggests a number of lessons that can be learned, as well as the reforms, regulatory standards, and policies that should be adopted in order to improve the banking sector.

⁵ This part of the analysis is only performed for the period between 2003 and 2015, as the Bank Regulation and Supervision Survey was not published in earlier years.

2. THEORETICAL SECTION

Nearly 26 years have passed since the complete dissolution of the Soviet Union, and Visegrad countries have not only integrated into the global economy, but also substantially improved their banking sectors. The theoretical section outlines a number of theories and relevant studies that have been written on this topic. It defines the primary hypotheses and attempts to summarise the main findings.

It starts with the definition of the basic, key terms that are used in the study, and then proceeds with a comparison of the banking system under communism to the current capitalist system. This is followed by the literature overview, which summarises the academic papers and books written on the transition of the banking system. The section serves as a basis for the formulation of the hypotheses, since these are based on part of the content of the literature review.

2.1. BASIC TERMS

For the sake of clarity and better understanding, this section provides the definition of basic terms used in this study.

The following terms are:

One-tier banking system – also known as a monobank system, this is, according to Lieberman (1992), the type of system in which private banks do not exist, with all banking functions being performed by state-owned banks. This type of system was common in the communist era.

Two-tier banking system – in this system, the top tier is represented by a central bank, while the bottom tier consists of all other privately owned commercial and investment

banks and other financial institutions (Lieberman, 1992). This type of system is common in market-oriented economies.

Visegrad group refers to a group of four Central European states: Slovakia, Czech Republic, Hungary, and Poland. The cooperation began on 15 February 1991, and its main goal was to further European integration, as well as to contribute to strengthening Europe, increase energy security and competitiveness, develop infrastructure, among many other objectives (The Bratislava Declaration, 2011). All members of the Visegrad Four effectively became members of the European Union on 1 May 2004.

Transition (from communism to capitalism) refers to the period extending from the dissolution of the Soviet Union up to individual states' complete independence and transition to a market-oriented economy. It is the process through which major political and economic changes took place, and is divided into two periods: 1989 to 1994, when the main reforms occurred, and 1995 to 2007, when the newly formed countries progressed toward the level of Western European states.

Perestroika and glasnost – economic reforms introduced by Mikhail Gorbachev in 1985⁶. The aim of the reforms was to improve the economic situation and international relations of the Soviet Union. The changes were intended to allow the Soviet economy to become more similar to that of Western countries by incorporating elements of capitalist systems. However, they failed to bring about economic recovery and are considered to be the first step towards the fall of Soviet Union.

⁶ The reforms were in effect from 1985 to 1991.

2.2. BANKING SYSTEM UNDER COMMUNISM

This section aims to introduce and set out a basic overview of Soviet-era banking, and further to point out the principal differences between its one-tier system and the two-tier system that prevails in market-oriented economies.

Under communism, banking was organised in a slightly different way in the countries of the Soviet Union, including in Czechoslovakia, Poland, and Hungary. Indeed, banks operated in a completely different way in Western, capitalist countries than they did in the Soviet Union, and the key differences are summarised in Table 2 below. The main difference lies in the basic organisational structure of the banking systems. Lieberman (1992) wrote that the Soviet mono-bank system differs from the Western dual system in terms of the presence of a second tier, consisting of privately owned banks, with each tier performing different functions⁷. According to Mejstrik (2015), central banks (in market-oriented system), representing the top tier, are responsible for money supply; they influence interest rates and have an impact on inflation. They also act as a financial regulator and assist in the implementation of government policies. Private banks (the bottom tier) process payments, serve as financial intermediaries, and provide other services of a non-cash character (Mejstrik, 2015).

Schmieding (1993) argues that communist-era banking was passive rather than active, and its role was to control over the whole production sector. In contrast, banks in Western countries were actively engaged in lending and investment activities, matching those who had excess deposits with those who needed funds to finance their investments, with the goal of making profit. In addition, Soviet banks⁸ were in charge of the execution of five-year plans, their role being to allocate money and other resources to the production sector (Barisitz, 2007). Through this allocation process, they achieved tighter control over firms,

⁷ The top tier is responsible for monetary policy, manages foreign currency reserves, supervises commercial banks, etc. The bottom tier consists of commercial and investment banks and other financial institutions, and provides various financial services to firms and private individuals.

⁸ Not only the central bank, but also the plan commission called Gosplan, exercised a controlling function over the five-year plans.

as they were able to see where additional money was required and to identify the firms that were short on funds.

The monetary system in Soviet times, as described by Kornai (1995), was ‘half-monetized’. This meant that money existed either in physical form, e.g. banknotes and coins, or in non-physical form, on special accounts designated for firms. The accounts were rarely available to private individuals. Physical money was used in the payment of salaries to the population, so that they could pay for goods and services in stores. Money was allocated to companies as stipulated in the central plan, and not on the basis of demand or production needs. This led to inefficiency and wastage of resources. Barter trade was also commonplace in the Soviet Union. Companies with excess of certain materials or products exchanged these with other companies for goods they lacked. Furthermore, this shortage of goods led to the emergence of shadow markets⁹. The company accounts also had a controlling function, as these enabled the central bank to identify when the pre-specified quantity of a product had not been delivered, or if a shipment had been delayed or even sold on the shadow market (Lieberman, 1992).

Interest rates were fixed and kept at relatively low levels. Thus, any changes in the environment or economic situation of markets hardly translated to interest rate changes. The same applied to the pricing of consumer goods—they were maintained at similar and relatively low levels regardless of economic conditions.

In a market-oriented economy, interest rates are influenced by various factors such as economic conditions and levels of supply and demand for money. The prices of consumer goods change according to the level of inflation, as well as due to competition, supply and demand, the price of labour, and many other factors.

In Soviet times, there was a separate state (central) bank in every country. In Czechoslovakia, the central bank was called ‘Statni banka Ceskoslovenska’, while in Hungary it was known as ‘Magyar Nemzeti Bank’, and in Poland it was ‘Narodowy bank Polski’. The full list of banks that existed in Visegrad countries during communism is displayed in Table 1. These banks issued loans to firms, and any profit made by the latter

⁹ According to Grossman (1977), a shadow market would often accompany insufficient planning and the resulting shortage of certain products.

would be allocated to the state repository (Strecker, 1994). In addition, state banks had branches spread across their respective territories in order to control firms more effectively. If companies failed to behave in accordance with the central plan, they would receive an increased interest rate and could even get penalised¹⁰.

Table 1: Components of the communist-era banking system in the Visegrad Four

Country	State bank	Investment bank	Foreign bank	Agricultural bank
Czechoslovakia	Statni banka Ceskoslovenska	N/A	Ceskoslovenska Obchodni banka	N/A
Hungary	Magyar Nemzeti Bank	Allami Fejlesztési Bank	Magyar Kulkeskedelmi Bank	N/A
Poland	Narodowy bank Polski	N/A	Bank Handlowy SA	Bank Gospodarki Zywnosciowej, Bank Polska Kasa Opieki

Under communism, retention of savings in anything other than domestic currency was disallowed in all states except Poland. Therefore, to increase the flow of foreign currency into the Soviet Union (for the interests of the state, rather than the population), some countries created specialised shops¹¹ that sold goods from capitalist, Western countries. Only those holding foreign currency were able to purchase these goods. Exports and imports were strictly monitored and managed by the foreign trade bank, Vneshtorgbank.

In divergence from other Visegrad countries, in 1968, Hungary adopted new rules. According to these, companies were no longer obliged to produce specific quantities of goods¹² (based on the five-year plan), and could instead produce as much as the population was able to consume, thus avoiding overproduction and wastage of resources (Barisitz, 2007). However, even after adopting the new rules, the economy continued to be firmly

¹⁰ Bankruptcy did not exist and companies were penalised in different ways.

¹¹ For example, Beryozka in Russia, Pewex in Poland, Tuzex in Czechoslovakia, and Intertourist in Hungary.

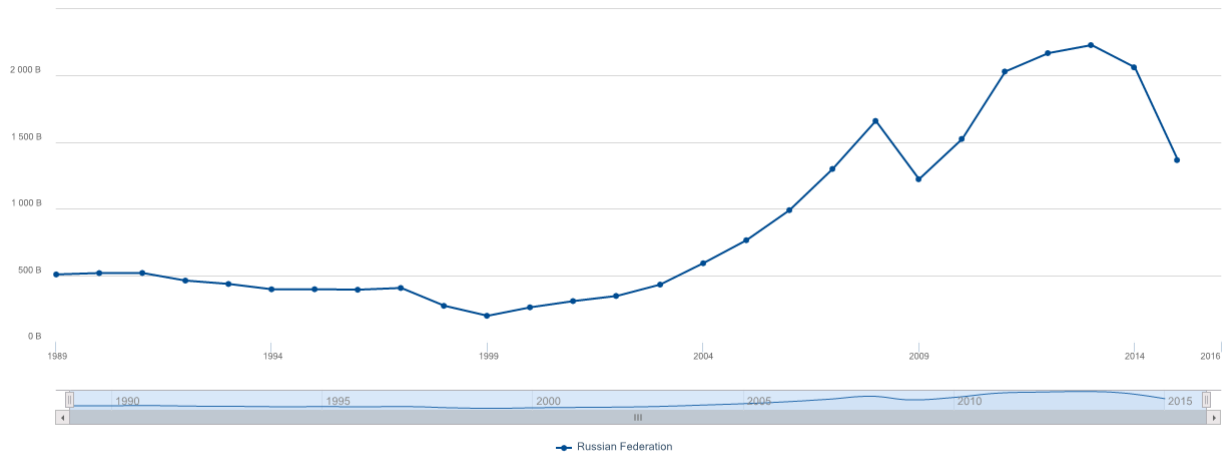
¹² Traditionally, the quantity of goods to be produced was strictly set by the central plan.

centrally planned, and the basic components of market-oriented economies, such as free competition and the forces of supply and demand, were non-existent. The government still had considerable power, with the ability to intervene whenever necessary.

As mentioned above, in the 1980s, the situation of the market was getting worse and Mikhail Gorbachev thus decided to introduce a number of reforms called 'perestroika' (restructuring) and 'glasnost' (openness). Apart from other reforms, he also transformed the existing one-tier banking system into a two-tier system. The new reforms brought many changes, including the creation of private banks. Although these banks were privately owned, they were now allowed to make a profit. However, even following implementation of the new reforms, central banks retained the role of supervisor over the private banks and, in some states, they were also charged with overseeing the fulfilment of state plans (Laurila, 1996). Therefore, the transformation was only partial and the system remained different from those in Western countries at that time. The reforms did not prevent the fall of the Soviet Union, and Gosbank fell along with it in 1991.

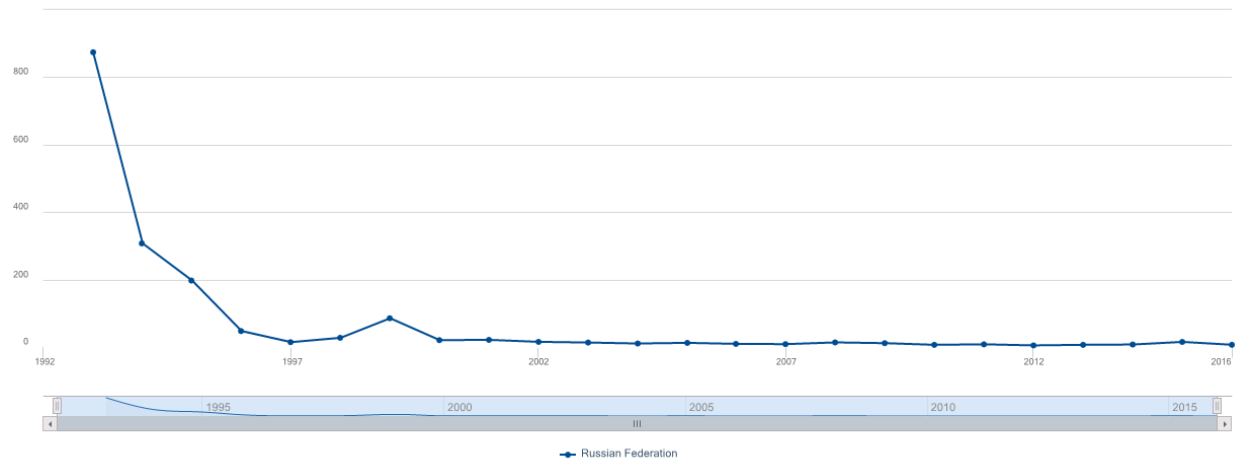
After dissolution, people in the newly formed states began to purchase domestic products from the firms in their own country. As a result, Gosbank was short of money and had to increase the money supply by printing out banknotes, thereby increasing inflation (Lieberman, 1992). This led to the collapse of the economy, resulting in the closure of a number of companies and the commencement of a massive privatisation process. As seen in the below graph (Figure 2), inflation in Russia reached 300% after Boris Yeltsin set prices free and, by the end of 1992, it reached more than 800%. GDP also was decreasing gradually up until 1999, at which point it started to rise.

Figure 1: GDP of Russia in US\$ from 1989 to 2016



Series : GDP (current US\$)
Source: World Development Indicators

Figure 2: Inflation in Russia from 1992 to 2016



Series : Inflation, consumer prices (annual %)
Source: World Development Indicators

Table 2: The main differences between one-tier and two-tier banking systems

	One-tier banking system	Two-tier banking system
Structure	Central bank and a few specialised banks owned by the state.	Central bank and a number of privately owned banks.
Role	Central bank has a passive role, exercising control over the production sector.	Active role – allocation of money from depositors to investors and households.
Interest rates	Kept at the same level.	Adjustments based on actual market conditions and influenced by monetary policy interventions and other factors.
Money allocation	Money allocated to companies as directed by the central plan.	Performed by financial institutions and based on the free market. Money allocated where necessary. Banks and other financial institutions lend money to businesses.
Foreign currency	The amount of foreign currency in circulation is not affected by economic factors.	Monetary policy used by the central bank to increase or decrease the supply of money.
Goal	To meet the central plan.	To maximise profits.
Money system	Physical money (banknotes and coins) and special accounts for companies.	Physical money and money on the accounts (available to both private individuals and companies).

2.3. LITERATURE OVERVIEW

A large number of articles, books, and studies have been published on the topic of transition from communism to capitalism, though fewer have focused exclusively on the banking sector. This lays out the theoretical basis of this paper, providing an overview of selected academic articles and books that have been written on this topic. It is followed by the methodology undertaken in conducting empirical research and then the formulation of three hypotheses.

2.3.1. TRANSITION AND REFORMS

In 2007, Barisitz published a book called *Banking in Central and Eastern Europe 1980-2006: a comprehensive analysis of banking sector transformation in the former Soviet Union*. He examined the transition of the banking systems of 14 countries during a 26-year period. He argues that, 17 years after the fall of communism, banking reforms in Central European countries were the most legally advanced and featured the highest degree of financial intermediation¹³. One of the advantages enjoyed by these states nowadays is their easy and direct access to the European Union market. On top of this, increasing competition is pushing prices and interest rates down.

The transition process evidently caused numerous changes in the banking systems of newly formed countries. Prices of goods were liberalised, thus causing inflation to rise significantly, which in turn led to an economic recession (Joshi, 2014). However, since each country had a different starting position¹⁴, and each had adopted different policies before the dissolution and during the early stages of transition, the former Soviet states were impacted differently. The graph below shows economic performance trends (measured in terms of GDP per capita) in Visegrad countries. From the graph, it can be seen that, in the initial period, the pattern of slow growth in GDP per capita was very similar across all four countries. Among these countries, the Czech Republic had the highest and Poland the lowest level of GDP per capita. On the other hand, Figure 4 outlines the effect of the recession on inflation in the Visegrad economies. The recession occurred because prices were adjusted to market levels at the beginning of the transition¹⁵. One extreme case was in Poland, where hyperinflation reached as high as 550% in 1990; however, with the implementation of the ‘Balcerowicz plan’, this inflation was stabilised in the following years.

¹³ The term financial intermediation refers to the process of directing money from lenders to borrowers.

¹⁴ Some countries, such as Hungary, had already adopted reforms in the 1980s.

¹⁵ During communism, the prices were fixed at low levels and did not reflect reality.

Figure 3: Changes in GDP per capita the Visegrad countries from 1990 to 2015

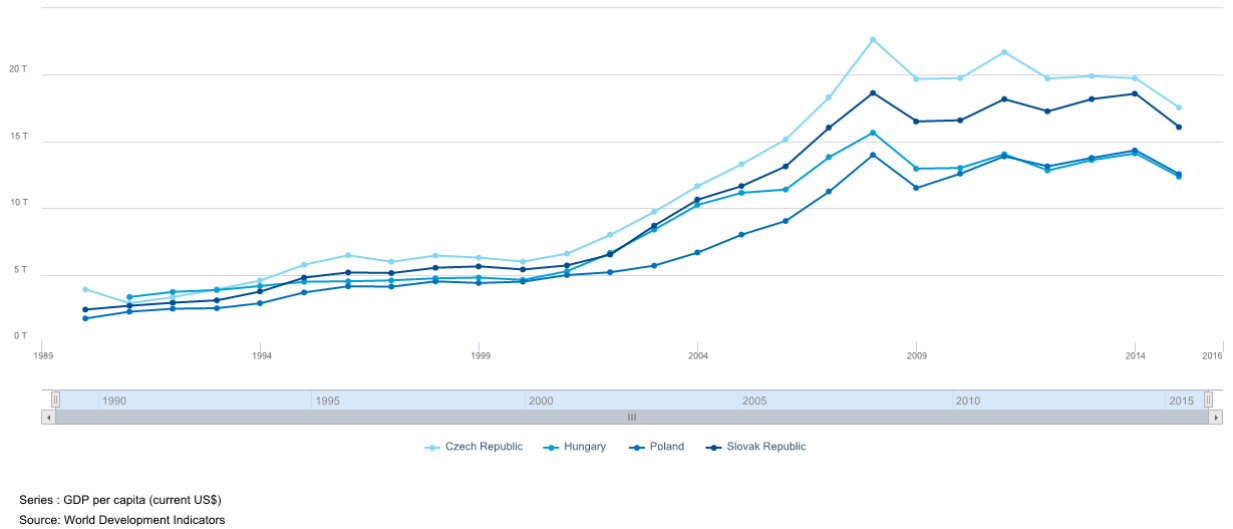
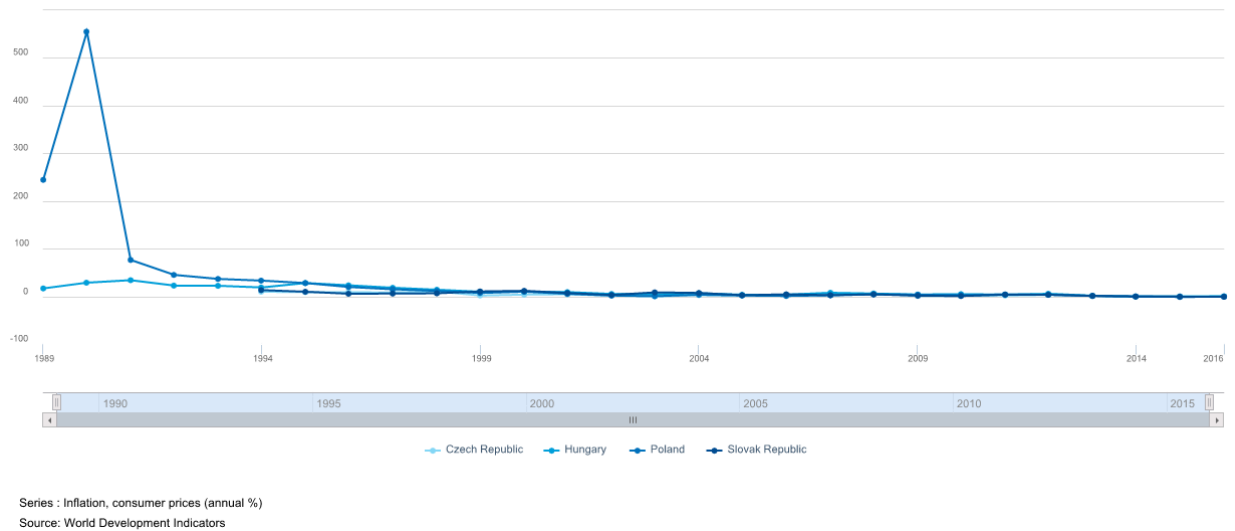


Figure 4: Changes in inflation in Visegrad countries from 1990 to 2015



Apart from high inflation and recession, the banking sector was facing a number of other issues during the transition period. Firstly, the sector lacked qualified staff—employees did not possess the required know-how and had insufficient experience in the functioning of banks in market-oriented economies. Secondly, there remained a number of existing low quality loans from the old regime. Unlike private banks, state-owned banks

were required to take over and administer these toxic non-performing loans from the communist era (Barisitz, 2007). Because the system was not fully organised and bank supervision had not been implemented yet, there was ample room for corruption and illegal activities in some of the newly formed states.

Furthermore, corporate governance¹⁶ had not yet been developed, and there were a large number of newly established or privatised companies without sufficient credit history (Mejstrik, 2015). Both of these factors made it more difficult for bankers to assess the risk when issuing loans, leading to incorrect assumptions and potentially a further increase in the percentage of non-performing loans. Another issue was that, in some countries, incoming banks did not pay adequate attention to the assessment of risk and proceeded to grant loans to risky individuals and firms. Additionally, Barisitz (2007) explains that newly established or incoming foreign banks faced substantial difficulties when coming to countries in the process of transition. This was due to the fact that, generally speaking, these countries did not have fully established foreign currency exchange markets or equity and bond markets.

Therefore, the countries needed to adopt new reforms in order to allow this sector to function smoothly and competitively. Moreover, with the establishment of new banks and the launch of international bank branches, the need for reforms became even more urgent.

The first step in improving the overall sector was to set up a new monetary policy; the existing policy under communism differed substantially from that of market-oriented economies. Most of the states followed the ‘Washington consensus’¹⁷, a set of reforms recommended by the IMF and World bank (Fries, 2002). One of the laws suggested by the consensus involved the separation of the central bank from commercial banks. Apart from that, other changes that had to be taken included the liberalisation of interest rates, as well as the introduction of facilities for converting domestic currency into the foreign currencies. In addition, state-owned banks were restructured or privatised, and the central

¹⁶ The main principles of corporate governance for banks are defined in Basel guidance (Corporate governance principles for banks, 2016). For instance, it defines board responsibilities, qualification and responsibilities, risk management, compliance, internal audit, compensation, role of supervisors, etc.

¹⁷ Compliance with these reforms was occasionally a precondition for receiving a loan from the IMF or World Bank.

bank needed to assume responsibility for the supervision of commercial banks. It is important to note that, even after the dissolution of the Soviet Union, some states continued to use the ruble as their currency. For instance, 15 former Soviet Union states were using the ruble in 1992, keeping it in use until November 1993, when all of the states (apart from Tajikistan) introduced their own currencies. Additionally, states had to set up new regulations and appoint the authorities that would be in charge of oversight. Although the changes were wide and comprehensive, all four Visegrad countries were relatively quick to implement banking reforms compared to some of the other new states.

HUNGARY

Firstly, standing apart from other Soviet states, Hungary was the first country that allowed the presence of international banks, as early as the 1980s, to perform a limited number of foreign operations. Soon, the number of international banks in the market grew higher than the number of domestic banks. In 1989, the Hungarian government initiated the transformation of the banking sector, which was, at the time, relatively decentralised in comparison to other countries in the union. During this time, there were a large number of non-performing loans from the old regime, GDP was declining, and many firms (mainly state-owned) were unable to repay their loans, thus becoming insolvent (Hasan, 2003). In 1991, the government decided to cover around 50% of toxic loans from the previous era via issuance of bonds. In the same year, the number of banks in the country doubled. Unfortunately, both the banks and the companies continued to behave irresponsibly, and the government had to inject further money into the banking sector in order to allow banks to comply with minimum capital requirements. Therefore, it became necessary to introduce bankruptcy law in 1993, followed by the ‘Bokros package’¹⁸ in 1995, and then, in 1996, a new programme of restructuring and privatisation (Joshi, 2014). The bank privatisation process was conservative initially, but was then liberalised in 1996, when it became possible for foreign banks to purchase an unlimited number of Hungarian banks’ shares.

¹⁸ The programme introduced in 1995 included currency devaluation, limitation on increases in nominal wages, and cuts in social benefits.

The main components of post-1990 banking reforms in the Visegrad Four are also summarised in Table 3.

POLAND

Secondly, in 1990, the Polish minister of finance, Leszek Balcerowicz, introduced a number of reforms known as the ‘Balcerowicz plan’ (see Table 3). The plan was also nicknamed ‘shock therapy’, and consisted of various reforms aiming to transform the Polish economy to a market-oriented economy in the fastest possible way. As outlined in Table 3, the goal was to reduce inflation (see Figure 4), which had reached more than 500% in 1990 (Loveman, 1995); liberalise prices, such that they were no longer under government control; devalue the Polish zloty; and peg the domestic currency to the US dollar and many others.

The plan was considered to be successful, and the necessary changes were implemented in a matter of months (rather than years). The environment became more business oriented and foreign trade was strongly supported by state authorities.

CZECHOSLOVAKIA

Lastly, Barisitz points out that the banking reforms in Czechoslovakia and, more recently, in the Czech Republic and Slovakia, took longer and started later than the reforms in Hungary and Poland (1991). Although the situation of the market was favourable, and inflation and national debt were at low levels, the country did not begin to adopt reforms as early as others (Barisitz, 1991). In 1990, three commercial banks—‘Investicna banka’, ‘Vseobecna uverova banka’, and ‘Komerčna banka’—were established. Due to government-imposed restrictions, foreign banks appeared in this market at a later stage in the transition. Czechoslovakia started with the initial privatisation of some state-owned firms. The Central Bank Act was signed in 1989. However, the banking system retained some components of the one-tier banking system, and the two-tier system was only introduced a year later (Holsen, 1991). Three new banks were established at that time (forming a total of six banks—three commercial and three specialised banks), each of which was under state ownership. By the end of 1991, the number of banks had increased

to 27. Similarly to Hungary, Czechoslovakia's banks had a relatively large number of toxic loans carrying over the Soviet system. According to Barisitz (2008), the government established a special bank that was charged with consolidation of non-performing loans named 'Konsolidacni banka'. The establishment of this bank was followed by two waves of bond issuance to cover the additional toxic loans. Mejstrik (2004) argues that the costs associated with this programme amounted to more than 100 billion Czech crowns. After completing the purchase of non-performing loans, the bank underwent two waves of privatisation¹⁹.

¹⁹ The first occurred in 1991 and the second in 1994.

Table 3: Main components of banking reforms in Hungary, Poland, and Czechoslovakia

Hungary	Poland - Balcerowicz plan	Czechoslovakia
<p>Financial – capital adequacy ratio has to be at least 8%. Minimal possible capital requirements were also set.</p> <p>Issuance of bonds – the government issued bonds against non-performing loans in three waves.</p>	<p>Financial reforms – devaluation of domestic currency, pegging the Polish zloty to the US dollar, increase in interest rates, wage increase restrictions, and changes in the income taxes.</p>	<p>Percentage of bank capital that could be used for long-term investments was limited to 25% (Thorne, 1993).</p>
<p>New restrictions – state could not own a stake greater than 25% of any commercial bank.</p>	<p>Liberalisation – liberalisation of prices (including prices for heating and electricity), introduction of import/export tariffs, and abolition of restrictions on holding foreign currency.</p>	<p>Risk-weighted capital was initially set at 6.25%, and subsequently increased to 8% in 1993.</p>
<p>Non-performing loans – mandatory creation of reserves against non-performing loans.</p>	<p>New market structure – improving the banking system and creating an environment conducive to the functioning of capital market.</p>	<p>Establishment of Consolidation Bank and issuance of bonds to cover non-performing loans.</p>

2.3.2. RESEARCH QUESTION

To sum up the literature overview of the theoretical section, all four assessed countries adopted economic reforms relatively successfully, some faster or earlier than others. However, ultimately, all of them met the tough and challenging conditions and became members of the European Union within 15 years from the complete dissolution of the Soviet Union.

Each of the four countries made changes and implemented reforms during the first stage of transition. They transformed their mono-bank systems into two-tiered systems, increased the number of new and foreign banks entering the market by weakening entry requirements, and also liberalised prices, thus triggering an initial period of high inflation. Furthermore, they issued bonds to banks to fight against bad debt, often in several waves, as well as carrying out the privatisation of companies and banks and setting up supervisory and regulatory bodies.

Understanding how banks overcame these difficulties, as well as how they implemented and coped with the strict reforms during the transition period up until today, is the aim of this dissertation. Therefore, the research question may be proposed thusly: How stable, effective, and well-performing were banks in the Visegrad countries from the period of transition until today? The main goal is to carry out empirical research and to provide a detailed overview, both qualitative and quantitative, of the banking system in Visegrad countries from the transition until present day. The study is structured on a country-by-country basis, allowing comparison of the measures across countries. For instance, were banks in Poland more stable than Hungarian banks during the second period of transition? Which country's banking sector was the best performing?

3. EMPIRICAL SECTION

3.1. SOURCES OF DATA FOR EMPIRICAL RESEARCH

Although various data sources were used in the empirical analysis, consistency has been maintained. To measure the impact of tighter regulation, stricter supervision, and private monitoring on the stability of the banking system, we obtained data from the second (published in 2003), third (published in 2006), and fourth (published in 2011) editions of the Bank Regulation and Supervision Survey, which were available on the World Bank website. Developed by the World Bank, this survey is essentially a database containing bank-related information for 143 states. The database was published in each of the years 2001, 2003, 2007, and 2012. It has been used widely by researchers such as Martin Cihak, James R. Barth, and Gerard Caprio, whose work also serves as a basis for part of my research. To measure bank stability, I collected data on bank z-score and the ratio of non-performing loans to gross loans from the World Bank Global Financial Development dataset²⁰.

Obtaining data to use in the analysis of bank performance and effectivity has been possible thanks to Charles University in Prague, which provided me with access to the Bureau van Dijk Bank Scope database, a reliable source of data on financial institutions' financial statements, yearly reports, bank ratings, along with various other reports and data. It consists of data on as many as 42,000 banks and other financial institutions. Recently, the database has been replaced with Orbis Bank Focus, which only includes data up until the end of 2016. However, since my analysis assesses data only till the end of 2016, and because Orbis Bank Focus only includes data going back six years, I found the Bankscope database to be more useful and decided to use it as a basis for my research.

²⁰ This is a time series dataset constructed by the World Bank, consisting of financial information on 203 states. It is updated annually, covering data from 1960 to 2016, and its main focus is on access to finance, depth, and stability.

Graphs on factors such as inflation, GDP per capita, and GDP growth, which are included mainly in the theoretical section, are constructed using data from the World Bank website, namely the World Development Indicators database.

However, the study has its limitations, one of these being that it does not include data on the entire period from the beginning of the transition, but instead covers only the 20-year period from 1995 to 2015. The main reason for this is that the data prior to this period are either unavailable or unreliable. In the period from 1989, when the new states were formed, it was either the case that states had not yet established statistical agencies or that the data they produced was not sufficiently reliable and would thus provide spurious results. Furthermore, since the Bank Regulation and Supervision Survey was published for the first time in 2001, the analysis relating to the influence of banking reforms and supervision on stability could not be performed for the entire period, but only for the years in which the survey had been published, i.e. 2001 to 2013.

3.2. DEFINITION OF HYPOTHESES

Using the data available on Bank Scope and the World Bank database, the study focuses on estimating the stability, performance (profitability), and effectivity (productivity) of banks in the Visegrad countries during a 20-year period. The timeframe under assessment is divided into four periods key historical events. The first period is from 1995 to 2004, which is considered to be the beginning of the second period of transition; the second period is from 2005 to 2008, when the global financial crisis started followed by the post-crisis and recession period - from 2009 to 2013; and the final period is from 2014 to 2015. Considering the scope of reforms and regulations implemented in the transition period, the main goal is to evaluate and compare how each of the four countries developed their respective banking sectors from a one-tier to a two-tier system.

The first null hypothesis is connected to financial sector stability, which is present, according to the European Central Bank (ECB), when resources are transferred efficiently

from savers to investors, financial risks are assessed and priced accurately, and institutions can comfortably absorb financial and real economic surprises and shocks (2015). Fang (2014) analysed the effect of reforms on the Visegrad countries' banking sectors following the transition, and she argues that stability, together with performance, increased rapidly after the adoption of reforms and the liberalisation of the system. Yet, in this analysis, countries that adopted more comprehensive reforms are expected to achieve the best results. The first hypothesis, therefore, is defined as:

1st Hypothesis: The Polish banking system was the most stable in all periods.

The second null hypothesis concerns the performance (profitability) of the banking system. Considering historical data from balance sheets and income statements available on Bankscope, and using financial ratios—including DuPont formula, ROAA, ROAE, and net interest margin—to evaluate and benchmark performance, a final assessment of bank performance is achieved. . We can thus cross-compare banks in these countries and, using the historical data, we can be compare these across different time periods (SC Bankers, 2013). Performance is closely connected with risk and, as such, it is expected that banks reporting exceptional performance are those taking higher risk by granting loans to risky individuals and firms or not balancing their loan portfolios. Moreover, I will perform regression analysis to assess the impact of banks' performance on the growth of the whole economy. Therefore, the second hypothesis involves performance assessment using ratios, and is defined as:

2nd Hypothesis: The Czech banking system was the most profitable across all periods.

The third null hypothesis is connected with the effectivity (productivity) of the banking system. Productivity is a measure of efficiency and can be defined as the sum of effectivity and efficiency (Rokhanian, 2012). An increase in banking sector productivity usually occurs as a result of endogenous and exogenous changes, such as the

implementation of new and more effective technologies or the closure of poorly performing divisions or branches. There are a few different ways to measure effectivity. For instance, Berger (1997), in his international survey on the Efficiency of Financial Institutions, used both: parametric and non-parametric approaches to efficiency frontier method²¹ in order to assess banking efficiency in 21 states. However, in the current study, I will test effectivity using the traditional method, specifically by measuring cost income ratio and non-interest expenses to gross revenue. Therefore, given the importance of the measure of effectivity, the third hypothesis is defined as:

3rd Hypothesis: Transition in Slovakia proceeded more smoothly than the transition in other countries.

3.3. METHODOLOGY

The empirical analysis is performed using the statistical software STATA, together with Excel, which is used primarily for simple calculations and the construction of graphs. The method used for the first part of the data analysis (banking stability) is panel (cross-sectional) time series data random-effects generalised least squared regression. To determine whether regression should be done with fixed or random effects, I performed the Hausman test using the command ‘hausman fixed random’, followed by the regression command ‘xtreg x y z re’. The random-effects model is typically used when it is believed that the differences among explanatory variables have an impact on the value of the dependent variable; fixed effects is normally used when we seek to determine the impact of the variable over a given time period (Torres-Reyna, 2007). As ‘Prob > chi2 = 0.9871’, which is higher than 0.05, the model I used in the analysis is random effects (the full list of commands is included in the Appendices). I decided both to measure stability, using z-score and percentage of non-performing loans, and to test the impact of banking reforms

²¹ The method established by Tjalling C. Koopmans and Gerard Debreu. It calculates the efficiency by measuring the distance from the point which is considered to be efficient (Simar, 2015).

and stricter regulations on stability. The latter is based on a study written by Barth, et al. (2008) on the influence of regulations and supervision on banking sector stability, and uses the following formula (this formula is explained in greater detail in the stability section below):

$$Y_{it} = \alpha + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + u_{it} + \varepsilon_{it}$$

Y_{it} = Banking sector stability measured through z-score or percentage of non-performing loans (Masarikova, 2016)

X_{1it} , X_{2it} , X_{3it} = Indices constructed from responses to the Bank Regulation and Supervision Survey, as seen in Table 4.

u_{it} = Error among entities

ε_{it} = Error within entity

Secondly, bank performance and effectivity (productivity) are evaluated using descriptive analysis, which is based on the construction of financial ratios. I selected the traditional method over methods such as stochastic frontier because the ratios can easily be extracted from company accounts, and they allow us to compare the risk taken with the return made. Another advantage of the ratios is that they enable a comparison of performance and effectivity across other banks in the country as well as between the countries over different time periods. However, as financial ratios are constructed using data from financial statements and balance sheets, they may be subject to manipulation and can thus produce inaccurate results. The impact of banks' performance on economic growth is measured via random-effects regression using the following formula (explained in detail in the performance section below):

$$W_{it} = \alpha + \beta_1 Z_{1it} + \beta_2 Z_{2it} + \beta_3 Z_{3it} + u_{it} + \varepsilon_{it}$$

W_{it} = GDP growth as a measure of economic growth

Z_{1it} = ROAA in a given year, Z_{2it} = ROAE in a given year, Z_{3it} = Net interest margin in a given year

u_{it} = Error between entities , ε_{it} = Error within entity

Firstly, I collected historical data from the financial statements and balance sheets of 192 banks in four countries, from 1995 to 2016, which are available on Bankscope. The number of banks for which all necessary data was available decreased from year to year. For instance, I performed the analysis on 192 banks for the year 2016, but, in 2005, the number decreased to 59 and, in 1995, only 14 banks in the region were analysed.

The dataset constructed in the empirical part is cross sectional (panel data). The analysis of performance has been carried out using the following three ratios: ROAA, ROEA, and interest margin. The analysis of effectivity is carried out using cost income ratio and non-interest expenses to gross revenue. The details of the research are described in the sections below.

3.4. BANKING STABILITY

This part is based on the author's previous work on the stability of the financial system and it aims to compare the stability of banking systems in the Visegrad countries from the period of transition through to present day. It also discusses how the stricter regulations and higher level of supervision led to the increase or decrease of stability in these countries' banking sectors.

According to the World Bank, the financial sector is considered to be stable when instability is not present in the market. Given an absence of instability, banks are more willing to grant loans, asset prices are stable and do not fluctuate away from their value, and firms and individuals do not make delayed payments to suppliers. According to World Bank, in an unstable environment, banks can go bankrupt, inflation can reach extreme proportions, and stock markets can plummet substantially.

This section is based on a study published by Barth, et al. (2008), which argues that strict regulations on banking activities and a high level of supervision have negative effects on the banking sector, while, on the other hand, private monitoring²² has a positive impact on banking stability in a country. However, Das (2004) performed similar empirical analysis and came to the opposite conclusions. According to the results of panel data analysis, the implementation of tighter regulations and supervision contributed to the stability of financial systems. Tabak (2016) recently published a study in which he examined the impact of supervision on banking stability. He found that, particularly after the crisis, supervision contributes positively to banking stability. Further research substantiating this finding was published by White (2006), who concludes that both strict regulations and enhanced supervision improve the stability of the whole financial sector.

In 2000, banks in transitional economies in both Central and Eastern Europe underwent a second wave of banking reforms, which included the tightening of regulations and stricter supervision. Despite these reforms, the 2008 financial crisis destabilised the financial system and caused a significant upturn in the percentage of non-performing loans. On top of this, countries such as Hungary, which provided mortgages in foreign currencies, faced even more serious consequences, as such foreign-denominated loans accounted for as much as 70% of the country's household loans during the global financial crisis (Economist, 2014). Among other things, policy makers have responded to this by re-instituting and improving a number of banking reforms (UCL Moodle lecture slides, 2016).

3.4.1. METHODOLOGY

To make this analysis more objective, I decided to measure banking stability through both bank z-score and ratio of non-performing loans to gross loans. As mentioned above, data for empirical research are obtained from the second (2003), third (2006), and fourth (2011) editions of the Bank Regulation and Supervision Survey, available on the World Bank website, which cover 143 states, with the inclusion of all four Visegrad countries.

²² Private monitoring is defined as an obligation to disclose a bank's information to the wider public.

The same database has been used as a basis for research performed by James R.F Barth, Martin Cihak, and Gerard Caprio. Data on bank z-score and ratio of non-performing loans to gross loans was extracted from the World Bank Global Financial Development dataset, which contains financial and banking data for 206 countries from 1960 to 2014. The first part of the research includes descriptive analysis, comparing the different values of two measures across the four countries during an 18-year period. The second part of the research is conducted using panel or cross-sectional time series data regression analysis, where the dependent variables are bank z-score and percentage of non-performing loans (Masarikova, 2016). Explanatory variables in the regression are indices constructed from responses to World Bank surveys from 2003, 2006 (released in 2007), and 2011 (released in 2012). The regression analysis focuses on three factors determining banking sector stability: entry requirements, restrictions on financial activities, and private monitoring (index representing the level of implementation according to Basel II requirements). All indices and their composition are outlined in Table 4 below. A higher overall index value indicates that the country has adopted stricter banking regulations and the level of supervision is higher.

Table 4: Composition of the indices and methodology used in their construction (Masarikova, 2016)

Name of Index – explanatory variables	Description of what the index represents	Set of questions asked in the Bank Regulation and Supervision Survey
Index measuring level of entry requirements in order to obtain banking license	This index represents the number of documents and additional information that must be submitted in order to obtain a banking license. A higher number means that it is more difficult to enter the banking system in the country.	Maximum value is 8. a) draft bylaws, b) provide the chart of the organisation scheme, c) business plan, d) three-year financial projections, e) financial information about shareholders, f) information about board of directors, g) information about senior managers, h) sources of capital.
Index measuring level of strictness on various banking activities	This index denotes the country's level of strictness in relation to potentially risky banking activities. The higher the index value, the stricter the country's approach towards banking activities.	Maximum value is 16. There are four possible answers to the set of questions: unrestricted, permitted, restricted, and prohibited. Are banks allowed to engage in securities, insurance, real estate, or non-financial business activities (four questions overall)? If the country does not allow banks to offer any of these product types, the index value is 16.
Index of private monitoring	This index represents the 3 rd pillar of Basel II. The lower the number, the lower the power of the private sector in monitoring the country's financial sector.	Maximum value is 8. a) directors are legally liable if information published is incorrect, b) consolidated accounts needs to be disclosed, c) number of top ten banks rated by international rating agency (positive point given to those with over 60%), d) off-balance sheet items are published, e) risk management framework is published, f) whether unpaid interest rate/principal is entered in the income statement when a loan is non-performing, g) subordinated debt is a component of capital, h) availability of deposit insurance protection.

3.4.2. LIMITATIONS OF THE STUDY

The study is subject to certain limitations, especially with respect to data availability. Firstly, the Czech Republic decided not to respond to all three banking regulation surveys. As such, it was necessary to exclude this country in this part of the empirical research. Therefore, the analysis is conducted solely on Hungary, Poland, and Slovak Republic, and we do not analyse the effect of bank regulations on stability in the Czech Republic. If we had opted to use different measures and methodology for the Czech Republic, the data would be inconsistent and the results of the analysis would be based on incorrect assumptions.

Secondly, in a few cases, countries did not answer some specific questions in the survey. Since this was not adequate reason to exclude them from the dataset (as in the case of the Czech Republic), the omitted questions were adjusted as follows: if no response in 2006 or 2011, the question is assigned the same value as in the previous survey; if no answer in 2003, the value is zero. As there is a limited number of missing values, these adjustments should have little impact on regression output (Masarikova, 2016).

Thirdly, the time span of the data for non-performing loans to gross loans extends from 1998 to 2014, as the database has not yet been updated for 2015, and this variable is not included for any of the four states prior to 1998. Similarly for z-score, the data collected are from 1996 to 2014.

3.4.3. MEASURING STABILITY USING BANK Z-SCORE

According to World Bank, in the banking sector, z-score is defined as a measure of risk, signifying the probability of a bank becoming insolvent. It can be calculated as:

$$\mathbf{Z\text{-score}} = \frac{k + \mu}{\sigma}$$

Where k is equity capital as a % of assets, μ stands for return as a % of assets, and σ is the standard deviation of return on assets (World Bank, 2013). It can also be written as:

$$\mathbf{Z\text{-score}} = \frac{\frac{\text{Equity}}{\text{Assets}} + \text{ROA}}{\text{sd ROA}}$$

It simply calculates the probability that the company's or bank's loans will exceed the assets the company owns.

This measure was first used by Edward Altman in 1968 and soon became very popular. Today, it is widely used by researchers and academics for its easy interpretation and its ability to be applied to different types of financial institution, since it uses information that can be found in income statements and balance sheets. To date, extensive research has been conducted on banking stability using z-score. For instance, Cihak and Hesse (2007) measured the stability of cooperative banks in 29 OECD countries using z-score. Lepetit (2013) applied various methods of calculating z-score in measuring the stability of Group of Twenty (G20) countries over a 17-year period. Similarly, Mare (2017) published new research in which he describes a new technique he developed for measuring stability using z-score, thus advancing the research on this measure by incorporating non-stationary returns to z-score calculation.

In spite of this, z-score has its limitations as a measure of stability. As with financial ratios, z-score is based on data taken from balance sheets and income statements. Thus, if accounting figures are somehow manipulated, results will be inaccurate.

3.4.3.1. RESULTS

This section summarises the results of the empirical analysis on z-score. Figure 6 illustrates values of bank z-score in all four examined countries between 1996 and 2014, where the horizontal lines represent z-score trends over the 18-year period. The higher the z-score value, the higher the banking sector stability in the country.

From Table 5 and the graph displayed in Figure 6, it can be seen clearly that the Slovak banking sector is the most stable across all four Visegrad countries throughout almost the entire period, with the exception of the pre-crisis period, during which Poland had a higher z-score. Slovakia is followed by Poland. However, in 2003, the z-score of Polish banks dropped substantially from 5.74 to 1.52, largely due to the bank consolidation that took place in 2002, when the number of banks decreased from 71 to 62, as well as the relatively high percentage of non-performing loans in 2003 (see Table 7), reaching as high as 21.2%. On the basis of z-score, Poland's banking stability was followed by that of Hungary. In contrast, the banking sector in the Czech Republic was the least stable during all periods, achieving values between 1.86 and 4.85.

Table 5 shows the z-score values for each country, including minimum, 1st quartile, median, 3rd quartile, and maximum z-score values during the examined 20-year period.

Initially, z-score dropped after 1995, following the commencement of the second wave of reforms in most of these countries. This drop was especially in the case of Slovakia, with z-score decreasing from 13.91 in 1995 to 6.90 in 1999, due to national elections in which Vladimir Meciar came to power and the second wave of privatisation began (privatisation of the banking system was postponed by two years). On top of this, stricter capital adequacy ratios and limits were imposed on Slovak banks. From 2004/2005 to 2007, the z-score value increased progressively or at least stabilised, owing to the harmonisation of national frameworks with the framework adopted by the European Union (Andries and Capraru, 2011). As shown in Figure 6, this value decreased for all countries in 2008, with the exception of Slovakia, indicating a downward effect on stability as a result of the global financial crisis. Then, from 2009 to 2010, z-score began to increase in all four countries, as banks reinvested their profits during the 2009-2010 period (Andries and Capraru, 2011).

A maximum z-score value of 16.15 was achieved by Slovakia in 2012, with the level of capital reaching its highest peak since 2005 and most of the profit made by banks in the previous year being retained (Slovak Spectator, 2013). On the other hand, a minimum value of 1.52 was achieved by Poland in 2003.

If we were testing the null hypothesis based only on the z-score, we would come to the conclusion that the null hypothesis can be rejected, as the Polish banking sector was not the most stable across all periods. It was only most stable in 1999, 2005, and 2006.

Figure 6: Bank z-score in Visegrad countries from 1996 to 2014

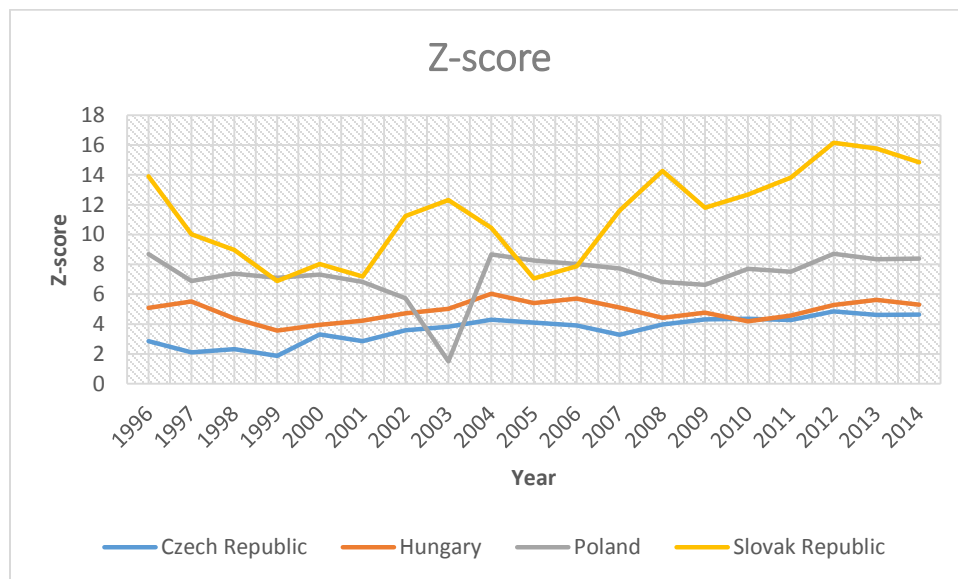


Table 5: An overview of bank z-score in the Visegrad Four from 1996 to 2014

Year	Czech Republic	Hungary	Poland	Slovakia	Average	Min	1st quartile	Median	3rd quartile	Max
1996	2.86	5.09	8.70	13.91	7.64	2.86	4.54	6.90	10.00	13.91
1997	2.10	5.51	6.90	10.01	6.13	2.10	4.65	6.20	7.68	10.01
1998	2.32	4.39	7.38	8.97	5.76	2.32	3.87	5.88	7.78	8.97
1999	1.86	3.56	7.11	6.90	4.86	1.86	3.14	5.23	6.95	7.11
2000	3.32	3.96	7.32	8.02	5.65	3.32	3.80	5.64	7.50	8.02
2001	2.86	4.23	6.82	7.19	5.28	2.86	3.89	5.53	6.91	7.19
2002	3.58	4.72	5.74	11.24	6.32	3.58	4.43	5.23	7.11	11.24
2003	3.82	5.03	1.52	12.32	5.67	1.52	3.24	4.42	6.85	12.32
2004	4.29	6.04	8.66	10.45	7.36	4.29	5.60	7.35	9.11	10.45
2005	4.10	5.42	8.26	7.05	6.21	4.10	5.09	6.23	7.35	8.26
2006	3.91	5.70	8.03	7.88	6.38	3.91	5.26	6.79	7.91	8.03
2007	3.29	5.10	7.73	11.60	6.93	3.29	4.65	6.42	8.70	11.60
2008	3.98	4.42	6.82	14.26	7.37	3.98	4.31	5.62	8.68	14.26
2009	4.31	4.77	6.63	11.80	6.88	4.31	4.66	5.70	7.93	11.80
2010	4.36	4.18	7.70	12.67	7.23	4.18	4.31	6.03	8.94	12.67
2011	4.27	4.57	7.52	13.81	7.54	4.27	4.49	6.04	9.09	13.81
2012	4.85	5.28	8.71	16.15	8.75	4.85	5.18	6.99	10.57	16.15
2013	4.60	5.61	8.34	15.77	8.58	4.60	5.36	6.98	10.20	15.77
2014	4.63	5.29	8.39	14.84	8.29	4.63	5.13	6.84	10.00	14.84
Total					6.78	1.52	4.30	5.72	8.28	16.15

3.4.3.2. COMPARISON OF INDICES TO Z-SCORE VALUES

Figures 7, 8, and 9 show how the values of all three indices changed over time. They demonstrate whether the countries' banking regulations became stricter, the extent of countries' implementation of Basel II regulations as a measure of private monitoring, and whether it became more difficult for new banks to enter the market (Masarikova, 2016). Overall, the highest index score was achieved by Poland in 2006, the same year it achieved the highest z-score value among the four countries.

On the other hand, the lowest index score was achieved by Hungary in 2003, however, z-score was much higher in that year than the z-score of Poland that had stricter regulation.

Moreover, in 2006, Hungary's z-score was almost the same value as it had been in 2003, despite the fact that the country implemented stricter regulations on both private monitoring (see Figure 7) and entry requirements (see Figure 9). In the case of Hungary, tighter regulations did not bring about higher stability in the banking sector.

Similarly, in Slovakia, the increase in the index did not improve stability. Even as the various indices related to banking regulation (indices of restriction on bank activities, private monitoring, and entry requirements) rose from 21 to 26 between 2003 and 2011, the country's z-score value decreased from 12.32 in 2003 to a historical low of 7.05 in 2005.

Plainly, these results cannot be generalised and also should not be interpreted as a final result of this academic research. Therefore, in the section below, regression analysis is performed with a dependent variable z-score and independent variables constructed from all three indices.

Table 6: Overall values of the indices of restriction on banking activities, private monitoring, and entry requirements in 2003, 2006 and 2011

	2003	2006	2011
Hungary	19	25	21
Poland	21	21	28
Slovak Republic	21	21	26

Figure 7: Index of private monitoring in Hungary, Poland, and Slovakia in 2003, 2006, and 2011

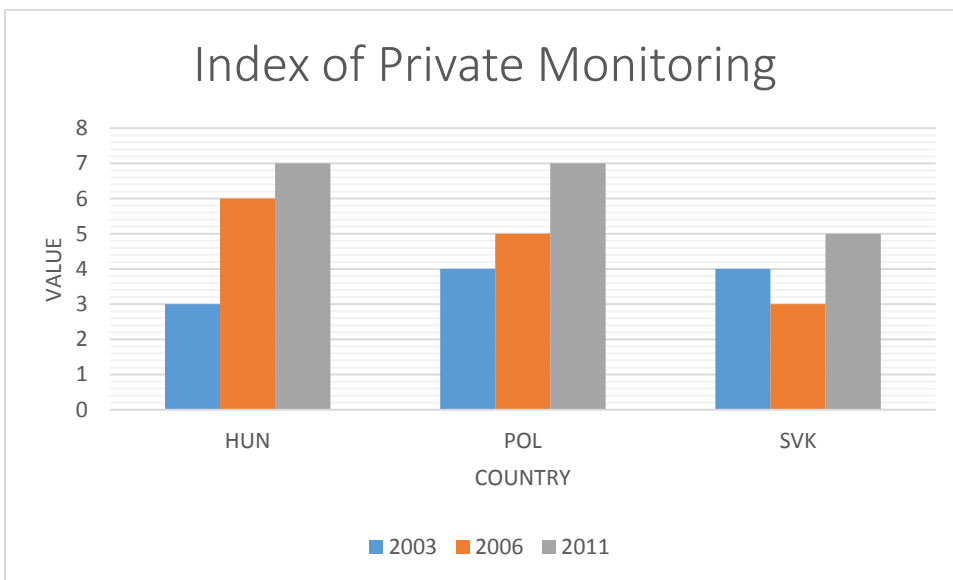


Figure 8: Index of restriction on banking activities in Hungary, Poland, and Slovakia in 2003, 2006, and 2011

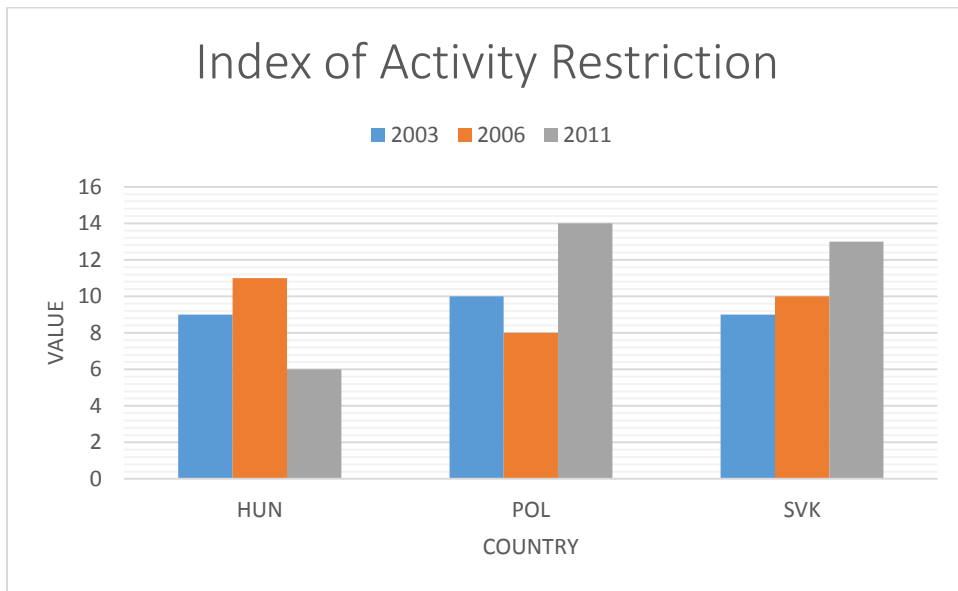
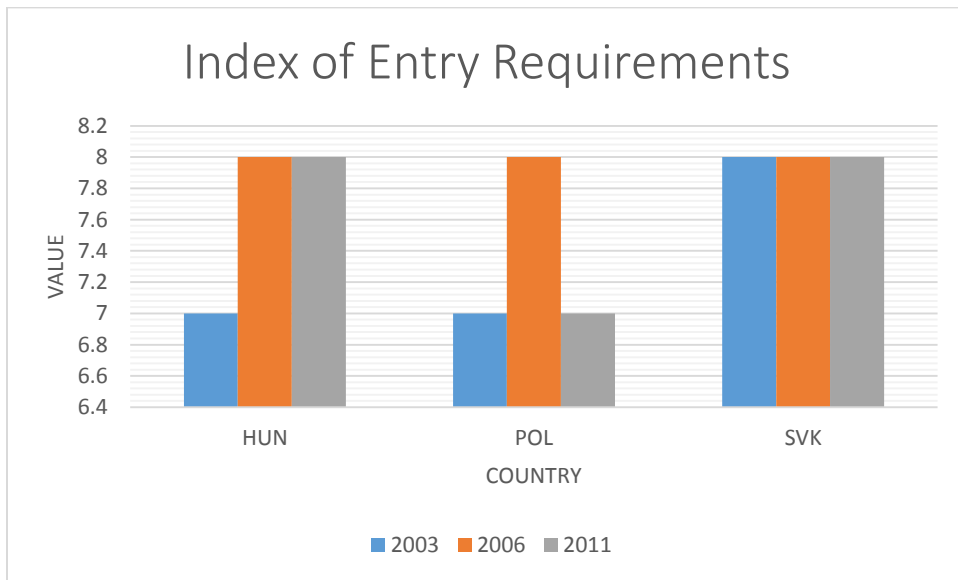


Figure 9: Index of banking entry requirements in Hungary, Poland, and Slovakia in 2003, 2006, and 2011



3.4.4. MEASURING STABILITY USING RATIO OF NON-PERFORMING LOANS TO GROSS LOANS

According to the ECB, the loan is considered to be non-performing when the debtor has not made any repayment in three months. Mejstrik (2015) asserts that the most serious issue in relation to non-performing loans is when large banks amass these as a result of issuing risky loans. A large number of NPL decreases their liquidity and, because they are ‘too big to fail’, state authorities bail them out to prevent them from becoming insolvent, thus causing further damage.

As mentioned in the theoretical section, during the transition period, banks (especially state-owned) were struggling with the high number of non-performing loans carried over from the communist regime. Each country dealt with them differently; Hungary, for instance, issued bonds to cover roughly half of the NPL held by its banks, while Czechoslovakia established a special agency (‘Konsolidacni banka’) that covered a substantial portion of these loans during the 1990s and 2000s (Mejstrik, 2015).

As seen in Figure 10 and Table 7, Slovakia, Poland, and the Czech Republic all had percentages of NPL exceeding 10% in 1998. Interestingly, Slovakia reached the highest value over the entire analysed period, at a dangerous level of 31.6% NPL, in 1998, while having a z-score of 8.97 (the highest among the group that year).

There were a large number of NPL in the Czech Republic during the late 1990s, leading to the closure of numerous banks. In early 2000s, the number of the banks stabilised at 37 and NPL was still at the level of 29.3%. Rod (2015) wrote that, in 2000, the Consolidation Bank sold 25% of its portfolio, the highest amount in the bank’s history.

Interestingly, Poland’s NPL ratio declined from 21% in 2003 to 2.8% in 2008, and it was the only country in the European Union that did not experience recession during the global crisis. Piatkowski (2015) argues that one of the factors that contributed to Poland’s resilience during the crisis was the country’s stable and well-capitalised banking sector.

On the contrary, Hungarian NPL increased from 2.3% in 2007 to 8.2% in 2009, reaching as high as 16.8% in 2013. This was due to the issuance of foreign-denominated

loans that had to be repaid in forint. The government introduced a programme through which these loans could be repaid at a more favourable exchange rate; however, since the NPLs were excluded from this programme, it increased the ratio even more.

If we were testing the null hypothesis based only on the NPL, we would come to the conclusion that the null hypothesis can be rejected, as the Polish banking sector was not the most stable across all periods. In fact, it was only the most stable, having the lowest NPL ratios, from 2009 to 2014.

Tighter bank regulations and supervision—in particular, stricter collateral valuation and classification of assets—are considered to be an effective tool for lowering this ratio (European Banking Coordination Vienna Initiative, 2012). The next section discusses the impact of the reforms on NPL and z-score by running regression analysis.

Figure 10: Non-performing loans to gross loans in Visegrad Four from 1998 to 2014

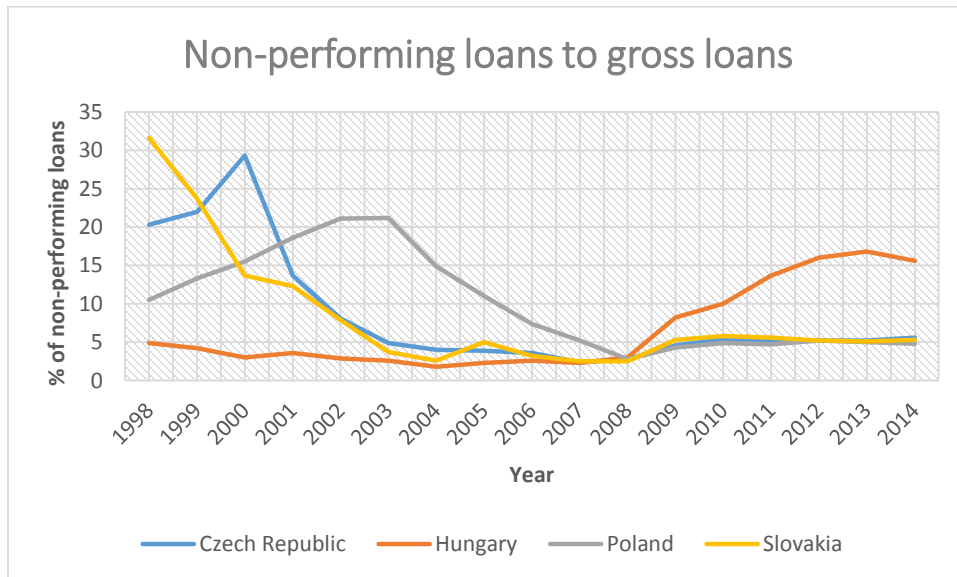


Table 7: Non-performing loans as percentage of gross loans in Visegrad countries from 1998 to 2014

Year	Czech Republic	Hungary	Poland	Slovakia	Average	Min	1st quartile	Median	3rd quartile	Max
1998	20.3	4.9	10.5	31.6	16.83	4.90	9.10	15.40	23.13	31.60
1999	22	4.2	13.3	23.7	15.80	4.20	11.03	17.65	22.43	23.70
2000	29.3	3	15.5	13.7	15.38	3.00	11.03	14.60	18.95	29.30
2001	13.7	3.6	18.6	12.3	12.05	3.60	10.13	13.00	14.93	18.60
2002	8.1	2.9	21.1	7.9	10.00	2.90	6.65	8.00	11.35	21.10
2003	4.9	2.6	21.2	3.7	8.10	2.60	3.43	4.30	8.98	21.20
2004	4	1.8	14.9	2.6	5.83	1.80	2.40	3.30	6.73	14.90
2005	3.9	2.3	11	5	5.55	2.30	3.50	4.45	6.50	11.00
2006	3.6	2.6	7.4	3.2	4.20	2.60	3.05	3.40	4.55	7.40
2007	2.4	2.3	5.2	2.5	3.10	2.30	2.38	2.45	3.18	5.20
2008	2.8	3	2.8	2.5	2.78	2.50	2.73	2.80	2.85	3.00
2009	4.6	8.2	4.3	5.3	5.60	4.30	4.53	4.95	6.03	8.20
2010	5.4	10	4.9	5.8	6.53	4.90	5.28	5.60	6.85	10.00
2011	5.2	13.7	4.7	5.6	7.30	4.70	5.08	5.40	7.63	13.70
2012	5.2	16	5.2	5.2	7.90	5.20	5.20	5.20	7.90	16.00
2013	5.2	16.8	5	5.1	8.03	5.00	5.08	5.15	8.10	16.80
2014	5.6	15.6	4.8	5.3	7.83	4.80	5.18	5.45	8.10	15.60
Total					8.40	1.80	3.68	5.20	12.55	31.60

3.4.5. REGRESSION ANALYSIS

This part of the empirical analysis is aimed at determining how tighter banking regulations and supervision affected z-score and NPL as a measure of stability of the financial systems in Hungary, Poland, and Slovakia²³. In order to assess the impact of regulation, it was necessary to consider appropriate models to test the hypothesis, and it was equally important to choose the correct technique. Initially, we needed to determine whether it is more appropriate to use random- or fixed-effects GLS regression method. The best way to determine this was to run the Hausman test by using the command ‘hausman fixed random’, which is followed by the regression command ‘xtreg npl (zscore) X1 X2 X3 re’. As ‘Prob > chi2 = 0.9871’ for the first regression, and ‘Prob > chi2 = 0.9217’ for the second regression, both being higher than 0.05, the null hypothesis cannot be rejected, meaning that the use of random effects is more appropriate for both models. Breusch–Pagan Lagrange multiplier also confirmed that it is better to use random-effects regressions over simple pooled regression.

3.4.5.1. REGRESSION USING Z-SCORE

The model to be used for testing the impact of regulations on stability is random-effects GLS regression. The regression is based on explanatory variables in the form of indices constructed from responses to the 2nd, 3rd, and 4th editions of the World Bank survey, and the dependent variable in this case is the bank z-score value (Masarikova, 2016).

$$Y_{it} = \alpha + \beta_1 X_{1jt} + \beta_2 X_{2it} + \beta_3 X_{3it} + u_i + \varepsilon_{it}$$

Y_{it} = Represents z-score as a measure of banking sector stability (for each country)

²³ As mentioned above, the Czech Republic is excluded from this part of the analysis, as they did not provide responses to the World Bank survey.

$X_{1it}, X_{2it}, X_{3it}$ = Value extracted from indices, as seen in Table 4

u_{it} = Error between entities

ε_{it} = Error within entity

α = Intercept

β = Slope

The results of the regression analysis with dependent variable z-score are summarised in Table 8. The table indicates that the level of entry requirements is statistically significant at 10%, while the level of restriction on banking activities and constant are statistically significant at 5%.

To begin with, banking entry requirements have a positive value of 5.590504 (5% significance). Based on this result, stricter entry requirements for banks applying for a licence leads to higher stability in the overall banking system. As the entry requirements index is positively associated with z-score value, an increase by one unit of entry requirements would lead to an increase in the z-score value by 5.590504. Since higher z-score denotes higher stability, according to this study, strict entry requirements positively contribute to the stability of the banking sector in the three assessed Visegrad countries.

Secondly, the level of restriction on banking activities have, according to the results, a negative value of -0.9241987 (10% significance). Thus, based on the results, higher restrictions on banking activities (namely securities, real estate, insurance, and non-financial activities) lead to lower stability in the overall banking system. As the index of banking activity restriction is negatively associated with z-score value, an increase by one unit of activity restriction would lead to a decrease in the z-score value by -0.9241987. Since higher z-score represents a higher level of stability, based on this analysis, higher levels of restriction on banking activities negatively contribute to the stability of the banking sector in these three Visegrad countries. As oppose to this, in the study of Barth, et al. (2008), it was concluded that banking activity restriction increases the likelihood of crisis and slows down bank development.

The value obtained for the index of private monitoring was not significant; therefore, it was not possible to form a conclusion on the impact of this index of stability.

Table 8: Random-effects GLS regression with dependent variable bank z-score (Masarikova, 2016)

Random-effects GLS regression	
Bank z-score (dependent variable)	
Banking entry requirements	5.590504 (P> t 0.015) **
Private monitoring	- 0.5196966 (P> t 0.472)
Restriction on banking activities	- 0.9241987 (P> t 0.051) *
Constant	- 42.18873 (P> t 0.030)*
Observations	9
Size	153
Number of countries	3
R Squared	0.5974
* significant at 10%, ** significant at 5%, ***significant at 1%	

3.4.5.2. REGRESSION USING NPL

The second analysis similarly uses the method of random-effects GLS regression. The model is based on explanatory variables, namely indices constructed from responses to the 2nd, 3rd, and 4th editions of the World Bank survey, and a dependent variable, in this case the percentage of non-performing loans.

$$T_{it} = \alpha + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + u_{it}$$

T_{it} = Represents NPL as a measure of banking sector stability (for each country)

$X_{1it}, X_{2it}, X_{3it}$ = Value extracted from indices, as seen in Table 4

u_{it} = Error between entities

ε_{it} = Error within entity

α = Intercept

β = Slope

Table 9 shows the results of random-effects GLS regression analysis, aimed at measuring the impact of regulations on non-performing loans as a percentage of gross loans, which is used as a measure of stability in the banking system. Although we observe positive correlation between the index of private monitoring and overall banking stability, and negative correlations between banking stability and both the indices of entry requirements and restriction on banking activities (see Table 9), the results are not significant. None of the indices were statistically significant and thus, from this research, we cannot conclude that any of these factors have an impact on the level of stability as measured by % of NPL in the three assessed countries.

Although none of the variables were statistically significant, various studies confirm the presence of a relationship between strict regulations, supervision, and NPL. For instance, Klomp (2015) tested more than 1,200 banks in more than 90 countries, finding that stricter regulations and supervision contribute positively to stability, while banking activity restriction also increases banking stability, particularly in large banks.

Table 9: Random-effects GLS regression with dependent variable non-performing loans as percentage of gross loans (Masarikova, 2016)

Random-effects GLS regression	
Non-performing loans as % of gross loans (dependent variable)	
Banking entry requirements	- 5.656332 (P> t 0.259)
Private monitoring	0.993202 (P> t 0.526)
Restriction on banking activities	- 1.227954 (P> t 0.231)
Constant	57.96688 (P> t 0.170)
Observations	9
Size	153
Number of countries	3
R Squared	0.3021
* significant at 10%, ** significant at 5%, ***significant at 1%	

3.4.6. SUMMARY OF THE FIRST HYPOTHESIS

The purpose of this section of the essay was to examine the stability of the banking system, draw a comparison between the Visegrad countries, and assess whether tighter government regulations lead to banking sector stability. These questions were addressed by conducting empirical research across four Visegrad countries over the 20-year period. The first part of the data included descriptive analysis of the measured values. In the second part, the data were organised into panel data and analysed through random-effects dynamic regression analysis in Stata. Two models were examined—the first measured stability through bank z-score, and the second through the ratio of non-performing loans to gross loans.

The findings from the first part indicate that, when looking at z-score value as the only indicator of banking stability, the Slovak Republic would be considered to have the most stable banking sector among the Visegrad Four. In second place would be Poland, which achieved a z-score lower than Slovakia, except in the years 1999, 2005, and 2006, when it outperformed the latter. Poland is followed by Hungary and the Czech Republic. Based on this measure, we can reject the null hypothesis stating that the Polish banking system was the most stable across all periods.

Secondly, when considering the parameter of NPL, we can again reject the null hypothesis, because Poland had one of the highest NPL ratios in almost all years. However, the global financial crisis did not lower the stability of Polish banks; in fact, from 2009 onwards, its NPL ratio has been the lowest among all four countries.

Lastly, we run two regression analyses, not to make a comparison between the countries, but rather to determine how tight regulations and supervision contributed to stability. In the z-score regression, we identified two variables that were statistically significant. The index of banking entry requirements is positively correlated with banking stability, and the value was statistically significant (5%). Therefore, according to this analysis, the stricter the entry requirements in the country, the higher the stability of the financial system in Visegrad countries. Another variable that was significant was the level of restriction on banking activities that typically do not represent core areas of business for banks. The variable had a negative value (10% significance). Prohibiting banks from undertaking these activities would lead to a decrease in banking sector stability in the assessed countries. All other independent variables are not significant; therefore, from this study, it cannot be concluded that these have an impact on banking stability (measured by z-score). The value of the index of private monitoring was not significant, and thus we could not form a conclusion on the impact of this index on stability.

The second regression analysis used NPL as a dependent variable. Unfortunately, none of the explanatory variables were statistically significant, and thus we could not conclude any findings from this part.

Although the study came obtained the abovementioned results, it nevertheless has some limitations. The first is that the dataset analysed was relatively small, even if it covered all

four countries during a 20-year period; the time span was even shorter for some of the measures. The results would be more accurate if the Bank Regulation and Supervision Survey had been completed for each year. The second limitation is the response rate. Some countries did not participate in the Bank Regulation and Supervision Survey and, in other cases, they did not provide responses to each question. The latter of these difficulties was overcome by small adjustments I have made in the dataset, and as such it has had little impact on the results.

However, the recommendation for future research would be to increase the number of indices. The survey data includes responses to 270 questions divided into 13 topics. I only used three of these, but the data also include factors such as liquidity, capital, audit, depositor's protection, or ownership.

3.5. PERFORMANCE AND EFFICIENCY

As already mentioned in the theoretical part, the financial sector in new newly formed states was very specific in comparison to the system in developed countries. The transition from the communist mono-bank system to the capitalist two-tier system, together with economic and political reforms, privatisation of state-owned companies, entry of foreign banks into the country, and a high amount of non-performing loans from the old regime, led to dramatic changes that influenced the performance and efficiency of all banks in these countries. Therefore, the aim of this section is to find out the extent to which banks in the Visegrad countries were successful in implementing reforms from the transition period through to present day. The results are achieved through empirical analysis, focused on measurement of performance and efficiency of the banking sector in each country separately.

3.5.1. LITERATURE OVERVIEW

According to the ECB (2010), the most important components of bank performance are revenue, liquidity, leverage, and effectivity; this section attempts to measure two of these components: revenue and effectivity.

Many studies have been published on the performance and efficiency of the banking sector in transition countries. For example, Grigorian (2002) measured bank performance and efficiency using data envelopment analysis (DEA), finding that foreign ownership and bank consolidation positively contribute to bank efficiency. Fries (2002) contributed to the research by performing analysis on more than 500 banks in transition countries during a five-year period. He concluded that bank performance is, for the most part, positively influenced by reforms. Additionally, he noted that countries that had not adopted all necessary reforms showed higher interest rates than economies that had done so.

Psilliaki (2017) also performed empirical analysis to assess the impact of reforms on the performance of the banking sector in transition countries during the early 2000s. He used SFA—stochastic frontier analysis—and obtained the same results as Grigorian. He concluded that reforms contribute positively to performance, while higher bank capitalisation contributes positively to overall efficiency.

Bonin (2005), on the other hand, measured the impact of bank ownership on both performance and efficiency. He also performed stochastic frontier analysis (SFA) on 225 banks in transition countries in the period from 1996 to 2000. His main finding was that the presence of foreign banks increases efficiency, but this efficiency decreases as the size of the bank increases. Privatisation does not in itself lead to higher efficiency or performance.

3.5.2. METHODOLOGY

Using data from 1995 to 2016, we measure the performance and efficiency of the banking sector in the Visegrad Four. The empirical research is based on two methodologies. The first of these is descriptive analysis, using the traditional method of financial ratios constructed from historical financial statements and balance sheets. The data for the analysis are obtained from Bankscope, and they include data for 192 banks in four countries (depending on the availability, the number decreases each year). The second method used in this section is generalised least squared random-effects regression, which is used to determine whether economic growth is influenced by bank performance. The bank-level data are obtained from Bankscope, while macroeconomic data relating to GDP growth are extracted from the World Bank's global economic indicators database.

This study contributes to the research because it measures performance and efficiency, during a 21-year period, using three different performance ratios and two different effectivity ratios, and thus offers a more comprehensive picture of both measures in each country. I have chosen the use of financial ratios over more sophisticated methods, such as data envelopment analysis or stochastic frontier analysis, because these allow us to compare the risk taken with the return made. By constructing financial ratios, we can also compare the performance and effectivity among other banks in the country as well as between the countries. This part of the study is further divided into four periods for better comparability.

We use a weighted average (based on total assets) to construct aggregate profitability and efficiency on the country level and thus to control for the size effect. Profitability and efficiency are calculated as follows:

$$N = \frac{\sum_{t=1}^n Wt * Vt}{\sum_{t=1}^n Wt}$$

Where:

N = Aggregated value of performance or efficiency on the country level

V_t = Value of the ratio at the bank level (ROAA, ROAE, interests margin, cost-to-income ratio, non-interest expenses to gross revenues)

W = Weight based on the value of total banks assets to total assets (computed from all banks in the country)

3.5.3. VARIABLES

Profitability is measured using adjusted DuPont formula, ROAA, ROAE, and net interest margin.

ROAA is an accounting measure that stands for return on average assets. It was first introduced by a US-based company, DuPont, in the 1920s. It is calculated as net income divided by the average of total assets, and the higher the value, the better. It shows how much of net income is earned on every dollar of the unit of assets invested. ROAA is used as a measure of profitability in a wide range of industries, including software development and luxury retail, which typically have high margins and thus high ROAA. On the other hand, the banking industry normally has a low ROAA because banks have high levels of debt.

$$\text{ROAA} = \frac{\text{Net income}}{\text{Average total assets}}$$

ROAE is also an accounting measure, and stands for return on average equity. It is calculated as net income divided by total equity and is widely used to depict the value created for each dollar of shareholder equity. Higher values of ROAE indicate both higher

performance and better effectivity. The value of this measure can be increased, for instance through reduction of costs, implementation of new and more effective technologies, or entrance into new, more profitable markets. It can also be calculated as ROA multiplied by an equity multiplier:

$$\text{ROAE} = \frac{\text{Net income}}{\text{Average total equity}} = \text{ROAA} * \frac{\text{Average total assets}}{\text{Average total equity}}$$

Net interest margin (NIM) is net income from interest to total assets. It is used as an alternative measure of bank performance; however, low NIM does not necessarily mean that the bank is performing poorly. There are number of banks that have low NIM simply because they earn profit from sources other than interest. Higher NIM is better for banks, though this value usually floats due to supply/demand forces. For instance, if demand for loans decreases, banks must decrease their margins in order to attract lenders and remain competitive in the market.

$$\text{NIM} = \frac{\text{Net interest income}}{\text{Total assets}} = \frac{\text{Interest income} - \text{Interest expenses}}{\text{Total assets}}$$

Efficiency, on the other hand, is measured by cost-to-income ratio and non-interest expenses to gross revenues.

Cost-to-income ratio (CI) is another measure of banks' effectivity and performance. It shows the amount of income generated per dollar of cost. The lower the value, the more profitable the bank. An increase in this ratio might mean that, in a given year, the bank has invested a considerable amount of money into innovation or the procurement of new technology. However, looking at this as a long-term investment, these expenditures would contribute to higher ROE, as effectivity will be increased.

$$CI = \frac{\text{Operating costs}}{\text{Operating income}} = \frac{\text{Overhead costs} + \text{other operating costs}}{\text{Net interest income} + \text{other income}}$$

Non-interest (total operating) expenses to gross revenues is an efficiency ratio composed of expenses such as rent, employee salaries and bonuses (normally around half of the overall non-interest expenses are overhead costs, depending on the type and size of the bank), professional fees, marketing costs, and other operating costs and gross revenues. A lower ratio indicates higher bank efficiency. Normally, firms are considered to be efficient if this ratio is below 5%. However, banks are highly leveraged, and it is thus acceptable for this ratio to be at the 60% level. The ratio can increase as a result of increases in employee salaries, insurance costs, non-recurring costs, etc.

$$NI = \frac{\text{Non-interest expenses}}{\text{Gross revenues}}$$

Figure 11: Changes in ROAA in Visegrad countries from 1995 to 2016

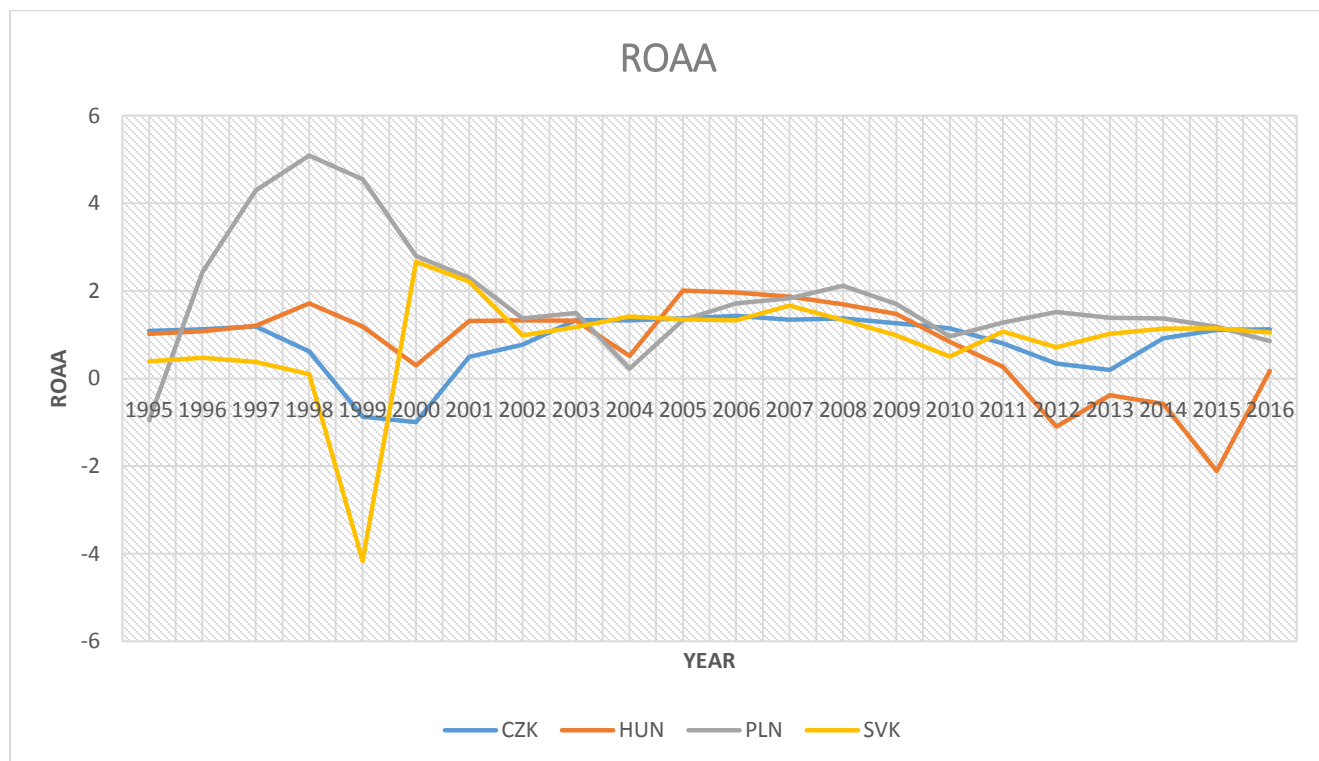


Figure 12: Changes in ROAE in Visegrad countries from 1995 to 2016

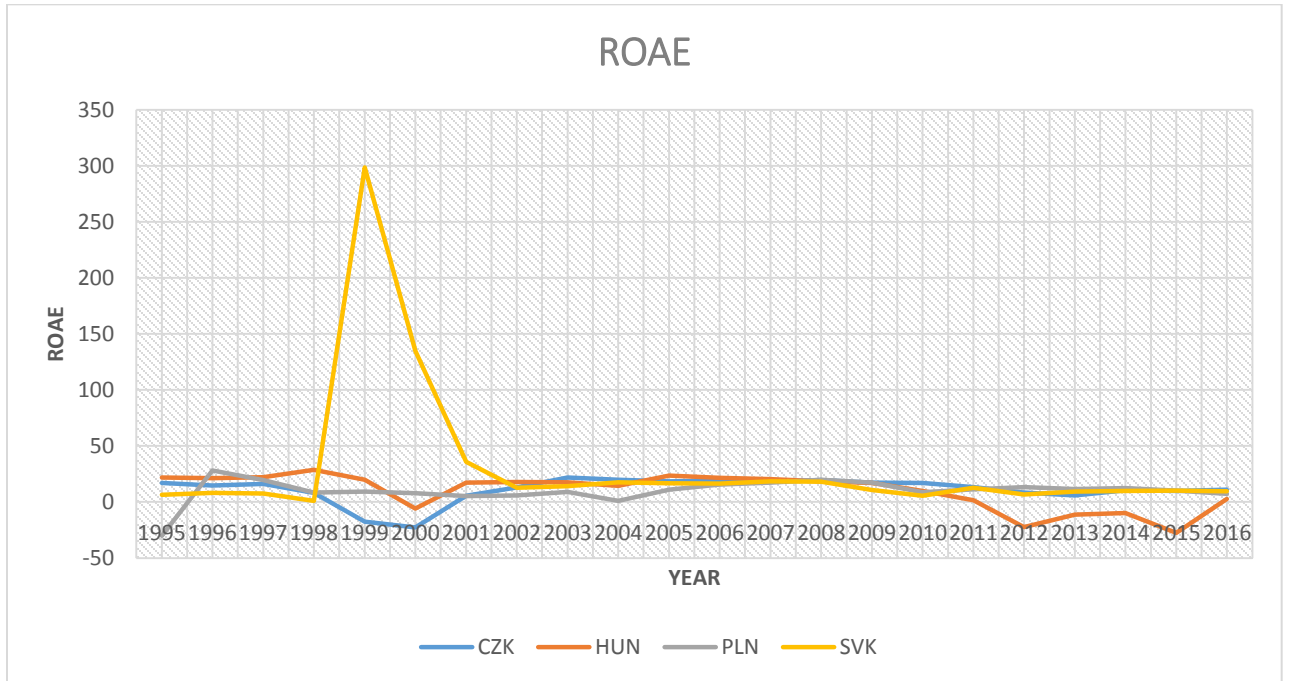


Figure 13: Changes in interest margin in Visegrad countries from 1995 to 2016

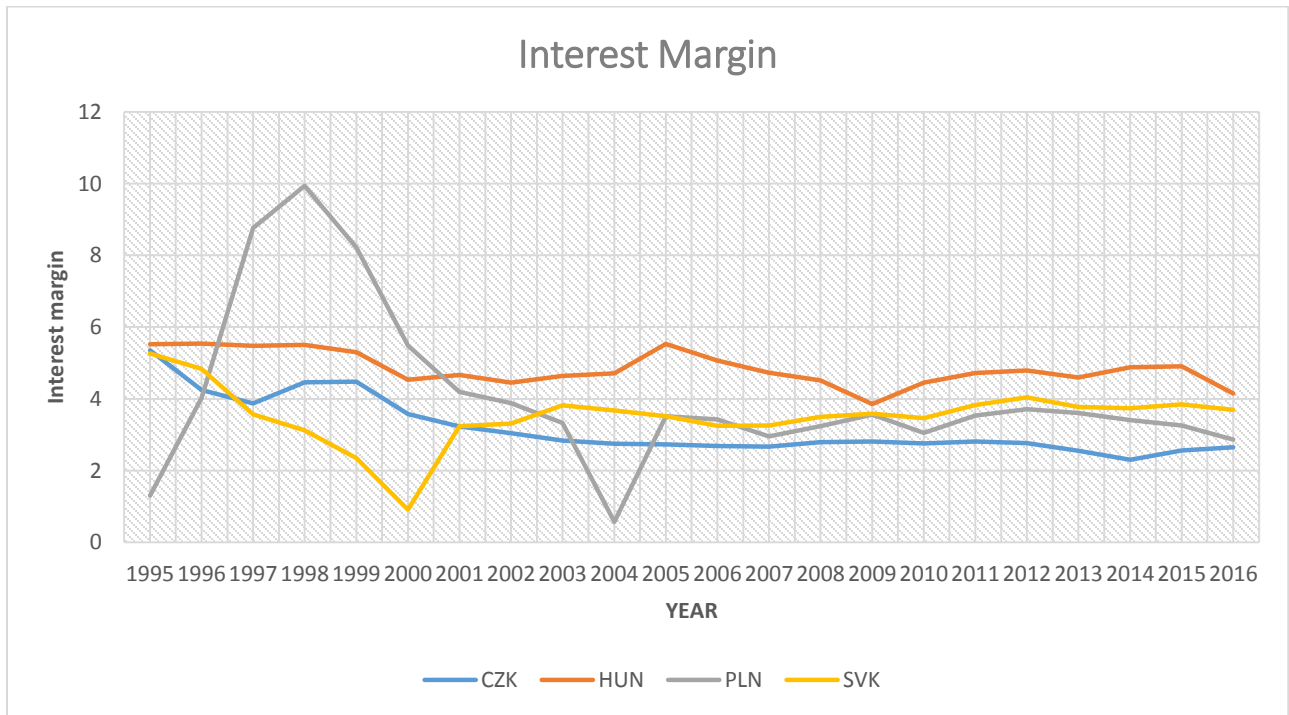


Figure 14: Changes in cost-to-income ratio in Visegrad countries from 1995 to 2016

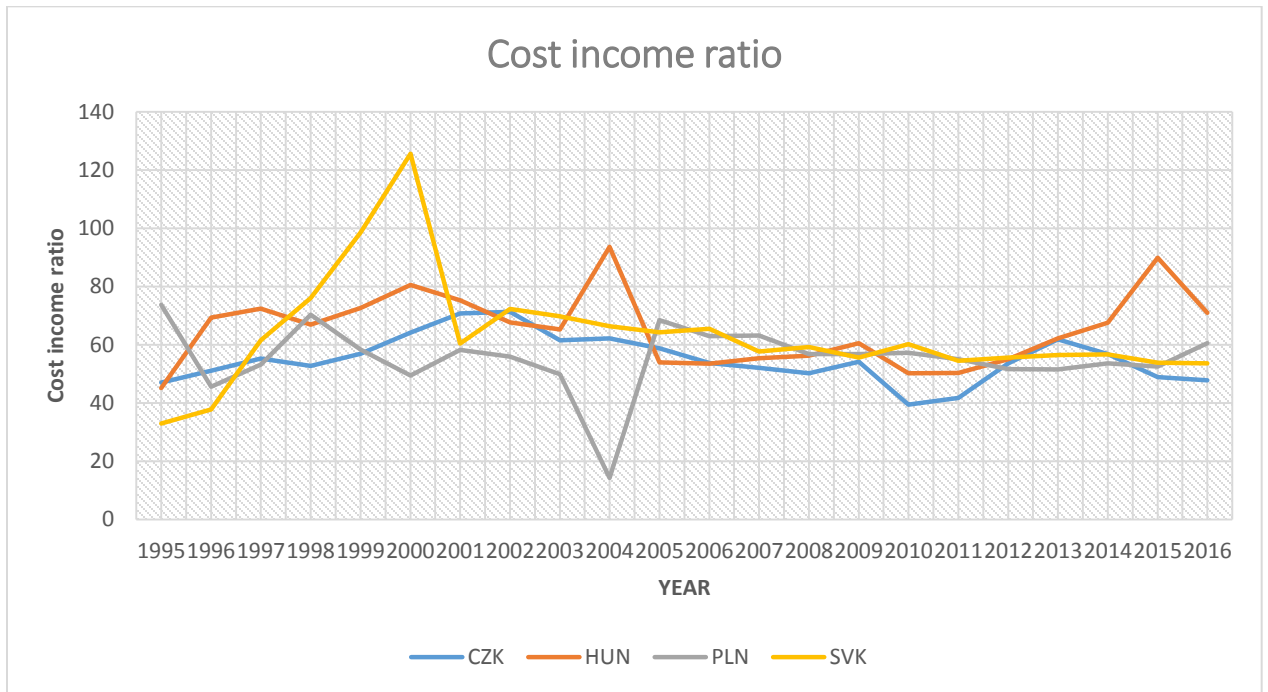
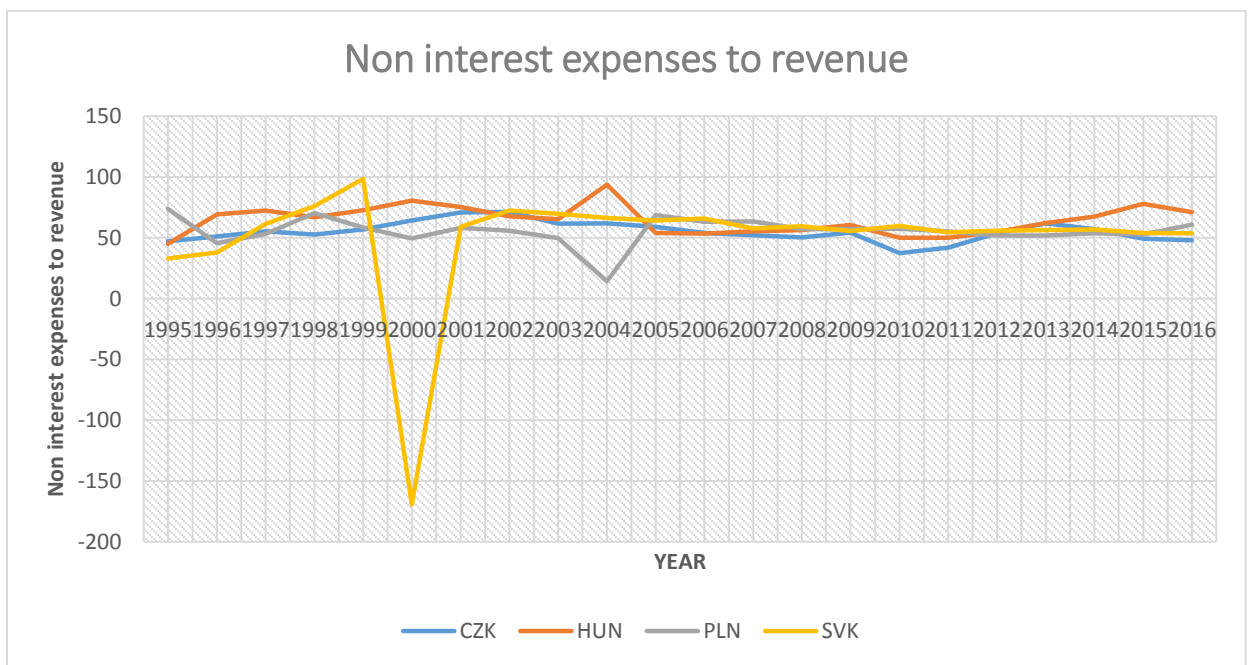


Figure 15: Changes in non-interest expenses to gross revenue in Visegrad countries from 1995 to 2016



3.5.4. LIMITATIONS

As the chief limitation of this portion of the empirical research, we note the fact that the number of banks with available data decreases from year to year. The number of banks is highest in 2016, and this number decreases progressively to only 14 banks that are analysed in 1995. This is in part due to growth in the number of banks in these countries over time, and partly because the data are either unavailable on Bankscope or are incomplete. Secondly, the transition period was very specific and the environment was highly volatile. Therefore, results may, in some instances, be spurious, due to the privatisation of the largest banks (as can be seen in the performance and efficiency results of Slovakia in 1999 and 2000).

3.5.5. RESULTS

This section presents the results of the analysis, and is divided into four periods. It consists of the results from the ratio-based analysis as well as the results of regression analysis.

1995 – 2004

The first time period begins with the year 1995, often regarded as the beginning of the second wave of reforms in the transition countries, and ends in 2004, the year all four countries effectively joined the European Union²⁴. Figure 16 displays the three profitability measures of the banking sector in the Visegrad Four from 1995 to 2004. As mentioned above, the higher the value of ROAA, ROAE, and NIM, the better the performance, and the lower the value of cost-to-income ratio and non-interest expenses to revenue, the higher the efficiency.

Looking at Figure 6, we can clearly see that the performance trend is significantly different in each country. For example, the ROAA of Poland increases sharply from its

²⁴ All four Visegrad countries have been a part of the European Union as of 1 May 2004.

initial negative value in 1995 to 5% in 1998, reaching a historical maximum, with this upsurge followed by a considerable decline to 0.22% in 2004. However, these results are misleading, as the increase in ROAA in the years 1997-1999 was caused by the high ROAA value (12.94% in 1998) of Bank Gospodarstwa Krajowego, which was, at that time, responsible for the privatisation process and was issuing bonds that were later converted into the shares of the privatised companies²⁵. In fact, according to the National Bank of Poland, ROAA decreased slightly in 1998, as compared to the previous year, together with net interest margin, due to a fall in market interest rates.

Another unusual trend can be observed in Slovakia in 1999—ROAA was extremely low, while ROAE was extremely high. This situation occurred due to the unusually high ROE seen that year in VUB bank, reaching 886.38%; ‘Slovenska sporitelna’, reaching 120.44%; and Slovak Guarantee and Development Bank, reaching 24.11%. According to Slovak National Bank, this was caused by the restructuring process prior to privatisation, when the majority of these banks’ stocks were acquired by the ministry of finance and property fund. In 2001, when the government introduced the Banking Act, and began the privatisation process of banks, both performance and efficiency stabilised at around 1.5% ROAA, 14% ROAE, and 66% cost to income. After the privatisation process was completed, more than 95% of banks in Slovakia were owned by foreign banks.

In the Czech Republic, we observed a decreasing trend in both ROAA and ROAE up until the year 2000. According to Czech National Bank, decline was due to the economic situation of the country and the increase in the percentage of NPL. The performance indicators began to rise in 2000, when the two major banks—CSOB bank and ‘Ceska Sporitelna’—were privatised and new regulatory and supervisory policies were implemented.

In Hungary, in the year 2000, the performance indicators began to rise (from ROAE -5.7% in 2000 to 17% in 2001) while inflation was still relatively high. The main reason was that banks, both domestic and foreign, significantly increased their household lending²⁶ (Badics, 2015). This led not only to an increase in performance, but also to an

²⁵ In 1998, the new banking law was introduced.

²⁶ Household lending was supported by the Hungarian government through a special programme.

increase in efficiency that can be noted in all five ratios (see Figures 16 and 17). The growth trends slowed down slightly after 2003, when many of them were transformed into foreign-denominated loans.

To compare the performance and effectivity of all four countries from 1995 to 2004, we summarised the median of each measure for each country (see Table 10). Due to the presence of outliers in the data samples, which could cause misinterpretation of results, we decided to use median instead of mean. As seen in the graph, Hungarian banks were the best performing, in terms of ROAE and NIM, largely due to consolidation that took place from 1994 (except for 1998, when three banks that accounted for one third of the Hungarian banking system generated losses), as well as a boom in household loans that started at the beginning of the 2000s (Badics, 2015). Not only did Poland have the best performance in terms of ROAA, Polish banks were the most efficient during this period according to both efficiency measures.

Table 10: Median value of performance and efficiency measures from 1995 to 2004

	CZK	HUN	PLN	SVK
ROAA	0.92892	1.19369	2.3613	0.72544
ROAE	13.7587	18.8608	8.01893	13.3564
Net interest margin	3.72204	5.00385	4.10884	3.4387
Cost to income	59.2078	70.8367	54.5375	68.0409
Non-interest expenses	59.2069	70.8368	54.5375	63.9733

Figure 16: Changes in performance measures from 1995 to 2004

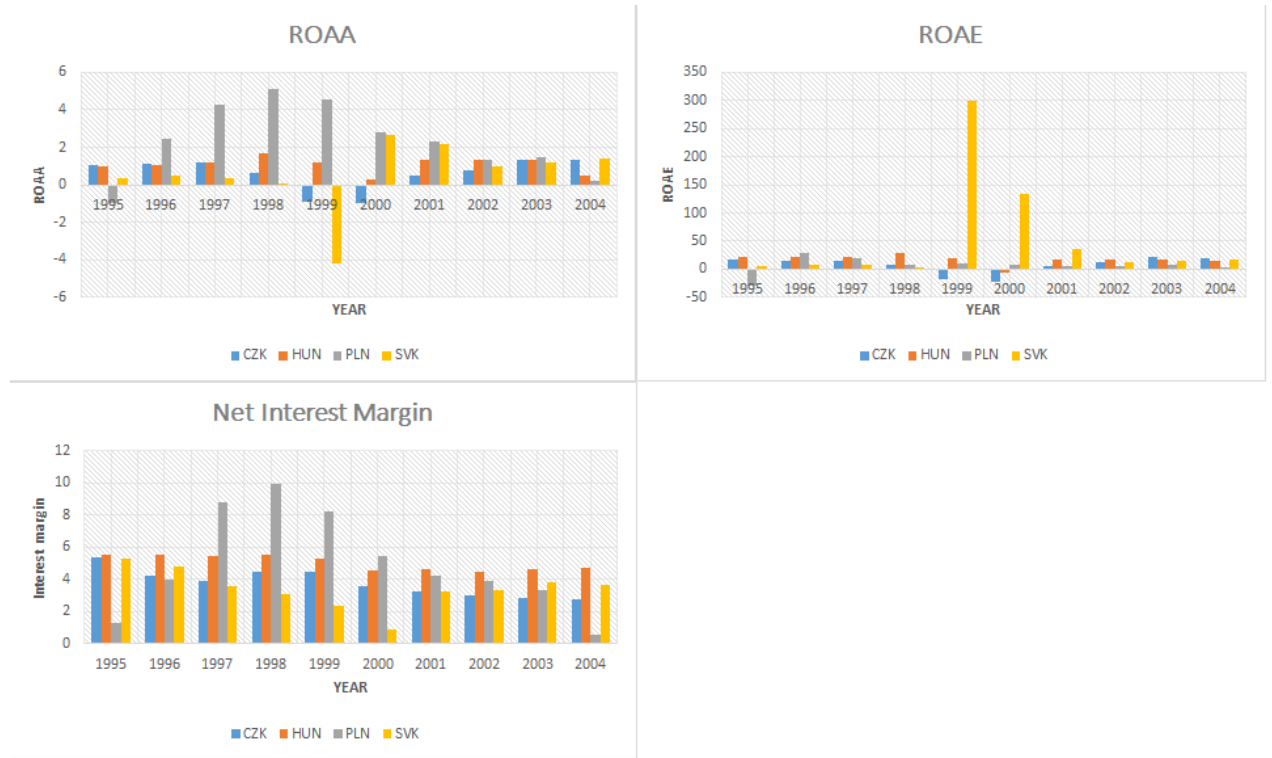
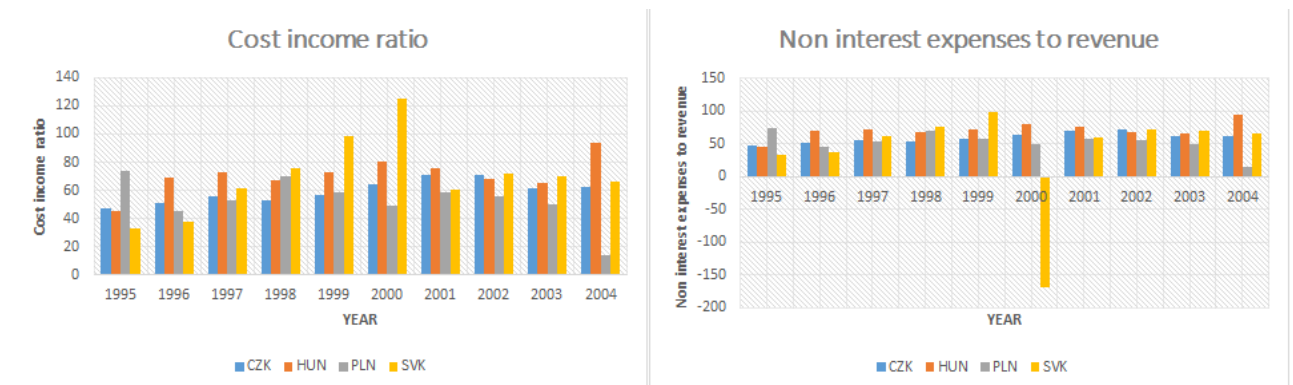


Figure 17: Changes in effectivity measures from 1995 to 2004



2005 – 2008

The second period starts in 2005, at which point all four countries were already members of the European Union, up until 2008, when the global financial crisis occurred. The rising trend of ROAA throughout this period is also reflected in the trend of ROAE.

The four countries show either stabilisation or slight increase in these values. Similarly, efficiency increases in all countries, with the exception of Poland, where the cost-to-income ratio increased from 14% to 68% in 2005.

According to National Bank of Poland, the performance in 2004 was rising thanks to higher interest rates and a higher volume of loans. In addition, in 2005, the number of mortgages issued rose by more than 40% (many of these being denominated in foreign currencies), which contributed positively to the performance of the sector.

The Hungarian banking sector was the most profitable country during this period, similarly due to high interest rates. Moreover, in 2005, the quantity of loans began to grow more rapidly, but the loans were often issued in foreign currency (Swiss franc), which caused major problems in the Hungarian banking sector at a later stage. From 2005, performance started to decline slightly (as interest rates were lowered)—net interest margin decreased from 5.5% in 2005 to 4.5% in 2008, while efficiency stabilised.

In Slovakia and the Czech Republic, the steady improvements in both performance and efficiency persisted throughout this period owing to positive economic trends, including low inflation, rising salaries, and an increase in household loans (Barisitz, 2007). However, in 2008, ROAA and ROAE started to decline due to the global financial crisis. For instance, in Slovakia, ROAE declined from 17.9% to 10.6% within a year, due to the negative impact of the crisis, though efficiency did not rise significantly. In the same year, cost-to-income ratio only increased from 57% to 59%.

Table 11 below depicts the median value of all five measures for the period from 2005 to 2008. Based on our findings, Hungary was the best performing country in the group, in terms of all three measures, while the Czech Republic was the most efficient.

Table 11: Median value of performance and efficiency measures from 2005 to 2008

	CZK	HUN	PLN	SVK
ROAA	1.37244	1.91464	1.77061	1.34146
ROAE	18.6902	20.8803	16.3977	17.2793
Net interest margin	2.70909	4.89823	3.33331	3.37386
Cost to income	52.8944	54.6215	63.0507	61.7155
Non-interest expenses	53.0019	54.6214	63.2851	61.9241

Figure 18: Changes in measures from 2005 to 2008

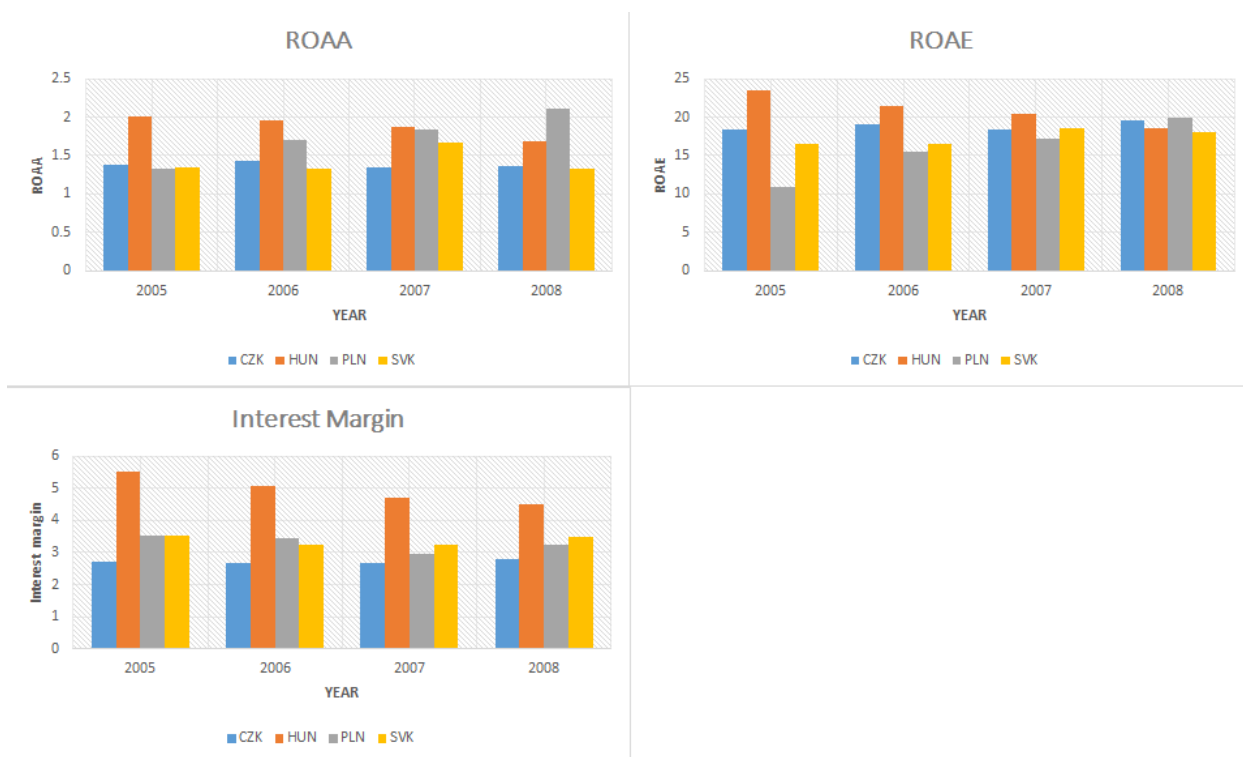
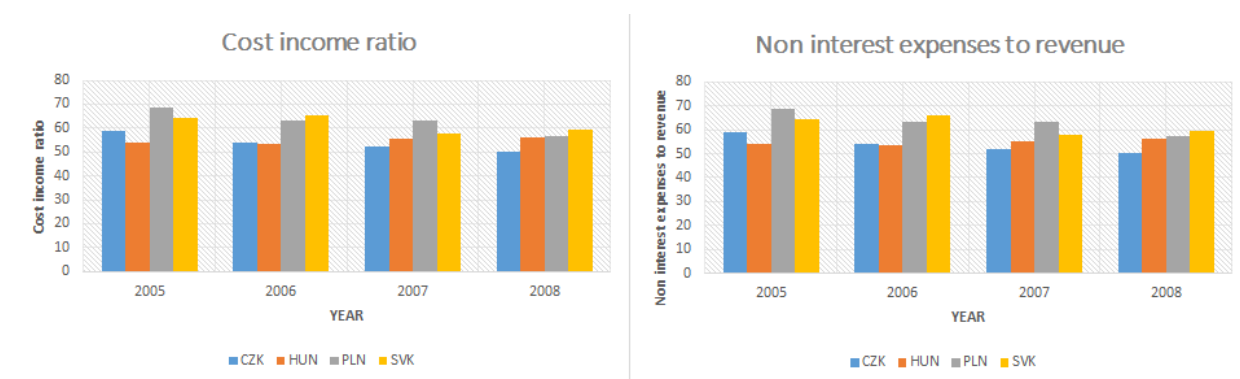


Figure 19: Changes in efficiency measures from 2005 to 2008



2009 – 2013

In 2008, the global financial crisis occurred, and the resulting drop in performance can be seen in the graph below. Performance decreased in all four states, though efficiency measures were not affected negatively (except in the case of Slovakia).

Poland is known as the country that avoided the effects of the 2008 crisis, with its GDP showing continued growth. The banking sector was well capitalised at the time and was considered to be healthy. As can be seen in the graph below, performance measures declined in 2009 and 2010, even in Poland, but not as much as in the other countries.

Among the Visegrad Four, Hungary was the most negatively influenced by the crisis because of its high quantity of foreign debt. ROAA decreased from 2% in 2005 to 1.7% in 2009, and then to -1.09% in 2012; ROAE dropped from 23.4% in 2005 to -22.39% in 2012; while efficiency remained relatively stable. Hungary's performance fell in 2012 due to considerable bank losses, which in turn were caused by the fact that over 50% of loans were denominated in foreign currencies (EUR and Swiss franc) and, with the forint devaluing, households were unable to repay their loans. At the end of 2011, the government introduced a programme that allowed households to repay the loans at a favourable exchange rate, so as to prevent further losses.

Table 12 shows the median value of all five measures for the period from 2009 to 2013. In terms of ROAA, the Polish banking system was the most profitable during this period and the Czech banking system was the most efficient.

Table 12: Median value of performance and efficiency measures from 2009 to 2013

	CZK	HUN	PLN	SVK
ROAA	0.79941	0.2671	1.38591	0.98602
ROAE	13.1432	1.61158	11.6641	9.27689
Net interest margin	2.76173	4.59539	3.55903	3.77283
Cost to income	53.643	55.046	55.0179	55.6362
Non-interest expenses	53.7264	54.892	55.179	55.7072

Figure 19: Changes in performance measures from 2009 to 2013

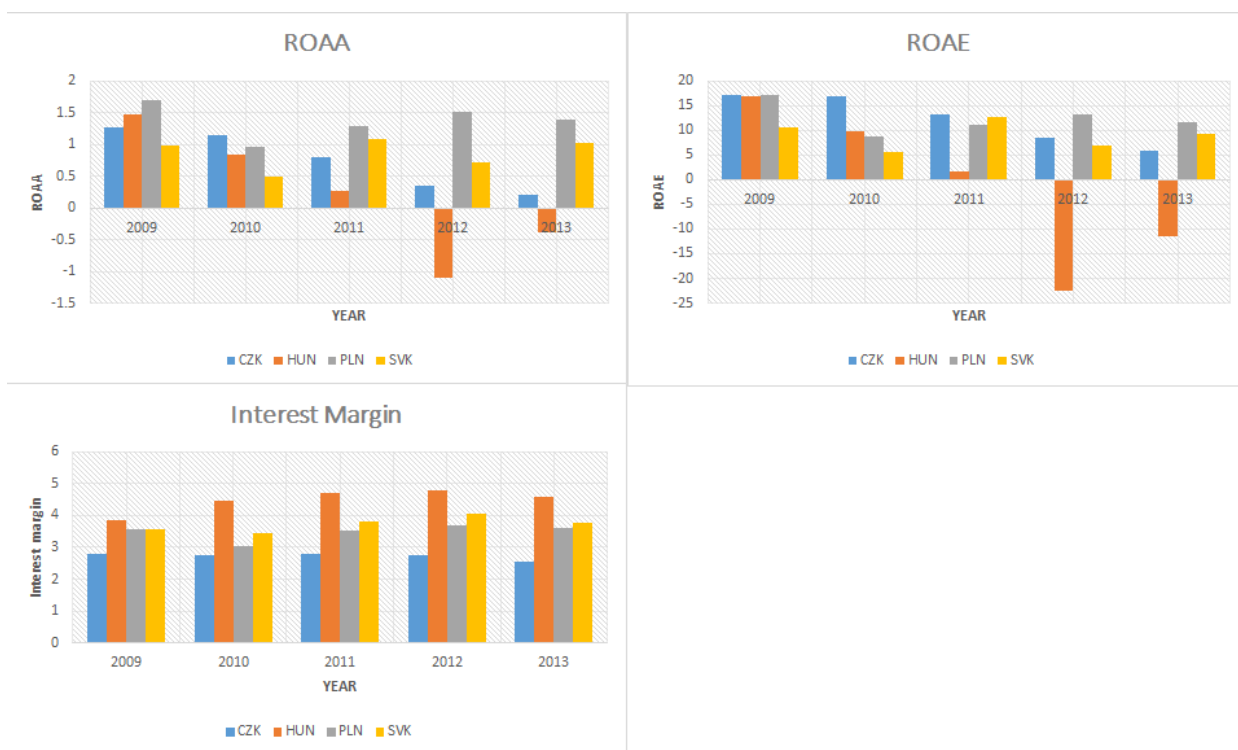
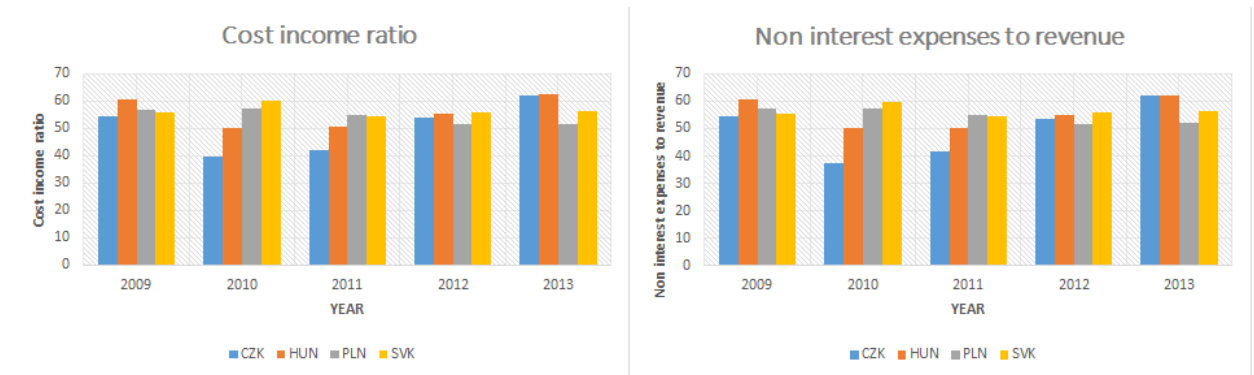


Figure 20: Changes in efficiency measures from 2009 to 2013



2014 – 2016

The final and most recent period is from 2014 to 2016. Firstly, we can see a significant drop in Hungary's performance, with both ROAA and ROAE reaching negative values in 2015. The reason behind this fall was the same as it was in 2012. A high number of mortgages were denominated in Swiss franc, which was unpegged in 2015 and appreciated by 23% at peak levels. Hungarian banks thus had to write off a large number of non-performing loans.

During this period, performance in all other countries either remained stable or increased moderately. The same is true for efficiency, which remained stable for all countries except Poland, where efficiency fell slightly. However, the market was experiencing negative EURIBOR and low or even negative values of deposit and lending rates in the European Central Bank and corresponding national banks. This was followed by the ECB's quantitative easing, along with other measures to increase liquidity in markets. As a result of these conditions, banks were forced either to pay to deposit their money or to find alternative locations to place their resources. This led to decreasing margins for retail and corporate loans, and therefore lower net interest income for the banking sector.

According to the table below, Poland was the best performing based on ROAA and the Czech Republic showed the best performance in terms of ROAE, while, according to

interest margin, Hungary was the most profitable. Both efficiency measures indicate that the Czech Republic was the most efficient during this period.

Table 13: Median value of performance and efficiency measures from 2014 to 2016

	CZK	HUN	PLN	SVK
ROAA	1.10932	- 0.5837	1.18282	1.13531
ROAE	10.4198	- 9.7307	10.1098	9.96328
Net interest margin	2.55806	4.87839	3.25541	3.74125
Cost to income	48.9339	71.0035	53.5612	53.8696
Non-interest expenses	49.3145	70.9952	53.6374	54.0365

Figure 21: Changes in performance measures from 2014 to 2016

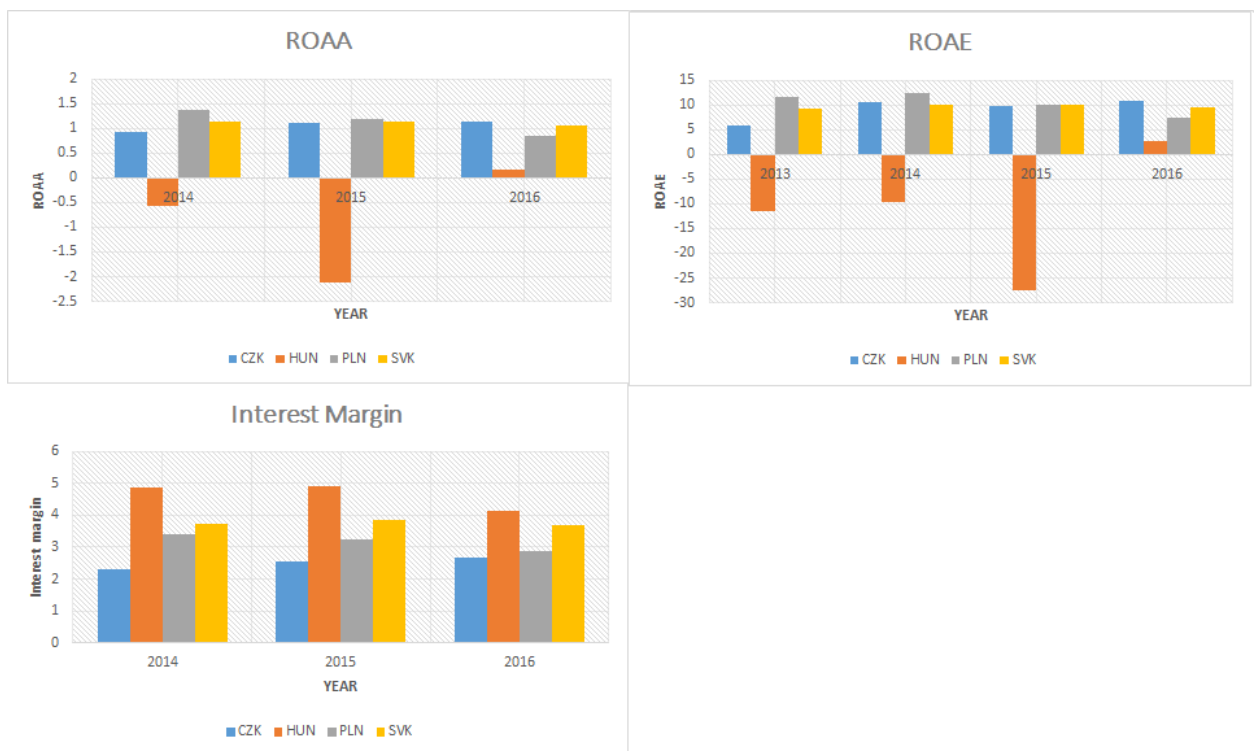
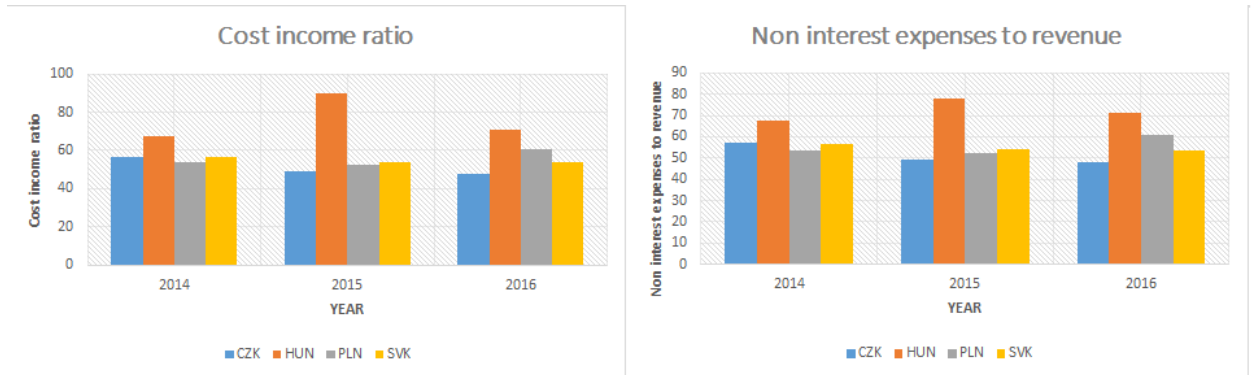


Figure 22: Changes in efficiency measures from 2014 to 2016



3.5.6. REGRESSION

The third regression analysis uses random-effects GLS regression, the same regression method used to measure stability. The model is based on explanatory variables—performance indicators constructed from the Bankscope bank-level data—and a dependent variable of macroeconomic variable GDP growth.

$$W_{it} = \alpha + \beta_1 Z_{1it} + \beta_2 Z_{2it} + \beta_3 Z_{3it} + u_{it}$$

W_{it} = Represents GDP growth as a measure of economic growth

Z_{1it} = Aggregated ROAA on the country level in a given year

Z_{2it} = Aggregated ROAE on the country level in a given year

Z_{3it} = Aggregated non-interest margin on the country level in a given year

u_{it} = Error between entities

ε_{it} = Error within entity

α = Intercept

β = Slope

Table 15 shows the results of random-effects GLS regression analysis, which was used to calculate the impact of bank performance on GDP growth, a common measure of national economic growth. We firstly run the Hausman test, where H_0 : random effects, H_1 : fixed effects. However, after running the test, the results were invalid, since the model failed to meet ‘asymptotic assumptions of the Hausman test’. Therefore, it was necessary to run the Hausman test adjusted for sigmamore, using the command: ‘hausman fixed random, sigmamore’. After adjustment, ‘Prob > Chi2 = 0.0611’, which is higher than 0.05; we can thus reject the null hypothesis, and should therefore use the random-effects model. Breusch and Pagan Lagrangian multiplier test also rejected the null hypothesis because ‘Prob > chibar2 = 1.000’, which is higher than 0.05, confirming the choice of random effects over OLS regression.

Although we observe a positive relationship between ROAA and economic growth, and a negative relationship between both ROAE and NIM, on one hand, and economic growth (see Table 15), on the other, the results are not significant because, by running a two-tailed p-value test, we cannot reject the null hypothesis ($p > |z|$ is higher than 0.05). As none of the explanatory variables were statistically significant, we cannot conclude, from this research, that bank performance had a significant impact on the economic growth of the Visegrad countries from 1995 to 2015. In light of this outcome, we also ran additional OLS (ordinary least squares) regression for each country separately. We found that, in the case of the Czech Republic, the variable ROAA was significant at the 10% level. We can thus say that, in the Czech Republic, ROAA is positively correlated with economic growth.

Although none of the variables in the GLS regression were statistically significant, most studies confirm the presence of a relationship between economic growth and bank performance in the four Visegrad countries. However, economic growth is also influenced by other factors such as the political environment and political stability. For instance, Hui (2013) performed regression analysis on banks in Nepal over a 35-year time span, and found that deposits and assets had an impact on growth, though loans did not. Petkovski (2014) used the GMM model to test the impact of banking sector development on economic

growth, and he concluded that the net interest margin and amount of credit granted to firms and individuals negatively impacts economic growth.

Table 14: Summary statistics of the variables used in the regression analysis

Variable	Mean	Standard deviation	Minimum	Maximum
GDP	3.284196	2.830623	- 6.563634	10.79958
ROAA	1.096006	1.217943	- 4.169181	5.086206
ROAE	15.85668	35.95934	- 30.11617	298.465
NIM	3.934026	1.420787	0.5717662	9.942265

Table 15: Random-effects GLS regression with dependent variable of bank GDP growth

Random-effects GLS regression	
GDP growth (dependent variable)	
Return on average assets	0.456481 (P> t 0.106)
Return on average equity	- 0.007573 (P> t 0.377)
Net interest margin	- 0.1083851 (P> t 0.654)
Constant	3.3333 (P> t 0.000) ***
Observations	84
Size	1 596
Number of countries	4
R Squared	0.047
* significant at 10%, ** significant at 5%, ***significant at 1%	

4. CONCLUSION

The research question of this dissertation was motivated by an interest in analysing and providing a detailed overview—both qualitative and quantitative—of the banking system in the Visegrad countries. The banking industry was chosen for this research because it played an important role in the transition of these countries, and had a direct impact on their overall economic growth. Although all four Visegrad countries are geographically proximate, and all were under the same communist system for decades, each has its distinct features and dealt with the transition differently. Therefore, this section aims to summarise the findings of the empirical research and its implications, as well as to provide suggestions on the reforms and regulations that should be implemented in order to improve the banking system in the future.

To assess the extent to which the transition of the banking system was successful, we use the measures of stability, performance, and efficiency, and, by taking into account the available information, we tested the following three null hypotheses:

Hypothesis 1: The Polish banking system was the most stable across all periods.

Hypothesis 2: The Czech banking system was the most profitable across all periods.

Hypothesis 3: Transition in Slovakia proceeded more smoothly than the transition in other countries.

To test the first hypothesis, we used data from the World Bank Global Financial Development dataset and Bank Regulation and Supervision Survey. The variables used to measure stability were bank z-score and percentage of non-performing loans over a 20-year period, and, to test the impact of the reforms and tighter supervision, we performed random-effects GLS regressions. We found that, if using the z-score value as the only indicator of banking stability, the Slovak Republic would be considered to have the most stable banking sector, followed by Poland, which had a z-score lower than Slovakia (except

in the years 1999, 2005, and 2006, in which it performed better); in third place would be Hungary, and in last place the Czech Republic. Based on this measure, we can reject the null hypothesis that the Polish banking system was the most stable across all periods. Similarly, by using NPL, we can reject the null hypothesis, as Poland had one of the highest NPL ratios during almost the entire period, though it stabilised and performed better than other countries from the 2008 global financial crisis onwards. The results of regression analysis suggest that, in Visegrad countries, strict requirements for banks applying for a license lead to higher banking system stability, while prohibiting additional banking activities—such as real estate, insurance, securities, or other non-financial services—leads to lower stability in the overall system.

The second and third hypotheses use bank-level data extracted from Bank Scope and macroeconomic data downloaded from the World Bank database. Performance and efficiency are analysed using the traditional method, based on ratios such as ROAA, ROAE, net interest margin, cost-to-income ratio, and net interest expenses to revenues. We found that, from 1995 to 2008, Hungarian banks were the best performing in terms of ROAE and net interest margin. After the global financial crisis, the best performing banking sector was in Poland (based on ROAA). The Czech Republic had the highest level of efficiency in almost all periods, with the exception of the first period (1995 to 2004), in which it was outperformed by Poland. Based on these results, we reject the second null hypothesis, because the Czech banking system was not the most profitable in all periods. In fact, Hungarian banking system was the most profitable most of the time (1995-2008). Similarly, we can reject third null hypothesis, since transition proceeded more smoothly in Czech Republic than it did in Slovakia. Efficiency was highest in the Czech Republic in almost all periods.

To assess how the profitability of the banking sector influenced economic growth, we again used random-effects GLS regression. Although we observe a positive relationship between ROAA and economic growth, and negative relationships between both ROAE and NIM, on one hand, and economic growth, on the other, the results are not statistically significant, and therefore we cannot conclude that bank performance had a significant impact on the economic growth of the Visegrad countries from 1995 to 2015. Additionally,

we found that, in the Czech Republic, ROAA is positively correlated with national economic growth.

Although this dissertation is a rather enhanced analysis of the transition of the banking system in Visegrad countries, there are some limitations as well as potential improvements for further research. Firstly, there is lack of sufficient data on the Bank Scope in the first years of transition. This is caused especially by a limited number of existing and working banks in the developing Visegrad countries during that time period. Secondly, bank regulation and supervision survey consists of 270 questions on 13 topics. Further research of the topics that are not covered in this dissertation may improve the quality of our results on the impact of regulations on the stability of the banking sector. Thirdly, further research may study the comparison of the banking sectors in Visegrad countries and the western countries, where the two tier banking system has been functioning for decades. The research may focus on the differences during the whole time period, i.e. at the beginning of the transition and now.

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LIST OF APPENDICES

Appendix 1: List of commands used for stability regression analysis

```
cd N:\QuantMeth
set more off
capture log close
log using tutorials, replace
cmdlog using commands.do, append
summarize
des
xtset state year
xtline zscore, overlay
xtline npl, overlay
xtreg zscore entry mon res, fe
estimates store fixed
xtreg zscore entry mon res, re
estimates store random
hausman fixed random
xtreg npl entry mon res, fe
estimates store fixed
xtreg npl entry mon res, re
estimates store random
hausman fixed random
xtreg zscore entry mon res, re
xttest0
xtreg npl entry mon res, re
```

Appendix 2: List of commands used for performance regression analysis

```
cd N:\QuantMeth
set more off
capture log close
log using tutorials, replace
cmdlog using commands.do, append
summarize
des
xtset state year
xtline gdp, overlay
xtreg zscore entry mon res, fe
estimates store fixed
xtreg zscore entry mon res, re
estimates store random
hausman fixed random
hausman fixed random, sigmamore
xtreg gdp roaa roae nim, re
```