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Macroprudential Policy in Central and Eastern European Countries - Is There Something We Should Learn?

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*Macroprudential Policy in Central and Eastern European Countries – Is There Something We Should Learn?**

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Abstract

This paper provides a deeper insight into the experiences of the CEE countries that belong to a relatively small group of countries that had used macroprudential measures and instruments in the past. In that context, the main goals of this research were to contribute to the understanding of the connection between the intensity of use of macroprudential policy, and macroeconomic and monetary trends and specificities as well as financial system characteristics, and to create an effectiveness evaluation model for macroprudential measures and instruments in the CEE countries with regard to the systemic risks associated with excessive credit activities in the period before the onset of the global financial crisis. Apart from that, special emphasis is put on the importance of better coordination between macroprudential and other economic policies not only in the pre-crisis period, but also during and after crisis episodes. Since this research is focused on small open economies that have their own particular specificities, these insights are also important because these risks can sometimes be overlooked in discussions on a global level.

Keywords: macroprudential policy, financial stability, credit growth, systemic risk

JEL: E58, E61, F55

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1. INTRODUCTION

Even though most economies in the world were affected by the global financial crisis, research shows that emerging markets initially suffered less than advanced economies, and this has been attributed to macroprudential policy used by the former in the pre-crisis period (Ceballos et al., 2013). Namely, the conditions in the global financial market in the pre-crisis period in conjunction with inherent macroeconomic, financial and monetary characteristics had greatly contributed to creating imbalances in the emerging markets. Therefore, many of these countries employed an active policy aimed at curbing excessive credit growth and capital inflows as well as reducing and preventing other systemic risks, while strengthening the resilience of the system to financial shock. To achieve these goals, the countries employed different macroprudential measures and instruments, though not necessarily termed "macroprudential" at the time of introduction. The choice of macroprudential instruments in these countries was influenced by the level of financial and economic development, the exchange rate regime, the degree of euroization and similar (Lim et al., 2011).

The first goal of this paper is to examine which macroeconomic, monetary and financial characteristics and trends encouraged central banks to expand their set of monetary measures and instruments with macroprudential instruments using a global sample as the basis for analysis. In this manner, the research will focus on identifying factors that encouraged macroprudential policy development, with special attention to CEE countries[1] as the frontrunners in the implementation of such policies in Europe. Insights into specific characteristics and risks that contributed to the development of macroprudential policy should contribute to the process of constructing an efficient macroprudential policy framework and developing macroprudential instruments. In general, practical experience in implementing macroprudential policies is very scarce at the global level. Most experiences are actually concentrated in the emerging markets that have applied such policies most frequently as a result of limitations in use of other types of economic policies and due to their specific characteristics. It is therefore useful to point to the characteristics of small open economies and contribute to the understanding of specific systemic risks that they are faced with, so as to

[1] The CEE countries include Bulgaria, the Czech Republic, Estonia, Croatia, Lithuania, Latvia, Hungary, Poland, Romania, Slovakia, and Slovenia.

ensure, among other things, that these risks are not neglected in the current macroprudential framework development process.

The second goal of the paper is to examine the effectiveness of macroprudential policy in mitigating systemic risks attributable to excessive credit activity, identified in many studies as one of the key characteristic of the periods preceding financial crises, on a panel of the CEE countries. Despite considerable recent increase in research on macroprudential policy, we still know relatively little about the effectiveness of its measures and instruments. Most papers that have taken these countries into consideration examine them within larger samples, without analysing the impact of macroprudential measures on credit to specific sectors. Therefore, in addition to bank credits to the private sector, this paper also examines total credit to corporate sector and households.. This is an extension of the analysis presented in the Appendix 1 and is one of the main contributions of this paper, thus providing additional information on the scope and experiences in implementing macroprudential policy as well as on potential room for circumventing such measures. Such an analysis should contribute to a better understanding of the importance of timely use of macroprudential policy in small open economies, but also point to the problems pertaining to calibration and identification of an optimal set of macroprudential instruments. Quantification of positive macroprudential policy effects is useful for macroprudential policymakers that typically have little experience in the field, and it can have a positive effect in terms of raising awareness of the importance of preventive and timely action. This can also be used as an argument in the communication with the authorities responsible for other economic policies and to sensitize the public toward the use of such measures and instruments.

The paper is divided in seven parts and is structured as follows. After the introduction, the development of macroprudential policy and the related challenges are briefly presented, underlining the significance of macroprudential policy in preserving financial stability and its contribution to sustainable economic growth. Section 3 provides a stylised presentation of the patterns that preceded the crisis episodes in the CEE countries, describing the major trends associated with the systemic risk accumulation process that prompted the use of macroprudential policy. Chapter 4 describes the link between the intensity of use of macroprudential policy on one hand, and macroeconomic and monetary characteristics and trends as well as the level of development of financial systems on the other. The main results of the analysis of the factors that led to an intensified use of macroprudential policy point to

the need to examine and comprehend specific risks faced by small open economies. Section 5 presents a model for estimating the effectiveness of macroprudential policy measures and instruments that points to the need to regulate the non-regulated segments of the financial system and underscores the importance of international cooperation aimed at preventing cross-border systemic risk spillover. The sixth part draws the most important lessons based on the results of analysing macroprudential policy in CEE countries and points to other potentially interesting questions that might be answered by studying countries, with a special accent put on the importance of coordination between macroprudential and other economic policies. The final part of the paper presents a summary overview of performed analyses. The Appendices briefly present the latest research on the topic of the effectiveness of macroprudential policy and the outcome of performed regressions.

2. Development and Challenges of Macroprudential Policy

Individual macroprudential policy segments started developing as early as in the 1970s, mostly due to the financial deregulation process. Though the term "*macroprudential*" was first used in the late 1970s, it entered wider use only with the onset of the recent global financial crisis in mid-2007 (Clement, 2010). In general, macroprudential policy addresses the financial system and its interconnectedness with the real sector. It focuses on preventing systemic risks, thereby reducing the probability of systemic events relating to financial institutions, markets, infrastructure and instruments that can threaten the system's financial stability.

Financial stability can be influenced by numerous institutions, but up to now the subject has been addressed primarily by central banks, most often in developing countries which were, on top of traditional and nonconventional monetary policy measures and instruments, also using a set of macroprudential instruments. Central banks have mostly used the macroprudential toolkit with the purpose of curbing credit activity, slowing down capital inflows, and influencing liquidity and capitalisation of the banking sector as well as the quality of granted loans. From a central bank perspective, preserving the stability of the financial system both at national and global level is of the utmost importance. This becomes especially apparent when macroeconomic costs of financial instability are taken into account. Windischbauer (2007) underlines that central banks engaged in activities aimed at preserving financial stability due to

different motives, primarily the importance of a stable and efficient banking system for a successful monetary policy and achievement of their primary objective, i.e. maintaining price stability.

However, the relationship between financial stability and monetary policy has often been oversimplified in the period up to the recent financial crisis. It was assumed that, if developed and efficient financial markets existed, price stability would be sufficient to maintain financial stability, and an independent central bank responsible for price stability would be sufficient to preserve monetary stability, but the crisis showed that such views were too narrow (Caruana, 2011). In fact, a sound and functional financial system is a prerequisite for an effective monetary policy, while an effective monetary policy is a prerequisite for maintaining financial stability successfully (Borio and Shim, 2007).

Along with macroprudential and monetary policy, other policies could also have a big impact on financial stability, primarily microprudential or fiscal and competition policies, which can significantly affect financial and real trends and the financial system as a whole. Their combined countercyclical effects increase the probability of success in preserving macroeconomic and financial stability during crisis episodes. But, the crisis revealed that many segments of the behaviour of policymakers combined with the regulatory framework were actually procyclical and that they had additionally deepened and intensified upward, i.e. downward phases of economic and financial cycles.

Recent discussions indicate that the “regulatory gap”, where no one was explicitly in charge for monitoring systemic risks, significantly contributed to the onset of financial crises. Traditional microprudential regulation has not proved effective in identifying the vulnerabilities of the financial system as a whole that were to threaten both financial as well as macroeconomic stability in the end, or in alleviating their implications. It became evident that, to preserve the stability of the entire financial system, supervising only individual institutions was not enough because financial stability risks can also arise due to the behaviour of the system as a whole (Angelini et al., 2012). The fact that different institutions were in charge of different parts of the financial system also contributed to creating the conditions favourable for the onset of the crisis. This made it impossible to see the big picture, as well as to detect the effects on the system as a whole, even in the countries using macroprudential policies. Consequently, the need for a different approach to maintaining stability arose. It is for this

reason that significant efforts invested by economic policymakers and the academic community in recent years have focused on an attempt to establish an efficient macroprudential regulatory framework. The primary goal is to facilitate efficient identification, monitoring and analysis of systemic risks which could threaten financial stability, and to create preconditions for applying appropriate measures and instruments in order to avoid or mitigate these risks and strengthen the resilience of the system to shock. In addition, since different policies may have opposing goals, the above can also serve as an additional argument in favour of establishing an effective institutional framework aimed at resolving such problems both in individual countries and at international level (Nier et al., 2011).

Although the intensity of macroprudential policy in the pre-crisis period was not the same in all EU member states, as a result of the crisis and due to identified weaknesses in the systemic risk management approach as well as initiatives from different EU institutions, the member states began intensive work aimed at enhancing the macroprudential policy implementation framework. The first step on that path is to establish an appropriate relationship among the existing supervisory bodies in charge of the financial system and, possibly, establish new bodies with an explicit mandate to implement macroprudential policy at national level[2], while next steps include selecting adequate and efficient macroprudential measures and instruments, defining their application criteria, developing public communication strategy and similar.

Under above assumption of having efficient macroprudential framework, proper application of appropriate macroprudential instruments could prevent crisis episodes or reduce probability of their occurrence, and diminish the volatility of financial and real indicators in the long term (IMF, 2011). They can be used to build buffers against possible shocks that would mitigate the consequences of systemic events and reduce the costs of crisis episodes. As with other types of instruments, when selecting macroprudential measures and instruments, it is necessary to take into account their appropriateness for the desired goal as well as their effectiveness. In addition to calibration and optimisation, possible implementation costs should also be taken into account. Such costs can most often be seen in the form of a slowdown in economic growth and a more difficult and costly financial intermediation process (IMF, 2011). Schwartz (2011) also emphasizes that tight regulations can also result in indirect costs like barriers to innovation and

[2] In late 2011, the European Systemic Risk Board issued an obligatory recommendation on macroprudential authorities in EU member states. It requires that the member states introduce the term “macroprudential policy” into their legislation and assign a macroprudential mandate to an authority, be it existing or newly-established.

competitiveness. The broader the reach of a macroprudential instrument and the tighter its setting, the more costly its application will be; hence, application of targeted instruments is recommended (CGFS, 2012). Therefore, the goal is to select those instruments that would contribute to achieving long-term sustainable economic growth, and help prevent systemic risk accumulation at the same time. Understanding the costs and benefits of using macroprudential policy is of utmost importance for instrument operationalization and macroprudential policy implementation, as well as in avoiding an inactive approach to the pursuit of macroprudential policy.

In the above context, an examination of the experiences of the CEE countries in the pursuit of macroeconomic policy can be exceptionally useful. An examination of the pre-crisis period provides an opportunity for a detailed analysis of the reasons that led to the application of the policy and of the systemic risks that the countries were exposed to. Additionally, information about practical effects of macroprudential measures and instruments could be disseminated – about their calibration, mutual interaction, interaction with measures of other policies, goals to be achieved, and their scope and effectiveness both in pre-crisis, crisis and post-crisis periods. In this way, it would be easier to demonstrate the benefits and possible costs of conducting macroprudential policy, which may actually help reduce inaction bias in the future.

3. Stylized Description of Developments that Prompted Macroprudential Policy Development in the CEE Countries

The crisis episodes in the emerging markets were typically preceded by similar developments, including banking sector deregulation and removal of capital controls. Together with favourable global macroeconomic and financial conditions, this exposed them to strong capital inflows that were mostly used to fund credit growth related to accumulation of internal and external imbalances.

Pre-crisis trends in the CEE countries were characterized by a similar pattern. Encouraged by developments in the world financial markets, and direct or indirect suggestions from international institutions, most CEE countries removed barriers to cross-border transactions. In doing so, they hoped that the benefits of financial liberalisation in the form of stronger financial system development, capital inflows, more efficient capital allocation, increased

investments and a contribution to higher long-term economic growth rates would exceed possible negative effects, like excessive risk-taking, increased macroeconomic volatility and stronger exposure to crisis episodes (Ranciere et al., 2006, Ranciere et al. 2010). But, it turned out that liberalisation in combination with insufficiently developed regulatory and institutional framework actually created favourable conditions for a build-up of systemic risk.

In addition to liberalisation, the circumstances in leading global financial markets also encouraged capital inflows to the CEE countries. High global liquidity, low global interest rates and increased risk aversion encouraged the investors to start looking for higher returns, with a large portion of the liquidity spilling over to the CEE countries that were posting above-average growth rates in that period. Additionally, the increasing willingness to invest in these countries was also due to their accession to the EU. The countries were fulfilling their pre-accession commitments, which in turn inspired confidence in investors who saw it as a reason to trust that the economic policymakers would be disciplined and that their economies would converge with the older member states at an accelerated rate; such expectations resulted in a sharp fall in the risk premium for the entire region. On the other hand, a stronger reliance on this type of cheap capital exposed these countries to risks associated with an increase in major world interest rates resulting in higher costs of foreign funding and reduced relative investment attractiveness in comparison to developed countries.

The transitional period has also been characterised by an increase in the number of foreign banks and their share in the banking sector assets in the CEE countries, especially those coming from the Eurozone. The entry of foreign owners in literature is often connected with an increase in the quality of financial services and the effectiveness of financial intermediation processes, as well as corporate management (Prasad and Rajan, 2008). But, with parent banks as the dominant source of funding for excessive credit growth in most countries, these positive effects have been overshadowed by a strong accumulation of systemic risks within the system. The influence of parent banks on capital inflows is evident in big transfers of funds towards domestic banks in the form of credits, deposits or hybrid instruments as well as credits granted to the non-financial sector in the CEE countries. According to the BIS data, the average annual credit inflow from parent banks in the 2002-2007 period reached 9% of GDP, while, in the end of 2007, cumulative credit inflows amounted to 38% of GDP on average.

The liberalization of the banking sector also led to an expansion of non-banking financial institutions and securities markets. These trends directly boosted access to foreign capital and expanded the range of opportunities for both domestic and foreign investors, facilitating an increase in investments accompanied by a fall in domestic savings.

The entry of foreign banks and the conditions on global financial markets on one hand and low saturation with bank loans in the CEE countries in early 2000s on the other, created fertile ground for credit expansion. The average credit growth to the private sector in the observed countries from the beginning of 2001 to 2008Q3 amounted to between 13% and 47%, while the average increase in the credit share in GDP reached high levels, amounting to 37 percentage points.

Research shows that intensive credit activity in the pre-crisis period builds up the effect in terms of spreading the crisis from financial intermediaries to the real sector and vice-versa (GFSR, 2011). Credit growth, if excessive, has a negative impact on macroeconomic stability as it stimulates relatively higher aggregate demand growth relative to potential growth. Namely, high demand for goods and services that exceeds short-term domestic supply capacities encourages import and leads to an increase in the deficit on the current account of the balance of payments, while maintaining price stability. However, at the same time, strong capital inflows into shallow financial markets with limited supply exert pressure on the prices of financial assets like shares or domestic currency exchange rates, thus causing “bubbles” to form in these markets (Rohatinski, 2009b). In addition to the above, insufficiently developed financial systems characteristic of most developing countries tend to direct the inflowing funds towards non-tradable assets, like real estate, that offer simple and reliable collaterals, and tend not to use the funds for productive purposes. This usually leads to a sharper price increase in that sector as well, while in the same time increasing values of collateral additionally boost credit expansion. The process is often accompanied by a decrease in the quality of granted loans and intensified risk-taking by the banks (Evans et al., 2000), as confirmed by different studies showing that banking crises often result from excessive credit activity optimism (Kaminsky and Reinhart, 1999). Sharp increases in real estate prices, inappropriate credit policies and high risk propensity have thus additionally contributed to systemic risk accumulation in the CEE countries.

Capital flow liberalisation as well as rapprochement to and integration into the EU in conjunction with international financial market conditions are therefore considered to be the main drivers of high and continuous current account deficits in the emerging markets in Europe, amounting to about 10% of GDP on average in the pre-crisis period. By region, pre-crisis deficits amounted to about 5% of GDP in central Europe, about 11% of GDP in Eastern Europe, while exceeding high 17% in the Baltic States (IMF, WEO).

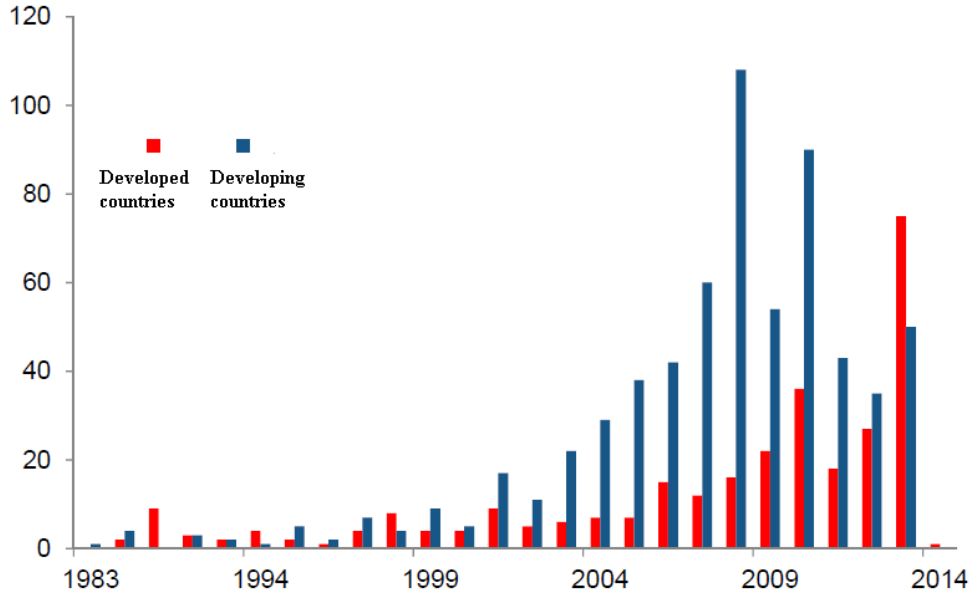
Another potentially unfavourable trait of strong capital inflow periods were the expectations of some economic policymakers who assumed that such inflows would remain continuous and stable, meaning that they were not prepared for the possibility of a sudden stop in capital inflows. Reinhart and Reinhart (2008) show that this wrong perception led to many banking or currency crises and inflation problems or increasing current account deficits in the balance of payments.. In this context, fiscal policy plays an especially important role. A countercyclical fiscal policy can prevent or significantly reduce some negative effects of capital inflows. However, in practice, it is more common to see undisciplined fiscal policies that presume continuous capital inflows and thus contribute to further increases in systemic risks, adding pressure on other policies, especially monetary and macroprudential policies (Watson, 2010). In fact, these policies then have to address this new source of imbalance as well, regardless of whether the cycle is in its upward or downward phase, which makes their job significantly more difficult and reduces their room for manoeuvre which would facilitate efficient action.

On the basis of described trends it can be concluded that strong capital inflows seemed to have had a positive effect on economic activity in the CEE countries, at least at first glance. But, at the same time, most of these countries paid the price for such effects in the form of growing internal and external imbalances, i.e. increased systemic risks and threats to financial stability.

4. Macroprudential Policy and Country Characteristics

A significant increase in the number of countries using macroprudential measures and instruments did not occur until early 2000s. In the major part of the observed period, macroprudential policy was mainly used by emerging market countries, while developed countries intensified its use only after the escalation of the financial crisis in 2008 (Figure 1).

Figure 1 – Use of Macroprudential Measures and Instruments in Developed and Developing Countries



Note: The y-axis shows the number of countries that use macroprudential measures and instruments.

Source: Sowerbutts (2014)

On the basis of an analysis involving 49 countries, Lim et al (2011) identified three groups of macroprudential instruments that were most frequently used in practice in the 2000-2010 period. The instruments are related to:

- credit activity (caps on the loan-to-value ratio, caps on the debt-to-income ratio, caps on foreign currency lending, ceilings on credit growth),
- liquidity (limits on net open currency positions, limits on maturity and currency mismatch, mandatory reserve requirements) and
- capital levels (countercyclical and dynamic capital requirements, dynamic provisioning, restrictions on profit distribution).

The starting point for analysis of relationship between the intensity of use of macroprudential policy, and country-specific macroeconomic characteristics as well as their monetary and financial system characteristics is the dataset prepared by Lim et al. (2011) on the intensity of specific macroprudential measures or instruments. These data have been used in order to calculate the overall intensity of macroprudential policy in each country. In addition, both macroeconomic and financial indicators as well as monetary characteristics of the countries in

the sample have been included in the database when theoretical assumptions suggested that these variables could have affected the intensity of use of macroprudential policy.

The analysis of macroprudential policy measures and instruments used by European countries in the pre-crisis period shows that the most frequently applied measures and instruments were aimed at limiting credit availability using caps on the loan-to-value ratio and on the debt-to-income ratio (Table 1). On top of the above, a number of countries attempted to limit the banks' open currency positions and foreign currency credit activity, while reserve requirements and dynamic provisioning were used for macroprudential purposes. The intensity of use of macroprudential policy differed greatly among European countries, but it can be seen that it was most frequently applied by the emerging market countries, while developed countries applied it only exceptionally (Table 1).

Table 1 – Intensity of Use of Individual Macroprudential Policy Measures and Instruments in European Countries

	Caps on loan-to-value ratios	Caps on debt/loan-to-income ratios	Caps on foreign currency lending	Ceiling on credit or credit growth	Limits on net open currency positions / currency mismatch	Limits on maturity mismatch	Reserve requirements	Countercyclical capital requirements	Time-varying/ dynamic provisioning	Restrictions on profit distribution	Intensity of use of macroprudential policy
Croatia	3	3	0	6	4	0	5	5	5	0	31
Serbia	0	5	6	0	5	0	3	6	0	2	27
Romania	2	5	5	0	1	1	5	0	4	2	25
Bulgaria	4	0	0	0	0	0	6	6	6	0	22
Russia	0	6	0	0	3	0	5	0	5	0	19
Turkey	3	0	6	0	4	0	0	0	0	3	16
Poland	0	3	6	0	0	0	2	0	0	2	13
Portugal	3	0	0	0	0	0	0	5	5	0	13
Hungary	3	3	3	0	1	0	0	0	0	0	10
Norwey	4	3	0	0	0	0	0	0	0	0	7
Austria	0	0	5	0	0	0	0	0	0	0	5
Ireland	0	0	0	0	0	0	0	5	0	0	5
Italy	3	0	0	0	0	1	0	0	0	0	4
Spain	0	0	0	0	0	0	0	0	3	0	3
France	0	1	0	0	0	1	0	0	0	0	2
Slovakia	0	0	0	0	1	0	0	0	0	1	2
Sweden	2	0	0	0	0	0	0	0	0	0	2
Beligium	0	0	0	0	0	0	0	0	0	0	0
Czech Republic	0	0	0	0	0	0	0	0	0	0	0
Finland	0	0	0	0	0	0	0	0	0	0	0
Germany	0	0	0	0	0	0	0	0	0	0	0
Netherland	0	0	0	0	0	0	0	0	0	0	0
Switzerland	0	0	0	0	0	0	0	0	0	0	0
Great Britain	0	0	0	0	0	0	0	0	0	0	0
Total number of countries which used certian measure	9	8	6	1	7	3	6	5	6	5	

Note: CEE countries are marked with bold letters.
Source: Lim et al, 2011, questionnaires sent to central banks, data processed by the author.

The paper proceeds with a description of the main characteristics of macroprudential measures and instruments used by the CEE countries, the effectiveness of which is analysed in this section of the paper, as follows: caps on the loan-to-value ratio, caps on the debt-to-income ratio, reserve requirement instruments, limits on maturity mismatch, and capital requirements.

a) Administrative restriction on credit growth

Credit growth can be influenced in a variety of ways, and administrative measures in the form of ceilings limiting allowable credit growth are among the most direct measures for this purpose. These caps are usually set on monthly, three-monthly or annual levels, and can be imposed on total credit or credit to individual sectors. Countries with high currency-induced credit risk exposure sometimes resort to certain measures with the view of limiting foreign currency lending. Depending on business strategy, the banks may, but do not have to, respond to the measure by slowing down their credit activities (BNB, 2005). Namely, if the banks estimate that achieving a greater market share represents a greater priority in the long term when compared to possible penalties to be paid if the allowable credit growth rate was to be exceeded, then this measure might not result in the desired effect. Additionally, the banks can consider it profitable to temporarily continue granting loans, even if such loans might not be profitable at the moment, expecting that the limitations will be removed after a while, i.e. that the duration of the measure is limited.

b) Caps on the loan-to-value ratio and caps on the debt-to-income ratio

These two instruments directly limit risky credit granting and strengthen the resilience of the market to risks arising from changes in real estate prices. Increases in collateral value, which are usually not based on fundamental reasons in times characterised by overheating in the economy, result in higher risks both for the banks, because capital growth increases their ability to grant credit, and for the borrowers, because higher value increases their borrowing power. In case of significant value adjustments, which typically follow the exogenous shocks in the price bubble burst phase, this can lead to significant problems that spill over from the borrower to the bank (Mörttinen et al., 2005). This type of measure is usually introduced or tightened so as to slow down credit activity.

c) Reserve requirement instruments

Reserve requirements represent one of the most important segments of the monetary policy implementation framework in most countries. Lim et al. (2011) underline that reserve

requirements have actually been used for macroprudential purposes, i.e. to build buffers against systemic liquidity shocks, and stress that reserve requirement rates, in order to be efficient, have to be adjusted depending on the stage of the economic cycle. Tovar et al. (2012) also reached the same conclusion, and demonstrated that many central banks applied reserve requirements in a countercyclical way in order to reduce systemic risk. In those countries where the interest rate transmission channel of monetary policy is not functional, raising reserve requirement can have a similar effect as a referent interest rate increase in the countries with a functional interest rate channel. Specifically, central banks can exert a strong influence on credit conditions and system liquidity through changes in reserve requirements. During upswing phases of the economic cycle, raising reserve requirements can prompt the banks to increase active interest rates, slow down credit activity, tighten credit conditions, and limit excessive leverage from borrowers. In the opposite phase of the cycle, during downturn, lowering reserve requirements makes it possible for the system to supply itself with previously accumulated liquidity reserves. When analysing the costs and benefits of macroprudential measures, it should be mentioned that, in a way, reserve requirements represent "defeat" for the banks, and can result in a widening spread between active and passive interest rates, contribute to disintermediation, encourage excessive risk-taking in more weakly regulated sectors, or regulatory arbitrage (Tovar et al, 2012).

Some emerging market countries introduced certain marginal reserve requirements for foreign funding of financial institutions. In this manner, systemic risk can also be affected by reducing foreign currency mismatches and mitigating foreign currency liquidity risks; however, capital inflows through the channel could also be slowed down (CGFS, 2010). Additionally, it is also possible to reduce the dependence of financial institutions on certain sources of funding and improve the structure of funding.

d) Limits on maturity mismatch

Maturity mismatches result from an excessive reliance on short-term sources of funds to finance long-term assets. In this regard, the regulator's aim is to ensure that the bank maintains enough liquid funds to settle its short-term obligations.

e) Capital requirements, higher risk weights for some types of risk, provisioning requirements

In view of the importance of banks for the financial system, their stability has to be ensured and protective buffers that can be used in case of crisis events have to be built. Capital

requirements are one of the most important segments of banking regulations, and are used with the aim of increasing the resilience of the banking system and reducing the likelihood of occurrence of crisis episodes.

The level of capital adequacy ratios is closely associated with the size of buffers used to cover expected or unexpected losses that are available to a bank. In practice, in the period up to the great financial crisis, most countries typically applied static capital requirements addressing more permanent systemic risk, but disregarding the associated time-varying component of systemic risk (Riksbank studies, 2012). Countercyclical capital requirements entail additional capital requirements to be introduced in the periods when credit activity is considered excessively intense. In such periods, the quality of loan portfolios usually deteriorates, thus increasing the probability for future losses. Raising capital requirements in good times creates buffers that have a direct impact on loss-absorbing capacities of the system, and may help mitigate credit and financial cycles (IMF, 2012). This reduces the probability of difficulties arising in the process of financial intermediation and credit activity (CGFS, 2012).

In addition to raising capital adequacy requirements directly, system capitalisation can be increased by raising risk weights for the types of risks that are considered elevated (e.g. higher risk weights on loans exposed to currency-induced credit risk). Foreign currency loans can also be limited by setting higher risk weights for foreign currency loans or loans indexed to a foreign currency. This measure both discourages the banks from offering such loans and reduces foreign currency induced credit risk.

In case of capital deficiency or insufficient provisioning, the banks can increase the spread between active and passive interest rates, thus influencing credit demand, or reduce assets, thus rationing the overall supply of credit (CGFS, 2012.).

Table 2 – Descriptive Statistics for Variables Used in Simple Linear Regressions

	Intensity of macropru dential policy	GDP, annual pchg	Gross domestic savings / GDP	CPI, annual pchg	Imports / GDP	Fiscal balance / GDP	Current account balance / GDP	Foreign owned banks' assets / total banks' assets	Total loans to private sector / GDP	Financial account balance / GDP	Currency regime	Euroisation level
mean	6,6	3,5	19,9	3,0	7,5	-1,7	-1,5	42,0	74,1	1,9	0,8	1,7
sample variance	68,5	4,1	30,0	3,5	19,2	6,4	29,8	1312,8	1972,6	25,3	2,4	7,4
sample standard deviation	8,3	2,0	5,5	1,9	4,4	2,5	5,5	36,2	44,4	5,0	1,5	2,7
minimum	0,0	1,1	0,0	0,6	2,0	-6,2	-8,7	0,0	12,8	-5,4	0,0	0,0
maximum	31,0	7,9	27,1	7,7	16,5	4,2	10,8	99,0	150,3	9,3	4,0	80,0
range	31,0	6,9	27,1	7,1	14,6	10,4	19,6	99,0	137,5	14,8	4,0	80,0
1st quartile	0,0	1,8	18,0	1,8	4,4	-3,4	-5,6	9,5	34,2	-3,3	0,0	0,0
median	3,0	3,2	20,7	2,6	6,7	-1,8	-2,2	24,0	74,6	2,3	0,0	0,0
3rd quartile	12,0	4,3	23,1	3,4	10,5	0,0	2,0	73,5	110,4	6,6	0,0	3,5
interquartile range	12,0	2,5	5,1	1,6	6,1	3,4	7,7	64,0	76,2	9,9	0,0	3,5

Source: IMF, World Economic Outlook Database, Lim et al (2011), Claessens & van Horen (2012), World Bank, author's calculations

The relationship between country-specific characteristics and the intensity of use of macroprudential policy measures and instruments has been examined using simple linear regression. The dependent variable in these models is the intensity of macroprudential policy, while the indicators of macroeconomic, monetary and financial characteristics of the countries included in the sample are used as independent variables. To avoid the problem of endogeneity due to interaction between macroprudential policy and macroeconomic, monetary and financial indicators, independent variables used in the analysis have been calculated for the period preceding the start of a more intense application of macroprudential policy in the examined countries. The 2000-2004 average has been used in case of variables that reflect processes, while the end-of-year value for the year 2000 has been used for situational variables.

Simple linear regressions were performed on a sample of 24 EU member states where the data on the intensity of use of macroprudential policy was available (Table 1, Figures 2, 3, and 5) and outliers have been removed from the dataset.

4.1. Macroeconomic Characteristics and Macroprudential Policy

The macroeconomic environment has a strong influence on systemic risks and financial stability as well as the state of the financial system as a whole; therefore, the indicators

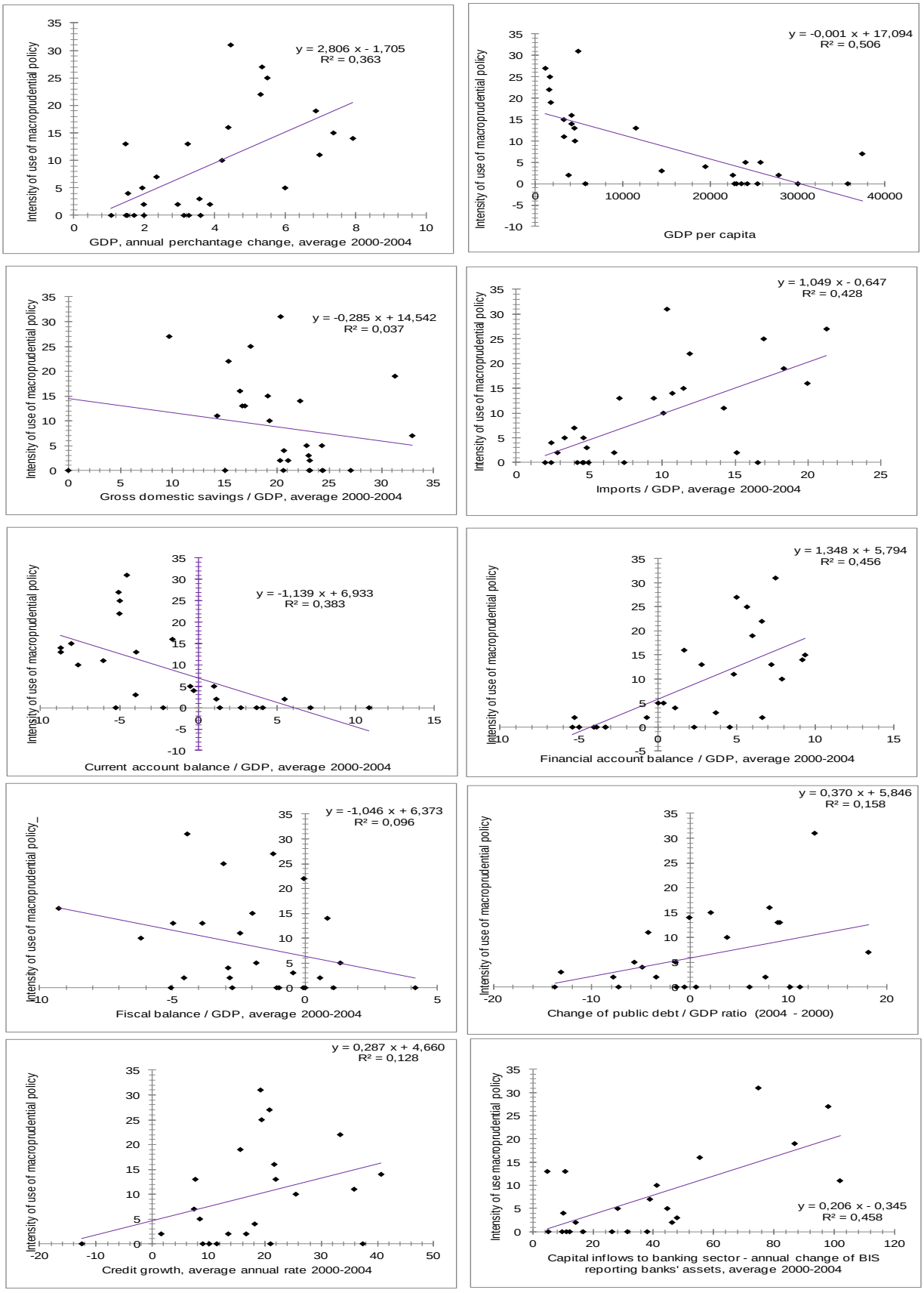
included in this analysis comprise measures of economic activity, external imbalances, inflation, and public finances.

In the period from early 2000 to the onset of the global financial crisis, the CEE countries underwent a process of convergence where the countries with relatively lower income levels grew faster than older EU member states with higher income levels, thus reducing the prosperity and development gap. Lower levels of economic development usually entail capital scarcity and higher productivity, which means higher return rates. It is for this reason that a rise in GDP per capita reduces the opportunities for above-average investment profitability, thus discouraging capital inflows, while lower levels of this indicator act in the opposite direction. The above observation supports the obtained results showing that, at the beginning of the observed period, the countries with lower initial levels of GDP per capita, as measured for the year 2000, used macroprudential policy more intensely than more advanced countries (Figure 2). At the same time, research shows that the countries which are more prone to crisis episodes achieve higher growth rates on average in relation to the countries with more stable financial conditions. This leads to the conclusion that, in some cases, such accelerated activity partly stems from greater systemic risk-taking, i.e. that the vulnerability of the system to financial shock and the probability of crisis episodes actually increase in these periods (Ranciere and Tornell, 2004), therefore encouraging macroprudential policy. Simple linear regression shows that the use of macroprudential policy was more intense in countries with higher economic activity levels in comparison to countries with lower average GDP growth rates (Figure 2).

At the beginning of the examined period, the level of gross domestic savings in most CEE countries was low and insufficient to finance strong credit growth. In case of limited investments due to insufficient domestic savings, capital imports are assumed to boost the investments, and foreign investors would then be rewarded with higher returns on such foreign investments (Prasad and Rajan, 2008). But, if capital inflows are primarily used for consumption and if they are directed towards the non-tradable goods sector, excessive domestic currency appreciation and lower profitability of investment ensue, while systemic risks increase. The analysis performed points to a negative correlation between the intensity of use of macroprudential policy and the share of average gross national savings in GDP, although the correlation is not very strong (Figure 2).

Data on changes in claims of BIS reporting banks vis-à-vis banks in individual countries have been used to measure capital inflows to the CEE countries through the banking sector. It shows that the intensity of use of macroprudential policy was higher in the countries which were characterised by strong capital inflows from foreign banks (Figure 2). Surge of capital inflows into the CEE countries and the opening up the financial system are also connected to the strong credit growth which led to an accumulation of internal and external imbalances in most CEE countries. Credit expansion and rapid growth of domestic consumption resulted in a sharp increase in the demand for imported goods, and worsened the balance of the current account of the balance of payments. At the same time, capital inflows impacted the financial account of the balance of payments and led to an increase in external debt as a share of GDP. These trends left most CEE countries vulnerable to sudden slowdowns or stops in foreign capital inflows; in such cases, it becomes extremely difficult, and sometimes even impossible, to refinance existing obligations. The assumption that such trends could encourage the use of macroprudential policy was also confirmed by simple linear regressions (Figure 2). Fiscal balance and change of the share of public debt in GDP between 2000 and 2004 have been used as fiscal policy indicators. The intensity of use of macroprudential policy was found to have been higher in countries with higher budget deficits and faster growing public debt to GDP ratios (Figure 2).

Figure 2 – Relationship between the Intensity of Macroprudential Policy and Macroeconomic Indicators



Sources: IMF, central banks, Eurostat, author's calculations

4.2. Monetary Policy Features and Macroprudential Policy

The fundamental precondition for a successful monetary policy transmission mechanism is the existence of an efficient and stable financial system with an adequate financial infrastructure that connects monetary policy instruments and real economic processes trough different transmission channels (Grgić, 2002). The reach of monetary policy is greatly affected by the selected exchange rate regime which influences the degree of systemic risk arising from changes in the exchange rate of the domestic currency, and directly influences reach of monetary policy, as well as the space and the need for using macroprudential policy as well. The exchange rate policy depends on the degree of euroization and other country-specific characteristics such as level of economic development, political (in)stability, level of international reserves, and exchange rate risk exposure (Poirson, 2001).

Higher levels of monetary sovereignty characteristic of countries with floating exchange rate regimes entail a wider range of options available to their central banks, while countries with lower exchange rate flexibility lose a part of their monetary sovereignty and have a limited set of monetary policy instruments and measures at their disposal (Disyatat et al, 2005). Research shows that countries with high currency substitution prefer fixed or managed exchange rate regimes. Even though some of them officially claim to have a flexible rate policy, euroization and great impact of exchange rate changes on prices (pass-through effect) often lead to “fear of floating”, which makes the monetary authorities intervene relatively frequently to prevent more significant changes in the exchange rate (Calvo and Reinhart, 2002). From a central bank perspective, the impact of a high degree of euroization on monetary policy and choice of exchange rate regimes is important as it limits the reach of monetary policy measures and instruments. In these countries traditional interest rate channels of monetary policy transmission usually do not work; however, the effects that would result from an increase in the referent interest rate in the countries that have functioning interest rate channels can be achieved by means of macroprudential measures and instruments.

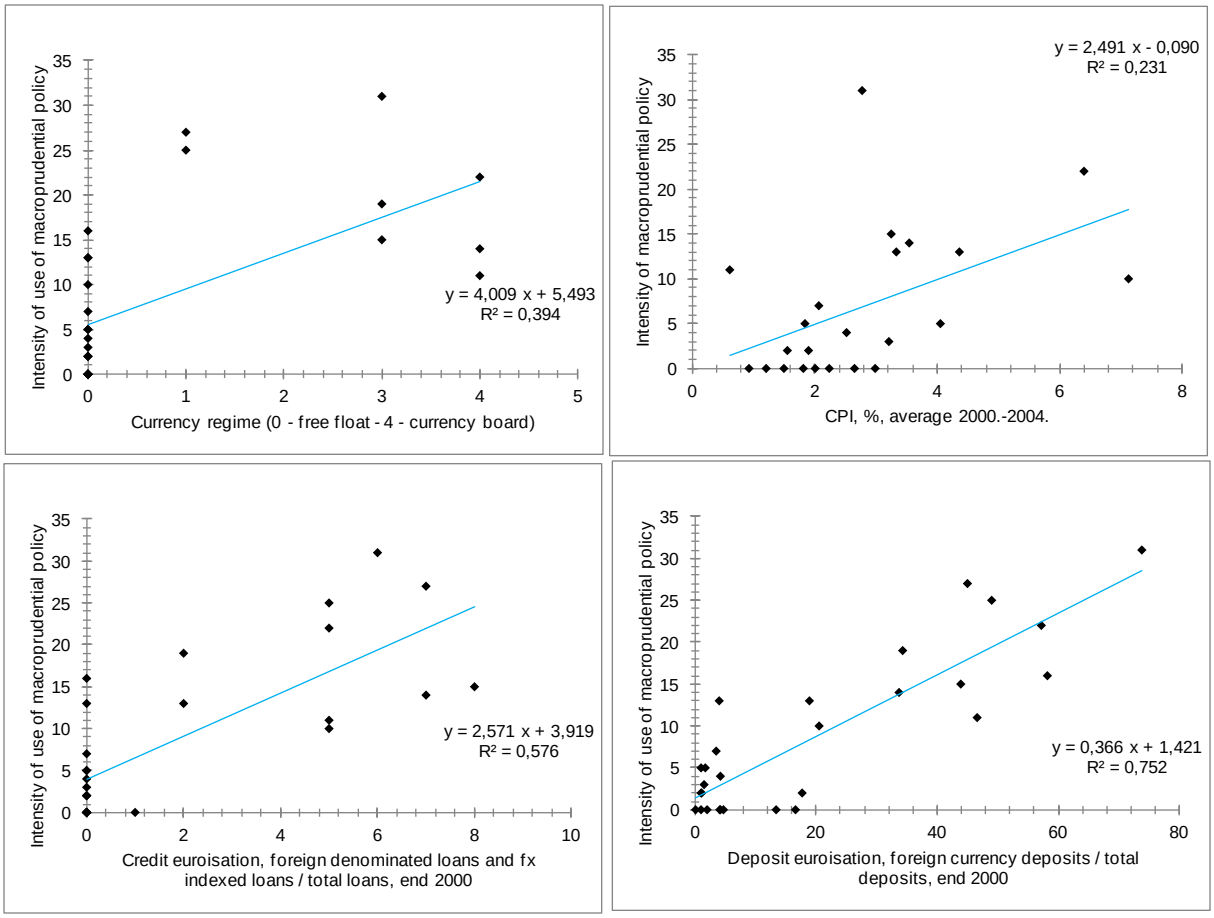
The monetary policy of a part of the CEE countries has been determined by their degree of euroization; in some of them euroization is present both on the assets side and on the liabilities side of bank balance sheets (Figure 4). In such countries, a significant part of the economy is exposed to increased currency-induced credit risk due to the fact that the assets and the obligations of the borrowers are regularly not denominated in the same currency,

which means that the probability of a significant deterioration in credit quality will increase in case of a sharper depreciation. Historically, macroeconomic instabilities as well market imbalances and imperfections were the most significant factor underlying the rise of euroization. Inflation was the most important feature among these contributing factors, since euroization typically represents a direct response to persistently high and volatile inflation rates resulting in loss of confidence in the national currency. In addition to inflation, high public debt and budget deficits also contribute to euroization. Fearing capital flight, many countries allowed euroization with the purpose of limiting financial disintermediation or reducing the cost of funding public debt. The "original sin" can also be mentioned in this context, a situation in which it is typically very difficult for the countries with underdeveloped financial markets to use the domestic currency to borrow long term (Eichengreen and Hausmann, 1999).

It can therefore be concluded that central banks have to strive to achieve some kind of balance between independent monetary policy and the currency substitution rate. According to that, it can be assumed that macroprudential policy has been more frequently used in countries with less flexible regimes, especially those measures and instruments focused on limiting foreign currency-denominated lending, e.g. directly limiting this type of loans or setting higher risk weights for foreign currency-denominated loans or foreign-currency indexed loans, which also discourages the banks from offering such loans and reduces foreign currency induced credit risk at the same time. In addition to the above, in the countries where foreign-currency denominated obligations dominate the liabilities side of the banks' balance sheets, sufficient foreign currency liquidity levels have to be maintained, on top of the measures and instruments aimed at ensuring sufficient domestic currency liquidity. These countries used measures such as minimum foreign currency liquidity requirements and similar more frequently.

In this case, the degree of euroization has been measured as the share of foreign-denominated loans and foreign-currency indexed loans in total credit at the end of 2000. The assumption that the intensity of use of macroprudential policy in the pre-crisis period was higher in the countries with with less flexible exchange rate regimes and a higher degree of euroization have been confirmed (Figure 3).

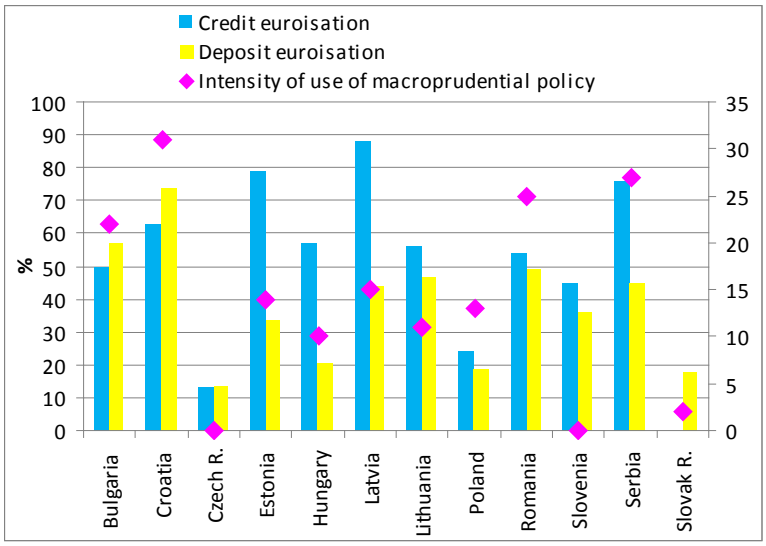
Figure 3 – Relationship between the Intensity of Macroprudential Policy and Monetary Characteristics and Indicators



Note: The countries have been divided into five groups depending on the type of exchange rate regime: countries with a currency board (4), pegged exchange rate (3), crawling peg, pegged with horizontal bank (2), managed float (1), and floating exchange rate (0).

Source: IMF, central banks, Eurostat, author's calculation

Figure 4 Credit and deposit euroisation in CEE countries



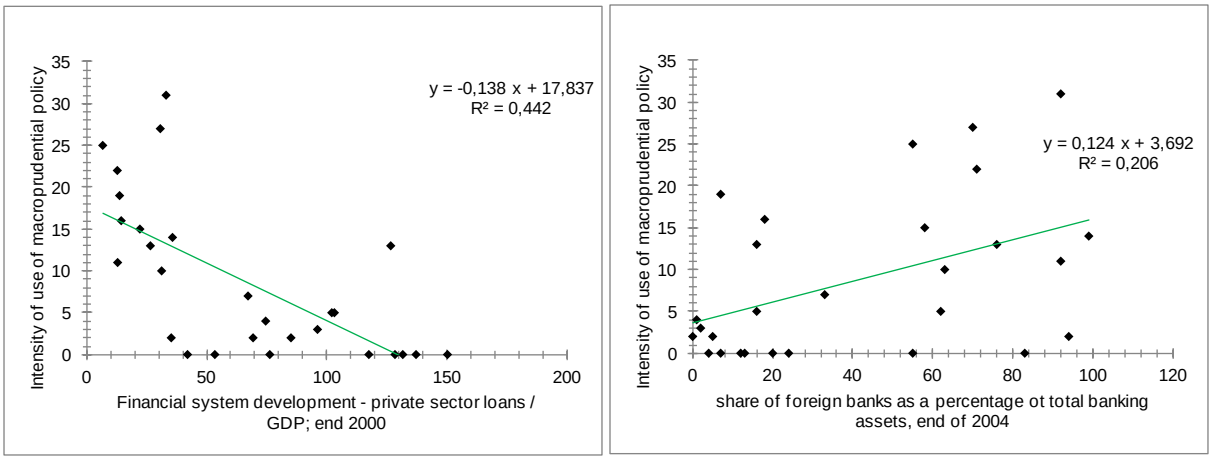
Sources: IMF (2009); Lim et al. (2011); De Nicolò et al. (2003.)

Inflation is often used to measure the success of monetary policy and macroeconomic stability. Lower levels of inflation can increase the risk appetite of investors in the financial market, while higher levels of inflation might signal structural weaknesses in the economy and increased levels of indebtedness, which may lead to a tightening of monetary conditions (Gadanecz and Jayaram, 2009). High and volatile inflation rates are accompanied by significant economic costs since they distort real prices, reduce savings, stimulate capital flight, make economic planning impossible, and, under extreme circumstances, can result in social and political chaos as well (Žigman and Lovrinčević, 2005). Literature shows that countries where the euroization issue does not exists and where inflation expectations are not related to the exchange rate are able to pursue their monetary policy much more freely (Ivanov, 2012). This analysis also confirms that the countries with higher average inflation rates used macroprudential policy more intensely (Figure 4).

4.3. Financial System Characteristics and Macroprudential Policy

The characteristics of the financial system can also influence the options and the need to pursue a certain type of policy. One of its most important characteristics of this kind is its overall level of financial system development which has been measured in this analysis using the ratio between private sector credit and GDP. The flaw of this approach lies in the fact that it does not take into consideration the entire scope of financial intermediation, like securities markets and non-banking financial institutions. But, in most European countries banks dominate the financial system meaning that this approach will not result in any significant loss of information about the level of development of the financial system. Simple linear regression has confirmed a negative correlation between the intensity of use of macroprudential policy and the level of development of the financial system measured using credit as a share of GDP at the end of 2000 (Figure 5).

Figure 5 – Relationship between the Intensity of Macroprudential Policy and Financial System Characteristics



Source: IMF, World Bank, Claessens and van Horen (2012), author's calculations

Bank ownership structure is another potentially important characteristic of the financial system. In most CEE countries, foreign-owned banks predominate. In view of the fact that a significant portion of capital inflow entered through foreign banks, the assumption is that these trends have partly been caused by this predominance, which could have prompted the use of macroprudential policy with the aim of discouraging such inflows directly or indirectly. The share of foreign banks as a percentage of the banking assets in individual countries at the end of 2004, when the banking sector consolidation process was already complete in most countries, has been used in the analysis which has shown that the intensity of use of macroprudential policy was higher in countries with a greater share of foreign banks within the system (Figure 5).

5. The Effectiveness of Macroprudential Policy in Alleviating Systemic Risks Related to Credit Activity

This chapter will endeavour to establish whether the macroprudential policy of central banks in the CEE countries has been effective in mitigating systemic risks related to credit activity in the pre-crisis period, and which macroprudential instruments proved effective in achieving this goal.

It is reasonable to expect that some measures, like caps to the loan-to-value ratio, caps to debt-to-income ratio, or administrative credit growth ceilings, reduce credit activity. But,

since the experiences show that business banks found different ways to avoid certain measures, especially in the period when the macroprudential framework was yet unformed or only in its infancy in most countries, and in view of the fact that these measures and instruments might be inadequately designed or too lenient, it is impossible to say with certainty if any of the measures had actually been effective. In practice, it often happened that the introduction of a measure failed to achieve expected and desired effects, be it due to its erroneous design (e.g. the restriction was too lenient) or due to unexpected reactions by the banks, and similar. For these reasons, it is useful to examine the effectiveness of these measures in a larger number of countries.

When selecting variables for the model, limitations pertaining to data availability and length of time series were taken into account. Trustworthy macroeconomic data for most countries from the examined group have only been available since 2000, while the situation with bank activity indicators is similar. In addition, the experience of the examined central banks in using of macroprudential measures and instruments is also relatively short (Appendix 2, Figure 8). In view of the above, as well as in view of the average duration of the financial cycle, the analytical section of the paper examines the effect of individual variables and macroprudential instruments on systemic risk relating to credit expansion using cross-country panel data regression rather than an analysis of individual countries.

Bearing in mind that numerous studies identify excessive credit growth as one of the key characteristic of financial crises and a relatively efficient predictor thereof (IMF, 2011; Borio and Drehmann, 2009; Borio and Lowe, 2002; Bank of England, 2011), credit activity has been used as the independent variable. The model uses quarterly rates of change in total credit to corporates and households, and in total banking credit. The rates of change have been calculated on the basis of seasonally adjusted data.

Several issues pertaining to credit growth should be mentioned here. Namely, it is not easy to measure credit growth at system level because, in addition to the banks, other financial institutions can participate in credit activity in an intensive manner. Also, it is not easy to determine when credit growth is excessive, especially in case of a cross-country comparison. To make such an assessment, it is necessary to be familiar with the currency and maturity structure of the loans, and the policy relating to collateral, credit conditions and sources. Likewise, although a strong credit activity is often linked to an increased probability of

occurrence of crisis episodes that justify the use of macroprudential instruments, it does not necessarily have to be related to higher systemic risks. Such cases might occur if strong credit activity results from expected future productivity growth (IMF, 2011). All the above mentioned factors should also be viewed in conjunction with the level of economic development, government credibility, institutional environment, and macroeconomic policies (Seidler, J., 2010). In addition to the fact that research confirms the correlation between credit growth and financial crisis, there are several more reasons to assume that it is appropriate to use this variable for systemic risk approximation purposes in this research. Namely, it is impossible to construct a general systemic risk indicator which would ensure comparability across all countries. It is for this reason that availability and comparability of data for a larger number of countries should be taken into consideration. Furthermore, this was the variable that central banks were trying to influence by means of macroprudential policy.

On top of lagged dependent variable, independent variables include quarterly percentage change in real GDP which reflects macroeconomic and fiscal stability, interest rates on credit to specific sectors which should be inversely proportional to the intensity of credit activity, and custom variables constructed to reflect the use of individual macroprudential policy measures and instruments: credit activity limitations, higher capital requirements, higher risk weights, caps to the loan-to-value ratio and the debt-to-income ratio, limits on currency and maturity mismatch, general reserve requirements, marginal reserve requirements, higher provisioning requirements, and macroprudential policy intensity.

The time series of macroprudential measures and instruments used by the central banks of developed and emerging market countries in the period from 2000Q1 to 2013Q1 has been created on the basis of information collected through direct communication with central banks, supplemented with data from their annual reports and the IMF, as well as the analysis by Geršl and Jašova (2014). Most measures and instruments examined in the research are remarkably complex, starting from reserve requirements (allocation basis, calculation method and dynamics, reserve currency, reserve rates, and similar) and so forth. In view of the fact that this research has been performed on a panel of countries, the aim was to group the measures and instruments used by the countries by shared characteristics on the basis of available data, and investigate whether a group of similar measures and instruments had proved efficient or not. This is also one of the major contributions of this research.

The variables that reflect the use of macroprudential measures and instruments were constructed in three ways - as:

1. simple binary variables which take on the value 1 in the periods when a measure is being used or, in case of an instrument used in all countries, in the periods when it is "tighter" than average. The main shortcoming of this approach is the fact that it does not take into account the intensity of use of a measure or an instrument, or tightening or loosening thereof.
2. stepwise variables which increase or decrease depending on whether macroprudential policy was tightening or loosening (marked by "step" in Tables 4, 5 and 6). The problem with this approach to measurement design lies in the application of the stepping procedure to the changes in the intensity of individual measures and the comparison between strength and reach of individual measures, which is mainly based on expert judgement. This is especially important when the overall macroprudential policy indicator has been constructed on the basis of variables that reflect the use of individual measures and instruments.
3. real values (i.e. general reserve requirements or the level of loan-to-value ratio) (marked by "level" in Tables 4, 5 and 6). However, comparability problem has been rather pronounced due to different scopes of measures, calculation bases etc.

Regressions include step variables and levels of different macroprudential measures, while for comparison of the macroprudential policy intensity among countries binary and step variables have been used. Figure 8 in Appendix 2 shows the series of overall macroprudential policy over time. Furthermore, the series created by summing up simple binary variables shows the number of measures and instruments used by individual countries for macroprudential purposes at a given time. The second series was created by summing up step variables, and it shows the changes in overall macroprudential policy intensity. Even though the level of the above variable partly depends on expert assessments when constructing variables that reflect individual measures, its changes can be useful in an analysis of the character of macroprudential policy at a given time. Among the countries examined, Croatia takes the lead in both categories as the country with the most intensive use of macroprudential policy in the pre-crisis period, followed by Romania, Bulgaria, and Hungary.

1.1.1. Model Estimation

The effect of different macroeconomic and banking indicators as well as macroprudential measures and instruments on key systemic risk and financial system resilience indicators in different countries in the pre-crisis period from the beginning of 2000 to 2008Q3 has been examined using regression in a panel of countries with fixed effects for the countries, with the following equation:

$$y_{i,t} = \alpha + \mu_i + \mathbf{X}_{it}\boldsymbol{\beta} + \varepsilon_{i,t}, \quad (2)$$

for i = 1, 2,...11 countries, t = q1 2000, q2 2000...q3 2008, where $\mathbf{X}_{it}$ denotes the observation in t for country i, μ_i denotes individual effects for the countries, and $\varepsilon_{i,t}$ denotes error.

Since it is assumed that unobserved heterogeneity is present, fixed effects facilitate control of omitted macroeconomic variables which are time invariant, but differ from country to country. Unlike traditional panel data where the number of units of observation is large and the time period is relatively short, this is a longitudinal panel with a relatively small number of observations in a relatively long time period. Beck and Katz (1995) have shown that using the FGLS to estimate parameters in such cases can result in a significant underestimation of parameter variability, i.e. "overconfidence". Following their solution, the present panel has been estimated using the OLS method, and the cross section SUR panel-corrected standard errors have been calculated, being more reliable than standard errors computed using the FGLS method. On the basis of the paper by Kristensen et al. (2003), and the 2004 paper by Beck and Katz that builds on their 1995 paper and tests the robustness of their initial methodology, it has been confirmed that it is appropriate to apply the lagged variable as the method for removing serial correlation and fixed effects in regression using panel corrected standard errors.

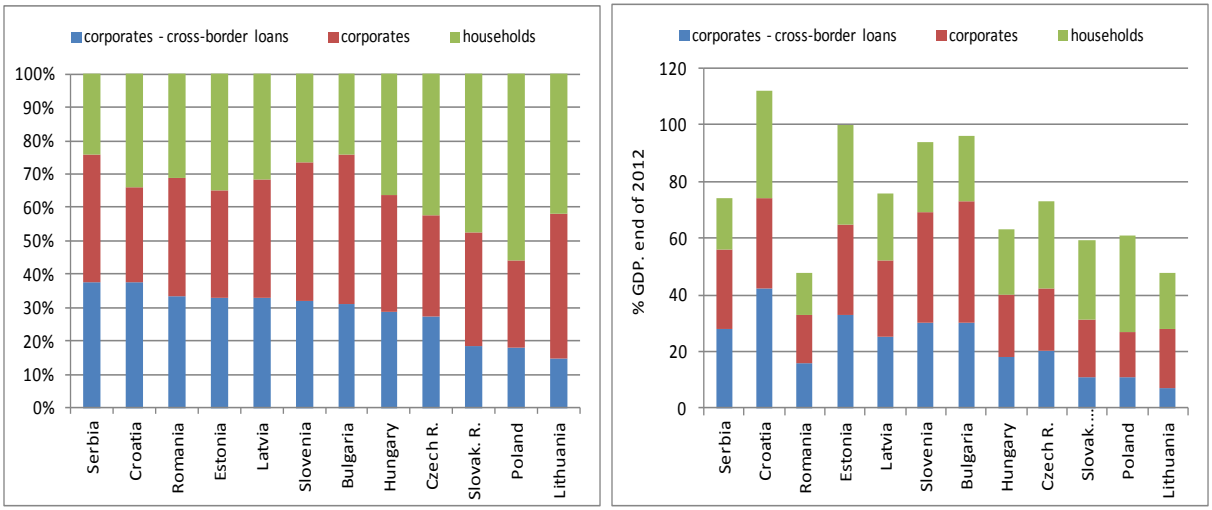
The issue of endogeneity in measuring the effectiveness of macroprudential policy using indicators such as credit growth has been stressed in economic literature (Lim et al., 2011). In order to avoid the issue, at least to a certain extent, and following the approach of Nier et al. (2012), the variables that reflect macroprudential measures and policies have been lagged by one time period, and the results were then compared to the results obtained using variables without the time lag. The same authors also stress that the resulting coefficients have to be

interpreted with caution, i.e. as indicators of the relative level of impact of different measures and instruments. Regression results have been presented in Tables 4, 5 and 6 in Appendix 3.

Among macroprudential measures and instruments, caps on the loan-to-value ratio, caps on the debt-to-income ratio, administrative credit growth ceilings, higher reserve requirement rates, higher provisioning requirements, and overall macroprudential policy intensity have proved effective in slowing down credit to households. In addition, a combination of the loan-to-value ratio and the debt-to-income ratio has also proved effective. A significantly different picture emerges when looking at credit to corporate sector. Among all observed instruments, only administrative credit growth ceilings have proved effective. As regards total bank credit to the private sector, it can be seen that, in addition to administrative credit ceilings, higher reserve requirements, higher provisioning requirements and overall macroeconomic policy intensity have also proved effective in slowing down credit activity.

A sectorial comparison of results shows that macroprudential policy has been more efficient in slowing down total credit to households than total credit to corporate sector. This result is in line with expectations, as corporate sector had easier access to other domestic and international funding sources outside the reach of domestic macroprudential regulations. The parent banks of domestic banks directed corporates towards their foreign subsidiaries, thus avoiding the limitations imposed. This has been confirmed by the structure of private sector debt which shows that the highest share of cross-border loans in total loans to private sector is present in countries that have used most intense macroprudential policy – Serbia, Croatia and Romania (Figure 6). A lack of macroprudential coordination among the countries had largely contributed to above as well.

Figure 6 - Private sector debt structure



Sources: ECB, WB, Ameco, HAAB Research

6. What Should We Learn and What Could We Explore Further?

In the context of macroprudential policy, inaction bias, i.e. reduced willingness of economic policymakers to take this type of measures, has often been mentioned. The bias is most often explained by quoting the costs associated with these measures, which become visible much sooner than the benefits, and the fact that such measures and instruments are often not popular with market participants or the public. Studying the experiences of the countries that have used macroeconomic policy as well as examining the effectiveness of these measures in mitigating systemic risks and maintaining financial stability and presenting them to the wider public can be employed with the aim of changing such perceptions and raising awareness on the importance of macroprudential approach. Special emphasis should be put on the importance of macroprudential policy in creating buffers for protecting financial stability and their usage during the crisis, which is also the area of a great research potential.

The analysis reveals that the countries that used macroprudential policy more intensely in the pre-crisis period had higher levels of economic activity, higher inflation rates, lower balance-of-payments current account balance, larger share of foreign banks in the banking sector assets, higher capital inflows, less flexible exchange rate regimes, higher degree of euroization, and lower level of economic development. Pursuant to the above, it could be concluded that the use of macroprudential policy was stimulated by inherent characteristics of

the countries themselves on one hand, and domestic and international macroeconomic and financial developments on the other hand. Some country-specific characteristics (e.g. high euroization) limited the reach of other policies, primarily monetary, while a part of these characteristics created "fertile grounds" (e.g. low credit saturation) and, in conjunction with exogenous factors (low world interest rates and high global level liquidity) contributed to the accumulation of internal and external imbalances. In view of the fact that country-specific characteristics greatly influence the intensity, choice and reach of the instrument set of macroprudential policy, as well as other policies, they should also be taken into account when designing frameworks for the implementation of macroprudential policy and imposing limitations for its usage.

Research also shows that bank-oriented macroprudential policy has been more efficient in slowing down credit to households than credit to corporate sector, because the latter were able to avoid the imposed limitations more easily since they had easier access to other sources of financing. This is yet another argument that underscores the importance of an institutional framework to be established on national level with the aim of implementing macroprudential policy so as to prevent measure avoidance through more weakly regulated segments of the national financial system. The results also underscore the importance of setting up an effective institutional flow framework at international level too. This could significantly reduce the risk of cross-border systemic risk spill-over and dissimulate the behaviour that increases vulnerabilities in the "host" countries, which have proved exceptionally important in the pre-crisis period when it had greatly reduced the reach and the effectiveness of macroprudential policy in the countries using this policy.

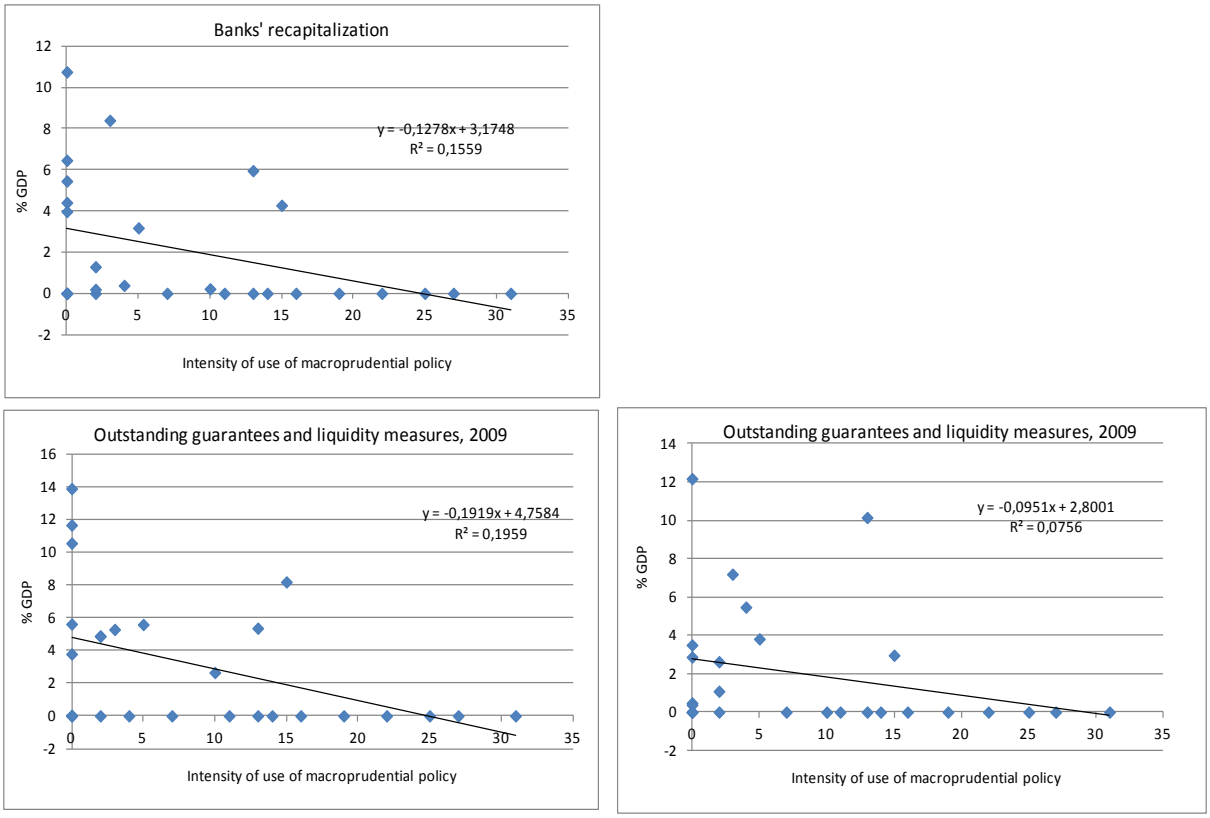
To facilitate the selection of appropriate macroprudential toolkit and its timely implementation, it is necessary to continue developing systemic risk identification, monitoring and analysis across all segments of the financial system, as well as analysis of macroeconomic trends that can influence financial stability. Furthermore, methods for analysing the effectiveness of macroprudential policy should also be developed. As macroprudential instruments may also affect other sources of systemic risk apart from those related to too strong credit expansion and on increasing financial system resilience to potential shocks, this represents an important area for further research. Development of macroprudential instruments is another big challenge in the coming period. In that respect, the experiences of the countries that have used macroprudential instruments can prove

exceptionally useful in analysing their effects and calibration problems, as well as their mutual interaction and interaction with other policies' measures and instruments. Special emphasis should be put on the experiences relating to the methods used by financial institutions in an attempt to circumvent them, what could be very useful when thinking about their design.

However, as shown in the present analysis as well, interaction among macroprudential policy measures and instruments is complex in itself and the issue becomes even more complex when other policies and other economic and financial trends are taken into account. It should therefore be stressed that previous attempts at measuring effectiveness, especially when applied on groups of countries, provide only general insights into individual instruments. This can be useful; however, when making decisions and contemplating instruments for a specific case, it is necessary to examine the relevant country with all its specificities, current macroeconomic and other national and international indicators which could influence financial stability.

Although this paper just touches upon the interaction between different economic policies, these complex relationships should also be mentioned. Analysis of the CEE countries' experience provides many lessons about the importance of their coordination, not only for the period prior to the crisis, but also during and after crisis. Some of these countries that had used macroprudential policy intensely in the pre-crisis period partially succeeded in mitigating the process of systemic risk accumulation and managed to significantly strengthen the resilience of the financial system to potential shocks by building up buffers at the level of the banking system. Despite the fact that this is a rather simplified analysis of macroprudential policy effectiveness during the crisis period, fiscal expenditures of the recent crisis related to the banking sector from 2008 to 2012 compared to the intensity of use of macroprudential policy point to a negative correlation between the intensity of macroprudential policy and costs of banks' recapitalizations, outstanding guarantees and liquidity measures. This leads to the conclusion that macroprudential policy could to a certain extent alleviate social costs of financial crisis (Figure 7).

Figure 7 - Fiscal expenditures of the recent financial crisis in EU countries (from 2008 to 2012)



Source: European Comission, DG Competition

But, in some cases, like Croatian, it turned out that the successful macroprudential policy that had maintained financial stability also resulted in inactivity bias within other segments of economic policy as it reduced the pressure on other economic policymakers to take the needed measures and implement the necessary reforms, i.e. to change the operational patterns which had, in fact, led to the crisis (Rohatinski, 2009c). This has been revealed through prolonged period of decreasing economic activity and a significant deterioration of fiscal indicators, despite the fact that there were no fiscal expenditures related to the financial sector sanation (Appendix 4, Table 7, Figure 9). This resulted with missed opportunity to use the relatively good "starting position" at the beginning of the crisis which enabled successful buffering of external shocks. In this segment, there is much room for research into the effects of macroprudential policy during and after the crisis, as well as its relationship with other policies, especially fiscal policy.

7. Conclusion

Despite numerous crisis episodes recorded throughout history, relatively little consideration was given to systemic risks and their impact on the financial system as a whole in the period before the onset of the global financial crisis. Consequently, in most countries, the ties between microprudential and macroprudential supervision have until recently been very weak or inexistent. The prevailing belief was that achieving price stability as well as the stability of individual financial institutions would be sufficient to ensure the stability of the entire financial system, and that market participants would be able to autonomously correct potential imbalances and avoid risks to a large degree within the existing regulatory framework. However, these beliefs have proven to be incorrect; they led to significant oversights in detecting potential threats and risks, thereby endangering financial stability and resulting in high economic and social costs in the end. High costs of the recent financial crisis in conjunction with the processes of financial liberalisation, globalisation of the financial system, and technological advancement that increase the impact and the reach of events which can result in financial instability significantly, have actually pushed the topics relating to financial stability into the limelight, making financial stability the dominant theme in economic policymakers' decision-making process as well as in academic debates.

The main goals of this paper were to provide a deeper insight into the hitherto experiences of the CEE countries that belong to a relatively small group of countries that had used macroprudential measures and instruments in the past, to contribute to the understanding of the relationship between the intensity of use of macroprudential policy, and macroeconomic and monetary trends and specificities as well as financial system characteristics, and to create an effectiveness evaluation model for macroprudential measures and instruments in the CEE countries in the period before the onset of the global financial crisis. Since this research puts emphasis on small open economies that have their own particular specificities, these insights are also important because these risks can sometimes be overlooked in discussions on a global level. Apart from that, the aim was to point out to other potentially useful insights that could be obtained by analysing macroprudential policy in CEE countries, particularly those related to crisis and post-crisis period, with the special emphasis on the interaction between macroprudential and other economic policies.

Understanding the causes and effects of the use of macroprudential policy is the basis for future activities aimed at maintaining financial stability. This is especially important in view of the fact that the use of macroprudential policy is associated with certain costs that materialize much sooner than its benefits which only become visible in the long term. On the basis of the analysis conducted, it can be concluded that it is exceptionally important to support the establishment of international preconditions which would allow macroprudential policymakers to impact all segments of the financial system where systemic risks might arise, and guarantee coordinated regulator action both at national and international level. Furthermore, the efforts to develop and enhance the measures and instruments that could be used for macroprudential purposes and to develop a warning system and signals to trigger the use of specific measures and instruments should also be supported.

However, it is important to bear in mind that each country has its own specificities and that any attempts to fit them in the same mould and adapt them to the same rules or predefined marginal values employed to trigger and calibrate specific instruments could result in additional systemic risks or disregarding such risks, which would increase the probability of occurrence of new crisis episodes. As underlined by Turner (2012), even in case of agreement about the theoretical aspects of macroeconomic policy, a one-size-fit-all solution that would work for all countries will be impossible to reach in practice, precisely because of their different levels of development, historical circumstances, baseline characteristics, and similar. Therefore, each country should be examined bearing in mind all its specificities and the relevant timeframe, because there is no one-size-fits-all recipe, not even for the same country in different periods of time.

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APPENDIX 1

A Review of Literature on the Effectiveness of Macroprudential Policy

Among numerous papers on the topic of macroprudential policy, the recent research literature on the topic of the effects of macroprudential policy in emerging market countries has been selected for this review. Some of the presented papers involve European countries too, but do not focus on their specific characteristics as these countries are typically part of a larger sample.

One of the most comprehensive papers on the topic of the effectiveness of macroprudential policy instruments was written by Lim et al (2011.) using IMF data. On the basis of research conducted on a sample of 49 countries, they have shown that there are many instruments which can effectively reduce systemic risk in the financial sector, and that their effectiveness does not necessarily depend on the stage of economic development or the type of exchange rate regime. They also concluded that macroprudential measures and instruments are more often resorted to by emerging markets with fixed exchange rate regimes or managed floats where the interest rate channel is usually not functional, that face large capital inflows, have shallow financial markets and bank centric systems, but that these instruments can be just as effective when used by developed countries with flexible exchange rate regimes. Taking into consideration the costs involved in using macroprudential instruments, the benefits of this regulation should be weighed against the costs of its introduction. Lim et al (2013) have expanded the above analysis with research on the relationship between institutional arrangements and the use of macroprudential instruments, showing that the use of these instruments is more effective in countries where the central bank plays an important role in the implementation of macroprudential policy.

Quereshi et al (2011) strove to examine whether macroprudential policy and capital controls can contribute to enhancing financial stability in the periods of large foreign capital inflows using a sample of 51 emerging markets over the period 1995-2008. For this purpose, they constructed new indices for macroprudential measures pertaining to currency risk, other domestic macroprudential measures and capital controls for the financial sector. Their main finding suggests that macroprudential policy and capital controls reduce the riskiness of external liabilities and foreign-currency lending. They have also shown that the policies that do not discriminate on the basis of currency or residency can also be effective in mitigating excessive credit activity.

Schou-Zibell et al (2012) analysed the 1993-2008 data for 41 emerging markets in Asia, Latin America and Europe as well as 18 selected developed countries, with special emphasis on Asian countries. The objective of the research was to identify the most important determinants of financial soundness and stability in developing countries. Using regression on a panel of countries, they estimated the impact of different variables on key financial soundness indicators, like capital adequacy, asset quality, earnings and profitability. They have shown

that the relationship between financial soundness indicators and macroeconomic indicators was variable, depending on the stage of development of an individual country.

With the aim of analysing the effectiveness of reserve requirements and other macroprudential instruments, Tovar et al (2012) studied a sample of five Latin American countries over the period January 2003 to April 2011. In their research, they used two methods - event analysis, and dynamic panel data VAR. On the basis of data on reserve requirement rates and other macroprudential instruments, they constructed a cumulative binary variable. Given the complexity of the system of reserve requirements in use in different countries, they used an average of rates of different types of obligations in a given country as the required reserve rate. In the event analysis, they presented the changes in the annual rate of loans to the private sector, active interest rates, reference rates and exchange rates four months before and after the time of implementation of three different instruments - average reserve requirements, marginal reserve requirements and other macroprudential instruments. They concluded that reserve requirements and other macroprudential instruments led to a slowdown in the growth of bank credit to the private sector. They included a binary variable for macroprudential policy, the level of economic activity measured by the industrial production index, and private credit growth (real rate of change on a monthly basis) in the panel data VAR, and confirmed the conclusion reached on the basis of the event analysis.

In a research on the topic of macroprudential instruments aimed at real estate market trends, Vandenbussche et al (2012) studied 19 countries from Central, East and Southeastern Europe. For this purpose, the authors also constructed a time series for individual measures and instruments as well as for overall macroprudential policy for each individual country. They have shown that the tightening of minimum capital adequacy requirements and nonconventional measures used to guarantee liquidity, such as marginal reserve requirements on foreign funding sources and excessive credit growth, contributed to a slowdown in housing prices.

Nier et al (2012.) also studied the effectiveness of macroprudential measures and instruments on credit activity, housing prices, economic activity and capital inflows, on a sample of 15 developed countries and 21 emerging markets using a fixed-effects dynamic panel. They tested their effectiveness as well, depending on the stages of the economic cycle. Capital requirements and reserve requirements contributed to a slowdown in credit activity, while caps to the loan-to-value ratio and the debt-to-income ratio also proved effective in the emerging market sample.

As part of the materials prepared after the 2012 Article IV Consultation with Canada, Medas et al (2013) used panel data regressions across a sample of countries to estimate the effectiveness of caps to the loan-to-value ratios, caps to the debt-to income ratios, greater risk weights and higher provisioning requirements. It was for this purpose that the authors constructed variables that reflected the intensity of use of individual measures, i.e. their value increased or decreased by one every time the instruments were tightened or loosened. In addition to the above, they also used the actual loan-to-value caps, and included a lagged dependent variable as well as the

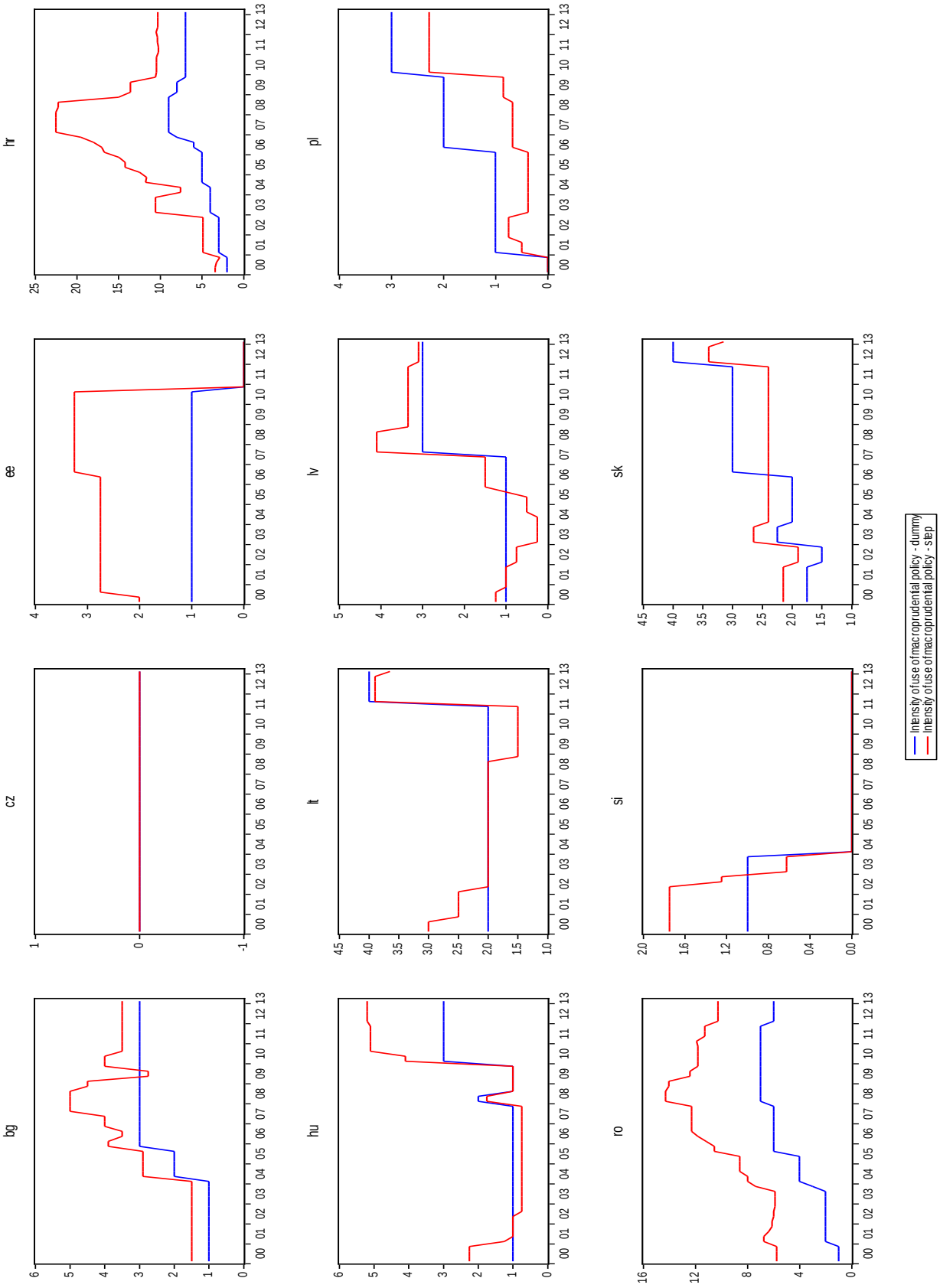
rate of change in GDP and active interest rate, into the panel. The outcome of regressions shows that greater risk weights and caps to the loan-to-value ratios as well as caps to the debt-to income ratios have been successful in dampening credit growth and limiting real estate prices.

Pečarić and Visković (2013) also conducted an empirical research of the effectiveness of macroprudential policy measures and instruments, focusing on their impact on banking sector stability, i.e. loan quality, bank profitability, liquidity and the loan-to-deposit ratio. Given the complexity of the financial system, they introduced different macroeconomic, financial and regulatory variables into the dynamic panel data model as well. They have shown that macroprudential measures had a positive effect on the stability of the banking system and stressed the importance of including this type of measures in the set of instruments of central banks.

One of the most recent papers on the topic of the effectiveness of macroprudential policy in the CEE countries is the paper by Geršla and Jašova (2014). The authors described the use of macroprudential measures and instruments in individual countries in great detail, and used panel regressions to examine the effectiveness of all instruments on credit to the private sector, cumulatively and individually, including macroeconomic indicators like GDP, credit interest rates and exchange rate volatility. Their results indicate that tighter provisioning requirements as well as caps to the loan-to-value and the debt-to income ratios have been effective in taming credit activities. They also underline that the measures that have not proven effective in slowing down credit activity did however play an important role in strengthening system resilience.

APPENDIX 2

Figure 8 - Overall Macroprudential Policy Intensity in the CEE countries in the Period from early 2000 to early 2013



Source: author's calculation.

APPENDIX 3

Table 4 - Impact of Macroprudential Measures and Instruments on Total Credit to Households

Dependant variable	total loans to households, quarterly rate of change																	
Independand variables	Spec. 1	Spec. 2	Spec. 3	Spec. 4	Spec. 5	Spec. 6	Spec. 7	Spec. 8	Spec. 9	Spec. 10	Spec. 11	Spec. 12	Spec. 13	Spec. 14	Spec. 15	Spec. 16	Spec. 17	Spec. 18
Constant	3.3206	3.3206	14.3530	4.4542	4.4542	3.6533	3.7980	4.5072	4.5072	3.3103	3.3103	3.6234	5.9125	4.3923	3.3071	4.6840	4.5960	4.4238
	(0.70)**	(0.70)**	(9.13)	(0.76)**	(0.76)**	(0.72)**	(0.79)**	(0.75)**	(0.75)**	(0.70)**	(0.70)**	(0.71)**	(1.40)**	(0.79)**	(0.72)**	(0.77)**	(0.81)**	(0.77)**
Total bank loans(-1)	0.5194	0.5194	0.5131	0.4520	0.4520	0.4969	0.5181	0.4737	0.4737	0.5184	0.5184	0.5025	0.4896	0.5062	0.5202	0.4603	0.4907	0.4945
	(0.07)**	(0.07)**	(0.07)**	(0.07)**	(0.07)**	(0.07)**	(0.07)**	(0.07)**	(0.07)**	(0.07)**	(0.07)**	(0.07)**	(0.07)**	(0.07)**	(0.07)**	(0.07)**	(0.07)**	(0.07)**
GDP	0.7445	0.7445	0.7548	0.6400	0.6400	0.7839	0.7499	0.6586	0.6586	0.7544	0.7544	0.7758	0.7587	0.7404	0.7436	0.6380	0.7334	0.7246
	(0.24)**	(0.24)**	(0.24)**	(0.24)**	(0.24)**	(0.24)**	(0.24)**	(0.24)**	(0.24)**	(0.24)**	(0.24)**	(0.24)**	(0.24)**	(0.24)**	(0.24)**	(0.24)**	(0.24)**	(0.24)**
Interest rate (-1)	-1.0945	-1.0945	-1.0795	-0.8768	-0.8768	-0.9394	-1.1108	-0.9169	-0.9169	-1.0980	-1.0980	-1.0191	-0.9666	-1.0626	-1.2137	-0.8761	-0.9868	-0.9989
	(0.38)**	(0.38)**	(0.37)**	(0.36)*	(0.36)*	(0.37)*	(0.37)**	(0.35)**	(0.35)**	(0.38)**	(0.38)**	(0.37)**	(0.36)**	(0.37)**	(0.41)**	(0.35)*	(0.36)**	(0.36)**
Credit growth limit - level (-1)	**-0.1114**																	
	(0.05)*																	
Credit growth limit - step (-1)		**-0.4456**																
		(0.19)*																
Capital requirements - razina (-1)			-1.3460															
			(1.11)															
DSI - razina (-1)				**-0.1360**														
				(0.05)**														
DSI - step (-1)					**-6.8023**													
					(2.39)**													
Limited currency mismatch - level (-1)						-3.0772												
						(2.07)												
Limited maturity mismatch - step (-1)							-1.1725											
							(0.65)											
LTV - razina (-1)								**-0.0459**										
								(0.01)**										
LTV - step (-1)									**-2.2953**									
									(0.64)**									
Marginal reserve requirement - level (-1)										-0.0189								
										(0.01)								
Marginal reserve requirement - step (-1)											-0.3783							
											(0.25)							
Increased provisioning requirement - step (-1)												**-1.3296**						
												(0.60)*						
General reserve requirement - step (-1)													**-0.2428**					
													(0.11)*					
General reserve requirement - level (-1)														**-0.1031**				
														(0.03)**				
Increased risk weights - step (-1)															-0.5875			
															(0.57)			
LTV - DSI - step (-1)																**-1.9784**		
																(0.56)**		
Total level of macroprudential policy - d (-1)																	**-0.3450**	
																	(0.10)**	
Total level of macroprudential policy - step (-1)																		**-0.2637**
																		(0.07)**
Observations:	332	332	332	332	332	332	332	332	332	332	332	332	332	332	324	332	332	332
R^2:	0.62	0.62	0.62	0.64	0.64	0.63	0.62	0.64	0.64	0.62	0.62	0.63	0.63	0.62	0.62	0.64	0.63	0.63
F-statistic:	37.11	37.11	37.30	39.92	39.92	37.98	37.23	39.95	39.95	37.01	37.01	37.75	38.65	37.59	36.72	40.43	38.45	38.37

Source: author's calculation.

Table 5 - Impact of Macroprudential Measures and Instruments on Total Credit to Businesses

Dependant variable	total loans to corporate sector, quarterly rate of change												
Independand variables	Spec. 1	Spec. 2	Spec. 3	Spec. 4	Spec. 5	Spec. 6	Spec. 7	Spec. 8	Spec. 9	Spec. 10	Spec. 11	Spec. 12	Spec. 13
Constant	3.1764	3.1764	4.0779	2.8750	3.3623	3.0573	3.0573	2.9740	2.7116	2.4956	3.0514	2.6824	2.8294
	(0.50)**	(0.50)**	(5.85)	(0.48)**	(0.58)**	(0.49)**	(0.49)**	(0.49)**	(0.84)**	(0.58)**	(0.51)**	(0.54)**	(0.53)**
Total loans to corporate sector (-1)	0.2540	0.2540	0.2583	0.2527	0.2550	0.2543	0.2543	0.2447	0.2551	0.2467	0.2449	0.2499	0.2532
	(0.07)**	(0.07)**	(0.07)**	(0.07)**	(0.07)**	(0.07)**	(0.07)**	(0.07)**	(0.07)**	(0.07)**	(0.07)**	(0.07)**	(0.07)**
GDP	0.7133	0.7133	0.7225	0.7260	0.7225	0.7316	0.7316	0.7313	0.7292	0.7501	0.7297	0.7500	0.7442
	(0.20)**	(0.20)**	(0.20)**	(0.20)**	(0.20)**	(0.20)**	(0.20)**	(0.20)**	(0.20)**	(0.20)**	(0.20)**	(0.20)**	(0.20)**
Interest rate (-1)	- 0.0677	-0.0677	-0.0633	-0.1463	-0.0759	-0.0440	- 0.0440	-0.0194	-0.0288	-0.0275	-0.0419	-0.0041	-0.0159
	(0.27)	(0.27)	(0.27)	(0.27)	(0.27)	(0.27)	(0.27)	(0.27)	(0.27)	(0.27)	(0.28)	(0.27)	(0.27)
Credit growth limit - level (-1)	**-0.0945**												
	(0.06)												
Credit growth limit - step (-1)		**-0.3781**											
		(0.22)											
Capital requirements - razina (-1)			-0.1192										
			(0.72)										
Limited currency mismatch - level (-1)				3.5267									
				(1.39)*									
Limited maturity mismatch - step (-1)					-0.5422								
					(0.55)								
Marginal reserve requirement - level (-1)						0.0213							
						(0.01)							
Marginal reserve requirement - step (-1)							0.4260						
							(0.29)						
Increased provisioning requirement - step (-1)								1.0803					
								(0.40)**					
General reserve requirement - step (-1)									0.0404				
									(0.07)				
General reserve requirement - level (-1)										0.0654			
										(0.03)*			
Increased risk weights - step (-1)											0.6947		
											(0.52)		
Total level of macroprudential policy - d (-1)												0.1413	
												(0.08)	
Total level of macroprudential policy - step (-1)													0.0794
													(0.06)
Observations:	333	333	333	333	333	333	333	333	333	333	325	333	333
R^2:	0.32	0.32	0.32	0.34	0.32	0.32	0.32	0.33	0.32	0.32	0.33	0.32	0.32
F-statistic:	10.84	10.84	10.74	11.83	10.78	10.81	10.81	11.15	10.77	10.94	10.78	10.93	10.83

Source: author's calculation.

Table 6 - Impact of Macroprudential Measures and Instruments on Total Credit to the Private Sector Granted by Business Banks

Dependant variable	total bank loans to private sector, quarterly rate of change																
Independand variables	Spec. 1	Spec. 2	Spec. 3	Spec. 4	Spec. 5	Spec. 6	Spec. 7	Spec. 8	Spec. 9	Spec. 10	Spec. 11	Spec. 12	Spec. 13	Spec. 14	Spec. 15	Spec. 17
Constant	6.1169 (1.29)**	6.0799 (1.29)**	16.5310 (8.33)*	6.1083 (1.56)**	6.1083 (1.56)**	6.5093 (1.50)**	5.3079 (1.36)**	6.3679 (1.49)**	6.3679 (1.49)**	6.0516 (1.30)**	6.0516 (1.30)**	6.3719 (1.37)**	9.5394 (2.39)**	6.9474 (1.44)**	5.9072 (1.30)**	6.7082 (1.41)**
Total bank loans(-1)	0.1115 (0.09)	0.1119 (0.09)	0.1117 (0.08)	0.1139 (0.09)	0.1139 (0.09)	0.1128 (0.09)	0.1099 (0.09)	0.1130 (0.09)	0.1130 (0.09)	0.1136 (0.09)	0.1136 (0.09)	0.1116 (0.09)	0.1015 (0.09)	0.1090 (0.09)	0.1095 (0.09)	0.1102 (0.09)
GDP	0.9808 (0.31)**	0.9831 (0.31)**	0.9768 (0.30)**	0.9805 (0.33)**	0.9805 (0.33)**	0.9743 (0.31)**	0.9934 (0.31)**	0.9596 (0.32)**	0.9596 (0.32)**	0.9896 (0.31)**	0.9896 (0.31)**	0.9809 (0.31)**	0.9064 (0.31)**	0.9609 (0.31)**	0.9935 (0.31)**	0.9557 (0.31)**
Interest rate (-1)	-0.1940 (0.10)	-0.1932 (0.10)	-0.2056 (0.10)*	-0.1986 (0.12)	-0.1986 (0.12)	-0.2322 (0.12)	-0.1698 (0.10)	-0.2109 (0.11)	-0.2109 (0.11)	-0.1929 (0.10)	-0.1929 (0.10)	-0.2156 (0.11)*	-0.2947 (0.12)*	-0.2017 (0.10)*	-0.1855 (0.10)	-0.2164 (0.10)*
Credit growth limit - level (-1)	**-0.1244** **(0.04)****															
Credit growth limit - step (-1)		-0.2979 (0.18)														
Capital requirements - razina (-1)			-1.2654 (1.01)													
DSI - razina (-1)				-0.0069 (0.06)												
DSI - step (-1)					-0.3460 (3.12)											
Limited currency mismatch - level (-1)						-1.6323 (2.40)										
Limited maturity mismatch - step (-1)							1.2102 (0.87)									
LTV - razina (-1)								-0.0080 (0.01)								
LTV - step (-1)									-0.3982 (0.75)							
Marginal reserve requirement - level (-1)										-0.0102 (0.01)						
Marginal reserve requirement - step (-1)											-0.2032 (0.23)					
Increased provisioning requirement - step (-1)												**-0.7218** **(0.54)****				
General reserve requirement - step (-1)													**-0.2529** **(0.13)****			
General reserve requirement - level (-1)														**-0.0830** **(0.04)***		
Increased risk weights - step (-1)															0.3378 (0.55)	
Total level of macroprudential policy - step (-1)																**-0.1228** **(0.07)****
Observations:	349	349	349	349	349	349	349	349	349	349	349	349	349	349	341	349
R^2:	0.27	0.26	0.27	0.26	0.26	0.27	0.27	0.26	0.26	0.26	0.26	0.27	0.28	0.27	0.27	0.27
F-statistic:	8.65	8.58	8.68	8.55	8.55	8.63	8.72	8.58	8.58	8.56	8.56	8.64	9.11	8.73	8.41	8.67

Source: author's calculation.

APPENDIX 4

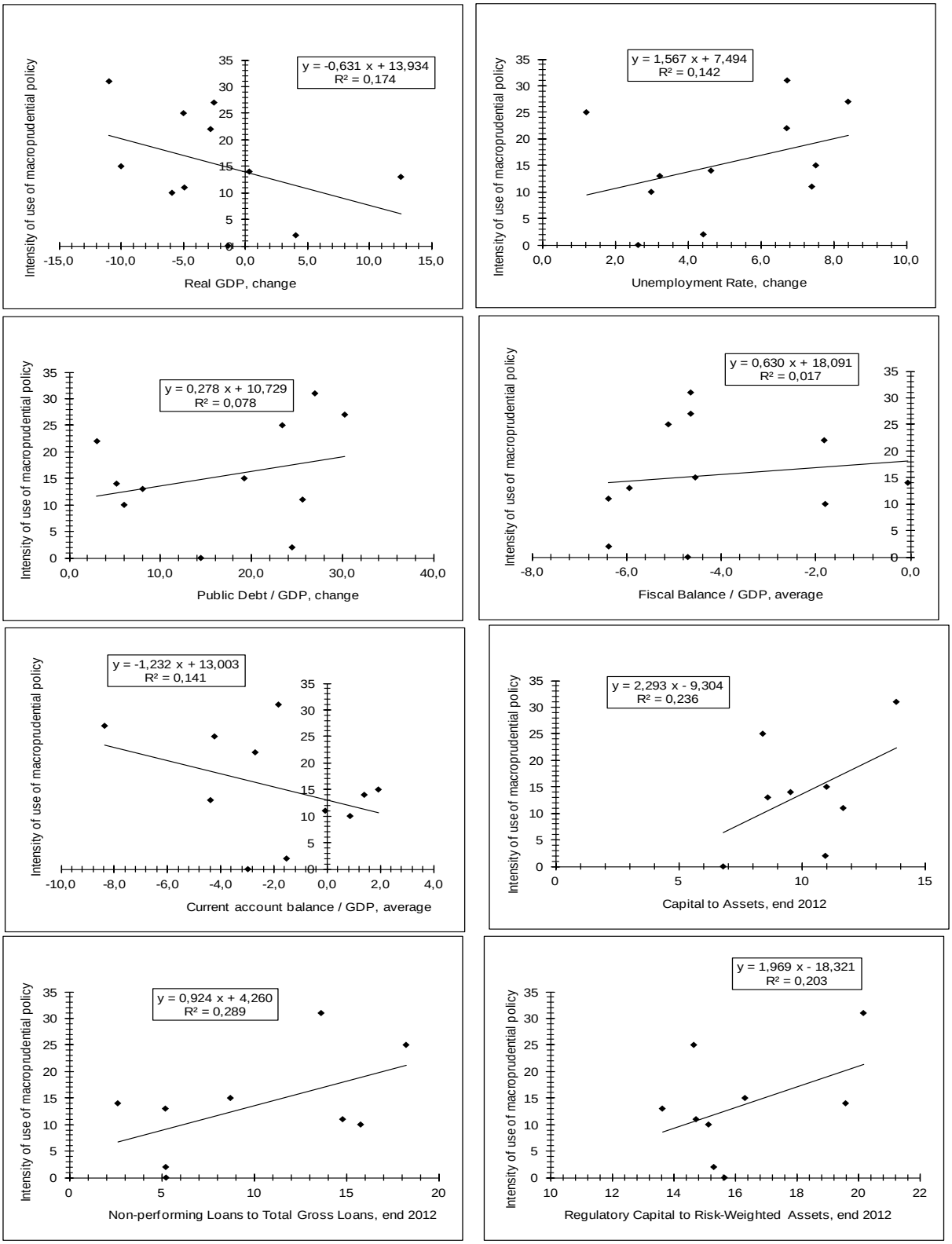
Table 7 - Selected indicators for CEE countries after 2008

	Intensity of use of macroprudential policy	Real GDP, change	Uneployment rate, change	Public debt / GDP, change	Fiscal balance / GDP, average	Current account balance / GDP, average	Non-performing Loans to Total Gross Loans	Regulatory Capital to Risk-Weighted Assets	Capital to Assets
Bulgaria	22	-2,8	6,7	3,0	-1,8	-2,7	na	na	na
Czech R.	0	-1,4	2,6	14,5	-4,7	-3,0	5,2	15,7	6,8
Estonia	14	0,3	4,6	5,2	-0,1	1,4	2,6	19,6	9,5
Croatia	31	-11,0	6,7	27,0	-4,6	-1,8	13,6	20,2	13,8
Latvia	15	-10,0	7,5	19,2	-4,5	1,9	8,7	16,3	11,0
Lithuania	11	-4,9	7,4	25,6	-6,4	-0,1	14,8	14,7	11,7
Hungary	10	-5,9	3,0	6,0	-1,8	0,9	15,8	15,1	
Poland	13	12,5	3,2	8,1	-5,9	-4,4	5,2	13,6	8,6
Romania	25	-5,0	1,2	23,4	-5,1	-4,2	18,2	14,7	8,4
Serbia	27	-2,5	8,4	30,3	-4,6	-8,4	na	na	na
Slovak R.	2	4,1	4,4	24,5	-6,4	-1,5	5,2	15,3	11,0

Note: Change – end of 2012 compared to the end of 2008, average – 2009-2012.

Sources: MMF World Economic Outlook Database, Financial Soundness Indicators, Lim et al (2011)

Figure 9 – Intensity of use of macroprudential policy compared to the selected macroeconomic indicators and indicators of banking sector resilience during and after the crisis



Note: Change – end of 2012 compared to end of 2008, average – 2009-2012.

Sources: MMF World Economic Outlook Database, Financial Soundness Indicators, Lim et al (2011)