NBP Working Paper No. 240

“One size does not fit all” – institutional determinants of financial safety net effectiveness

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Acknowledgements

The authors are grateful to Prof. Andrzej Slawiński, Prof. Mateusz Pipień, Tomasz Chmielewski, Ph.D., Olga Szczepańska, Ph.D. and other participants of the seminar organized by Narodowy Bank Polski, for their remarks and suggestions.

The authors are responsible for all errors and omissions.

This research project was conducted under the NBP Economic Research Committee’s open competition for research projects to be carried out by the NBP staff and economists from outside the NBP and was financed by the NBP.
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Abstract

The main objective of the study is to identify both similarities and differences among seemingly homogenous countries (OECD) in respect to their safety net design and a supervisory role played by central banks. This goal is achieved using an extensive data set, describing financial supervisory institutions between 2000-2013, hence including recent modifications in response to global financial crisis. The data show the existence of similar supervisory standards in both crisis- and non-crisis countries. Whether it is a presence of a single supervisory authority, allocation of macroprudential responsibilities in a country, or implementing capital adequacy requirements, while working well in certain countries, did not make others immune to a crisis. At the same time, data show that non-crisis countries implemented stricter rules than those in crisis-countries, and that this process started way before the burst of the Global Financial Crisis. Often, these more rigorous rules were observed in countries with past crisis experience, indicating an importance of learning mechanism. With empirical analysis, we prove that certain basic safety net elements (obligatory reserve requirements or sufficient coverage of deposit insurance scheme), as well as high level of central bank financial transparency are negatively correlated with the speed of credit growth. Based on our results and discussion on previous empirical analyses we give recommendations for institutions involved in the financial safety net.

Keywords: central bank, financial regulation, financial supervision, monetary policy, financial crisis, macroprudential policy, safety net

JEL: E52, E58, G01, G18, G21, H12
Introduction

The last few years have been a challenging time for central bankers, regulators and policymakers as well. The Global Financial Crisis (GFC) exposed clear gaps in the pre-crisis regulatory and supervisory framework in most of financial systems worldwide, but not in all financial systems.

Optimal design of supervisory and regulatory arrangements in the post-crisis perspective requires identifying elements that failed in helping predicting current slowdown, and those that directly or indirectly affected vulnerability of financial markets. Both tasks appear to be as challenging as twelve labors of Hercules: demanding, covering wide aspects of financial and macroeconomic markets, requiring cooperation of many key agents in all markets; hence truly virtually impossible.

Those who try, fail at the first step of generalizing causes of the crisis. Many research results are sensitive to changes in samples and time changes. Some countries like Australia, New Zealand, Norway or Canada¹ did not suffer from crisis despite large development of their financial markets and interconnections with other infected countries. Some countries, Germany or Portugal did not record lethal for other states real estate bubbles, or even observed decrease in prices in this market. Still, they were not immune to crisis. Since it is difficult to draw general conclusions for European and world markets based on just a few salient countries. Rose and Spiegel (2011) doubt about potential for comparable, common for all early warning forecasting model going forward (Rose & Spiegel 2011).

Empirical flaws in determining causes of crisis are one problem. Another is a lack of uniformly accepted definition of financial stability that could be a reference for countries rebuilding their own financial systems (Schinasi 2010). What follows, it is also difficult to find reliable sets of financial stability indicators (European Central Bank 2005).

The main objective of the study is to identify both similarities and differences among seemingly homogenous countries (OECD) in respect to their safety net de-

¹ On Canada avoiding the crisis see Haltom (2013).
sign and a supervisory role played by central banks. With an extensive characterization of countries’ financial regulation and subsequent empirical analysis, our aim is to prove that there exist crucial differences in financial market supervision, regulation and in designing the financial safety net, which helped some countries avoid the crisis. We also prove that some basic elements of institutional arrangements are crucial for financial stability and should be implemented in all financial systems. At the same time we underline the problem of “one size does not fit all” in relation to the broadly defined financial safety net arrangement. By comparing similar broader arrangements among countries, we show that the same regulations, structured in exactly the same manner, do not guarantee immunity to crisis.

The first view on crisis vs. non-crisis countries does not help to reach a conclusion on what constitutes the key characteristic helping one group to avoid financial turmoil. Some studies underline importance of the origins of law for the stability of financial system, where a particular role would have Nordic law (Masciandaro 2007). This theory, however, is fragile on the ground of current crisis experience of Denmark, Iceland and Sweden. Sixty-two banks ceased to exist during 2008-August 2013 in Denmark, while none in Finland or Norway (Rangvid 2014).

The theory on optimal currency area, defined by seminal paper of Mundell (1961) suggests that countries may avoid currency crisis if are members of a currency union with a legal tender being an international currency. This could be a relevant theory for Austria, Belgium or Germany, members of the eurozone, which have avoided current account instabilities caused by currency mismatches during the crisis. This theory is also valid for Iceland that was not able to cover its liabilities denominated in foreign currencies due to a plunge in the value of domestic krona. On the other hand Australia, Canada or Norway is nowhere close to joining any currency union.

Economic and social variability among countries has also been explained with the use of cultural indices, describing proneness to risk taking, assertiveness, institutional collectivism or orientation for future (Hofstede 2001). But yet again, time-constant cultural variables have difficulties to explain development of financial risks in many countries since the 2000. Therefore, this theory fails to indicate reasons of
crisis experience differences among historically and culturally close Nordic countries, or those with transition economies.

Performing deeper analysis of safety net regulations, we discover similar arrangements leading to different outcomes. Thus we draw a conclusion that one size of financial stability model, even designed for similarly developed countries, does not guarantee stable systems in all countries. To underline this problem, section 3 presents an extensive characterization of similarities and differences in area of financial regulation. Following recent legislative changes in many countries, we enrich this descriptive analysis with time-varying data.

We especially underline the structure of financial safety net: role of deposit insurance, existence of obligatory reserve requirement at the central bank, and the role of monetary authority in the supervising system. Underlining importance of the Basel regulations and united movement towards their improvements, we focus also on the countries’ cohesion with these rules. In addition, this section includes characterization of a few typical macroprudential indicators, which were used either officially (officially reported by supervisory agency) or simply accepted as early warning indicators\(^2\).

Searching for a conclusive answer to the question of efficient and optimal arrangements of the safety net and hoping to improve findings of other scholars and researchers, we perform a series of empirical tests. Describing financial instability with variables characterizing growth of credit, we estimate models augmented with institutional safety net arrangements, described in section 3. The value added of our study originates from a wide data set, originally collected by the IMF and accommodated by us for further empirical estimation. Additionally, we use a new recommendation by the European Systemic Risk Board, defining financial instability (crisis occurrence) early warning indicator as credit to GDP gap. Empirical, as well as descriptive analyses consider also a different classification of the European Union countries experiencing crisis since 2007.

\(^2\) A wide set of macroprudential instruments was defined already in 2000 by the IMF in Evans et al. (2000). A list of officially used macroprudential instruments is collected by Cerutti, Claessens & Laeven (2015).
The paper is organized as follows. Section 1 opens the paper with a literature review on indicators of financial crisis (concentrating on Global Financial Crisis), financial safety net architecture and the role of a central bank in the supervisory and regulatory process. We define our hypotheses in section 2. Their relevance and validation is first performed in section 3 with an extensive comparison of safety nets arrangements among countries under inspection that is the OECD countries augmented with Latvia and Lithuania. Here, we additionally present a more detailed picture of a few case studies (we chose Finland and Denmark as case studies), which, in our opinion, improve understanding of institutional differences among countries. Empirical analysis found in section 4 helps in further validation of hypotheses of this study. Finally, section 5 concludes.
1. Literature review and theoretical background

1.1. Global financial crisis – causes and leading indicators

Identification of causes of current financial crisis seems to be crucial for improving financial regulation, supervision and central bank policy. Misdiagnosis of the crisis caused by either focusing on factors that did not contribute much or ignoring factors that did, might result in designing the wrong remedies. As a result all the reforms to enhance financial regulation and supervision and improve the safety and soundness of financial system will do little to fix problems.\(^3\)

We all agree that finding a cure for the financial crisis and its subsequent recession requires identifying the key factors leading to the crisis. Opinions are divided but it is possible to group them into a few clusters. What’s important is to realize the factors and mechanism that “turned several hundred billion dollars of losses in the subprime mortgage market into a multi-trillion dollar destruction of wealth” (Brunnermeier 2009).

It seems that the full and detailed diagnosis of the causes and mechanisms of transmission of global financial crisis will be possible in a few, or even a dozen, years. But, there are many lessons from the global financial crisis. One of them relates to the theoretical explanation of financial crisis and stress the complete failure of mainstream economic theory to anticipate, explain or provide policies to mitigate the effects of the global financial crisis (Wojtyna 2010, King 2011). That is why, economists offer different lens to explain causes of the financial crisis and mechanisms of its transmission from country to country, from financial market to financial market. First, because of some analogies between Global Financial Crisis and the Great Depression, economists found Keynes analysis described in “Treatise on Money” relevant in today’s context (Leijonhufvud 2008). Second, Hyman Minsky’s (1992) theory is used to identify endogenous mechanism, which explains relations between financial and real sphere and is the underlying reason for investors’ decision-making process (Sławiński 2007). Third, due to the great significance of specu-

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\(^3\) Barth, Caprio & Levine (2014) list the number of reforms on the U.S. financial market, which seem to be ineffective (e.g. establishing Financial Stability Oversight Council to enhance communication across agencies, although such a body already existed, which is Federal Financial Institutions Examination Council, established in March 1979 or establishing the Consumer Financial Protection Bureau).
ative bubbles and herd behavior in explaining global financial crisis, economists increase their interest in the theoretical achievements of behavioral economics. Fourth, economists offer new interpretation of the balance of pro and cons of financial globalization and liberalization, indicating potential causes of global financial crisis (Kose et al. 2009, Rodrik & Subramanian 2009).

What were the primary causes of the global financial crisis?


(1) macroeconomic causes: problems associated with the build-up of imbalances in international claims (global imbalances as co-determinant of global financial crisis) and difficulties created by the long period of low real interest rates (overly expansionary monetary policy),

(2) microeconomic causes: inadequate regulation of financial institutions, poor systems of incentives and inadequate risk measurement.

Bootle (2009, p. 8) makes step further and identifies crisis as a result of the interaction between eight powerful factors: the bubble in property, the explosion of debt, the fragility of the banks, the weakness of risk assessment, an error of monetary policy, the super-saving of China and a number of other countries, the complacency and incompetence of the regulators, the docility of outside assessors (credit rating institutions). He also identifies some deeper underlying cause and mechanisms of interaction between the eight factors. His conclusion is that the primary cause of the global financial crisis was ‘dictatorship of professoriat’, as he described the economic theories and their deficiencies (Bootle 2009, p. 22).

A number of studies have pointed to weaknesses in regulation and supervision as one of the factors leading to the crisis (Dam 2010, Chan-Lau 2010, Levine 2010, Merrouche & Neir 2010, Barth, Caprio & Levine 2012). Cukierman (2011) identifies several channels for the contributions of regulatory incompleteness and supervisory forbearance to the emergence of the global financial crisis, such as:

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4 Stiglitz (2010) comes to the similar conclusions.
the growth of poorly regulated segments of the financial system (the growth of
the so-called shadow financial system had many serious consequences for fi-
nancial stability, i.e. increase of the fraction of financial intermediation which
is not subject to capital requirements, many institutions of this segment had no
access to the lender of last resort facility, making them subject to run, institu-
tions in shadow financial system had liabilities with average maturity shorter
comparing to assets maturity (the case of classical liquidity run of Diamond &
Dybvig 2000), institutions, such as hedge funds, engaged in highly leverage
operations),

short-termism and excessive risk taking as a consequence of the construction
of compensation packages (compensation packages of senior- and sometimes
even mid-level financial executives might be perceived from principal-agent
problem perspective, first, there is a question whether the compensation pack-
age was justified taking into account the contribution of executives to the
long-term performance of financial institutions, second, there is another ques-
tion of the effect of the compensation packages on the decision leading to in-
crease of return rate and risk pattern),

systemic risk and the too-big-to-fail problem (Eijffinger 2011),

procyclicality in the behavior of both financial institutions and investors (dur-
ing the upper phases of the business cycle investors and financial institutions
accept higher risks in order to increase expected return, during the down phas-
es a ‘flight to safety’ happens; this phenomenon is caused by many economic
and psychological factors, as well as by selected features of financial regul-
ations\(^5\)),

lack of regulation of rating agencies (De Haan & Amtenbrink 2011),

securitization and the trade-off between transparency and efficient intermedia-
tion (process of mortgage loans securitization caused disconnection of the link
between the mortgage originator and the final holder of mortgage-backed se-

\(^5\) The ‘balance sheet effect’, i.e. the procyclical behavior of collateral is reinforced by the Basel II
requirement to mark collateral to market (Brunnermeier et al. 2009).
curity – MBS, which made the monitoring of the borrower and the evaluation of the securitized asset value extremely difficult).

The prior-crisis supervisory framework was described as a “patchwork of rules of the game and regulatory and supervisory principles” (Schinasi 2010) emerging after the Great Depression and each less significant crisis. These rules relied heavily on private risk management, and less on appropriate incentives, effective regulation and monitoring (Schinasi 2010).

Blundell-Wignall and Atkinson (2008) and Blundell-Wignall, Atkinson & Lee (2008) explain that reasons in the current financial crisis lay in, both global macro policies affecting liquidity and in a very poor regulatory framework. The “deadly concoction of social and financial engineering”, according to Buiter (2012), originates from wide-range deregulation of financial market and financial innovation, especially in the US, but also in many other countries.

First, from macroeconomic point of view, it seems that central banks failed by delivering too lax monetary policy, which led to the building of bubbles in a period of low interest rates and macroeconomic stability. On the one hand we have observed extremely low interest rates in the US since 2003/2004 (and the associated weakening of the US dollar from 2002). On the other hand Japan’s near-zero interest rate and low exchange rate policy. (Too) Low interest rates in some countries could be also due to large capital inflows from abroad, especially originating from countries with pegged exchange rate. Large capital flows and global imbalances are the second factor. Large account surpluses and deficits, large saving glut in some countries and connected with it the search for yield – further contributed to the growth of global instability and put pressure on financial markets. While the US and Japan have played a significant role in this process, China and its industrialization and foreign reserve accumulation has been another crucial factor contributing to this situation.

On the other hand, banking and financial sectors, largely left alone for its own regulation, driven by even greater search for yield and search for bonus, developed a wide range of financial innovations. These instruments not that long ago seemed to positively affect the market transferring banking risk to non-banking institutions
(hence causing risk to disperse). Today, we acknowledge that in practice they imported systemic risk from non-banking institutions and securities markets to the banking system (Dewatripont, Freixas & Portes 2009). Dewatripont, Freixas & Portes (2009, p. 2) admit that this risk dispersion towards non-banking institutions (such as AIG or Lehman Brothers) not only was accepted and supported by supervisory regulators, but also led to a passive attitude of regulators. At the same time, banking sector underwent a deep structural transformation driven by the research finding positive and causal relation between development of financial markets and country’s growth. Blundell-Wignall & Atkinson (2008) argue that factors having causal effect on the crisis can be found in many past policy reforms, in credit rating agencies, poor risk modeling and underwriting standards as well as corporate governance lapses. At the same time, authors continue, these factors were simply elements of new banking business model (Blundell-Wignall, Atkinson & Lee 2008).

These factors leading and deepening the crisis involve also opacity of these financial innovations, failure of credit rating institutions, which failed in being neutral in their opinions, and the lack of adequate countercyclical prudential regulation. Dewatripont, Freixas & Portes (2009) describe the onset and the subsequent period of the financial crisis as the regime switch. This change was triggered by liquidity shortages, accumulation of credit default swaps (CDS) and the collapse of credit ratings. Among regulatory framework, the key causes were: the pro-cyclicality of Basel 2 regulation and the lack of system dealing with banks in distress (insolvent).

While entering the seventh year of the global financial crisis, the literature seems to revise earlier studies analyzing causes of GFC. As Barth, Caprio & Levine (2014) write, the authorities (authors focus on cases in the U.S.) misdiagnosed what went wrong. The crisis was not the result of consequences originating from regulatory gaps, nor inadequate regulatory and supervisory power and resources (Barth, Caprio & Levine 2014). As authors underline, the US financial system increasingly relies on regulatory and supervisory agencies – and thereby declines the meaning of market discipline – to maintain the financial stability. What is even worse, this means relying on agencies that were partially responsible for the crisis without improving their operation, governance or accountability (‘the choice and maintenance
of regulatory and supervisory practices that permitted and, in some cases encouraged, excessive risk taking by financial institutions”, Barth, Caprio & Levine 2014, p. 3). Similarly Levine (2010) argues, “the senior policymakers repeatedly designed, implemented, and maintained policies that destabilized the global financial system in the decade before the crisis”.

Acharya et al. (2011) view the crisis mainly as a regulatory failure, originating from ill-designed supervision coming from ad-hoc responses to prior crises. The recent analyses addressing the problem seem to agree at least to one point: the currently undertaken changes of regulation and supervision in the broad area of financial activities are far from optimal and perfect (Barth, Caprio & Levine 2014, Acharya et al. 2011).

To summarize, the result of analyzing the reasons of crisis at an early its stage, the Financial Stability Forum provided a list of weaknesses of financial markets leading to turmoil (Financial Stability Forum 2008, Blundell-Wignall & Atkinson 2008):

– poor underwriting standards,
– poor risk management practices in firms (especially cultural factors embedded in bank strategy, led some boards to give a lower weight to risk before the crisis),
– poor investor due diligence/excess reliance on Credit Rating Agencies (CRA),
– poor CRA performance,
– incentive distortions,
– weaknesses in disclosure,
– thin market feedback loop with sharp price falls,
– weaknesses in regulatory frameworks pre-Basel II,
– originate-to-distribute model itself.

Many economists (Obstfeld & Rogoff 2001, 2005, 2007, 2009, Bini-Smaghi 2008) believe that there is direct connection between global financial crisis and global imbalances, hence global imbalances might be perceived as a critically important co-determinant of crisis. Still, it is controversial what is the precise connection between global imbalances and the global financial crisis. Some commentators
argue that global imbalances, as external phenomenon, had little or even nothing to do with the financial crisis\(^6\). Others put forward various mechanisms to show the crucial role of global imbalances in causing the financial collapse.

The global financial crisis has renewed interests in early warning indicators as variables that could help to predict which countries or markets might be impacted by the crisis. Empirical research on early warning indicators is very extensive, but it is also difficult to identify universal conclusions or recommendations. First, the definitions of ‘crisis’\(^7\) and ‘crisis incidence’ vary across surveys (Kaminsky, Lizondo & Reinhart 1996, Abiad 2003). Second, variables identified as early warning indicators are usually selected, based on some specific economic reasoning. These are reasons of thinking of early warning indicators as only able to explain the crisis on an \textit{ex post} basis. Third, economists propose different modeling approaches in surveys: from linear regression or limited dependent variable probit/ logit techniques (Eichengreen, Rose & Wyplosz 1995, Frankel & Rose 1996), through non-parametric approach (Kaminsky, Lizondo & Reinhart 1996, Edison 2003), a qualitative and quantitative analysis of behavior of variables in a crisis group of countries and non-crisis control group (Edwards 1989, Edwards & Santaella 1993), to use of binary recursive trees, artificial neural networks and genetic algorithms (Ghosh & Ghosh 2003, Apoteker & Barthelemy 2001).

Frankel & Saravelos (2011), among others (cf. Table 1), investigate whether leading indicators (the selection of indicators was driven by a very details review of previous surveys on early warning indicators) can help explain the cross-country incidence of the global financial crisis. Their econometric analysis confirmed that the top two indicators identified in the literature review, i.e. the level of international reserves and real exchange rate overvaluation, were useful indicators of the global financial crisis.

\(^6\) Some economists (e.g. Dooley, Folkerts-Landau & Garber 2005, Cooper 2007, Mendoza, Quadrini & Rios-Rull 2007, Caballero, Farhi & Gourinchas 2008) argue that global imbalances are essentially a ‘win-win’ phenomenon with two sides benefiting from safe and liquid saving terms (developing and emerging countries) and easier borrowing terms (rich, developed countries). However, their analysis is burdened by the assumption that developed countries capital markets were fundamentally perfect.

\(^7\) Another issue complicates this analysis: the literature investigates different types of crisis (e.g. currency, banking), in different countries, regions and in relation to different time.
Table 1. Early warning indicators for Global Financial Crisis – summary of empirical studies

<table>
<thead>
<tr>
<th>Study (authors)</th>
<th>Measures of financial crisis</th>
<th>Early warning indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obstfeld, Shambaugh &amp;</td>
<td>currency depreciation</td>
<td>the excess of reserves (as a proportion of M2)</td>
</tr>
<tr>
<td>Taylor (2009, 2010)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rose &amp; Spiegel (2009)</td>
<td>changes in real GDP, changes in the stock market, country credit rating</td>
<td>none out of 60 analyzed variables was statistically significant</td>
</tr>
<tr>
<td></td>
<td>and exchange rate</td>
<td></td>
</tr>
<tr>
<td>Rose &amp; Spiegel (2011)</td>
<td>declines in currency value, stock market, GDP</td>
<td>none of analyzed variables was statistically significant</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Berkmen et al. (2009)</td>
<td>revision of growth forecasts by professional economists</td>
<td>international reserves</td>
</tr>
<tr>
<td>Lane &amp; Milesi-Ferretti</td>
<td>change in GDP growth and its demand-side components</td>
<td>current account, trade openness</td>
</tr>
<tr>
<td>(2011)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frankel &amp; Saravelos</td>
<td>nominal local currency percentage change versus the US dollar, equity</td>
<td>level of international reserves, real exchange rate overvaluation</td>
</tr>
<tr>
<td>(2011)</td>
<td>market returns, change in the level of real GDP, change in industrial</td>
<td></td>
</tr>
<tr>
<td></td>
<td>production, recourse to IMF financing</td>
<td></td>
</tr>
<tr>
<td>Babecký et al. (2013)</td>
<td>output and employment loss, fiscal deficit</td>
<td>domestic houses prices, share prices, credit growth, private credit</td>
</tr>
</tbody>
</table>

Source: Authors’ compilation.

There are important policy implications, which can be derived from these researches. First, the international reserves play crucial role in shielding countries from the crisis (however, it should be mentioned that Blanchard, Faruqee & Klyuev 2009 and Rose and Spiegel 2009 did not find reserves as a key leading indicator of crisis incidence). Second, although financial crisis characteristics differ across time and countries, definitions of crisis and measures of crisis event differ as well, a number of indicators identified in the previous research, is useful in explaining and predicting crisis incidence.

1.2. Supervisory and regulatory architecture

Following the crisis there is a broad consensus that financial supervision and regulation should be reinforced. One of the most important elements of this consensus is adding macro regulatory authority (to the existing micro regulatory authorities) to monitor systemic risk and use policy tools able to deal with such risks (see section 2.4).
In the aftermath of the global financial crisis, the authorities in different countries, are attempting to improve the supervisory and regulatory framework of financial system. These attempts involve three issues:

(1) diagnosing the causes of crisis (see section 2.1),
(2) designing regulatory and supervisory reforms,
(3) implementation of reforms.

In theory and practice there are varying approaches to banking and financial supervision. General division of tasks of financial supervision would include: macroprudential supervision, micro prudential supervision and conduct of business supervision. Recent crisis has shown that some of the fundamentals need and will be changed. The literature divides itself into two competing brands, where one group represents the integration view and supports the central bank’s high involvement in supervision. Opponents, the separation view supporters, underline possibilities of policy failure risks (Masciandaro 2012a, 2012b). Two existing models of financial supervision are challenging each other: the single integrated regulator model, where an integrated regulator operates along the central bank; and the twin-peaks model, where the central bank is responsible for prudential and systemic risk and operate alongside a conduct of business regulator (Nier 2009).

It has been argued that assigning the goal of financial stability to the central bank may create a conflict of interest between execution of this goal and of price stability. Especially during a downturn, there is risk that the central bank may fail to deliver on price stability by keeping an overly loose monetary policy to address banks’ problems with liquidity (Goodhart & Schoenmaker 1995). In the pursuit of low inflation, Mishkin (1996) argues, high levels of interest rates may negatively affect banks’ balance sheets and firms’ net financial worth.

The critics of such a separation claim that a central bank focusing only on price stability might not respond to financial instability unless its inflation goal was threatened (Bordo & Wheelock 1998, Borio & Lowe 2002, Borio, English & Filardo 2003, White 2006, Leijonhufvud 2007). At the same time the “Schwartz hypothesis” assures that a central bank “that was able to maintain price stability would also incidently minimize the need for lender-of-last-resort intervention” (Schwartz 1988,
Integrating both objectives under one roof of the central bank means also that the bank will have informational advantages (having already informational bias against other market participants) and can achieve economies of scale (see for example Bernanke 2011 or Blinder 2010 among many).

The number of institutions responsible for supervision and how independent they are from government are next questions. Government may wish to assign all supervisory responsibilities to one institution or to multiple authorities, each separately for example for a banking sector, for non-banking financial institutions and a separate one for insurance companies. Quintyn and Taylor (2003) suggest that bank supervisors must be independent in relations with various groups of interests: politicians, institutions they supervise, and government.

Current literature on financial market supervisory models goes to great lengths to compare various (Di Noia & Di Giorgio 1999, Masicandaro 2012a among many). Integrated financial supervisory authority has definitely been preferred by many countries. By the early 2000s the division of powers between a central bank with monetary policy and a financial stability supervisor (usually with consolidated responsibilities for banking, finance and insurance) was widely introduced in many countries. Modern design of central banking was characterized by eliminating supervising powers from central banks (see for example Eijffinger & Masicandaro 2011) and several indices measuring central bank independence that proliferated in the literature of the 1990s assigned greater degree of autonomy to the central bank if the bank had no responsibility to oversee banking sector.

Alongside the separation principle being advocated in literature, many authors, already in the 1990s, focused on the opposite, that is the benefits for monetary policy and the whole economic activity of keeping supervisory responsibilities at central banks. Former Federal Reserve Chairman Alan Greenspan advocated in 1994: “Joint responsibilities [monetary, supervisory and regulatory] make for better supervisory and monetary policy than would result from either a supervisor divorced

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8 Index of economic independence by Grilli et al. (1991) assumes assigning two points if central bank has no responsibility to oversee banking sector or one point if it shares this responsibility with other institution.
from economic responsibilities or a macroeconomic policymaker with no involvement in the review of individual banks’ operations” (Greenspan 1994).

June 1998 seems to be symbolic date in the financial supervisory worldwide (Masciandaro & Quintyn 2011). After this date the number of unified supervisory agencies has grown rapidly:

- in June 1998 the responsibility for banking supervision in the UK was transferred from the Bank of England to the newly established Financial Services Authority (FSA),
- the Scandinavian countries (Norway (1986), Iceland and Denmark (1988) and Sweden (1991) had preceded the UK and also established FSA for financial supervision,
- three old EU member states Austria (2002), Belgium (2004), and Germany (2002) have since assigned the task of supervising the entire financial system to a single authority other than the central bank,
- in Ireland (2003) and the Czech and Slovak Republic (2006) the supervisory responsibilities were concentrated in the hands of the central bank,
- five countries involved in the EU enlargement process Estonia (1999), Latvia (1998), Malta (2002), Hungary (2000) and Poland (2006) have also reformed their structures, concentrating all powers in a single authority,
- outside Europe unified agencies has been established in Kazakhstan, Korea, Japan and Nicaragua,
- Switzerland adopted a unified structure at the beginning of 2009.

Interestingly, there is a common feature of developed countries’ financial systems, which had not been hit by the global financial crisis, i.e. Canada, Australia, New Zealand, and Finland. All these countries have stable situation in relation to their supervisory arrangements for at least ten years before the global financial crisis, they did not introduce any significant changes in their supervisory structures. The consequences of the above mentioned tendency (or rather lack of tendency) might be the following:

- supervisory mandate was explicit and clear,
- decision-making process was rapid,
– the level of uncertainty in relation to the existence and working of regulatory and supervisory structures was low,
– policymakers have public support,
– communication was clear and reduce moral hazard.

The vertical (silos) model of supervision is characterized with a separate supervisory agency for each sector (for example different for insurance, banking or investment banks). In the horizontal (peaks) model every goal is supervised by a different authority, while the unified (integrated) model is characterized with a single authority to supervise a variety of institutions (see e.g. Taylor 1995, Masiandaro & Quintyn 2009, 2011, 2013).

The evolution in the supervisory regimes becomes clear if focusing only on those countries, which implemented reforms in the selected period. Figure 1 shows that the distribution of supervisory models has been relatively equal. In the period 1998-2008, forty per cent of 66 analyzed countries adopted an innovative unified supervisory regime; while the remaining sixty per cent chose a ‘conservative’ approach of a more traditional model (silos or hybrid) (Masiandaro & Quintyn 2011). Interestingly, not only the regime is different but also the role that a central bank plays in a supervision process. In countries with ‘conservative’ regimes the central bank is the main banking supervisor in almost all cases; while in unified regimes this role is delegated to a central bank only in a few cases (usually the sole supervisor is the institution other than a central bank).

Currently, especially in Europe, there is tendency to move towards “twin peaks” structure, which means that a central bank continues its major goal of price stability and bears greater responsibility for macro- and microprudential supervision⁹. The “twin peaks” structure with the central bank as the key financial market supervisor is being incorporated in a few European countries, already, in 2010, the Bank of England Act was amended and the key prudential functions of the Financial Services Authority were transferred to the Bank of England.

⁹ The Single Supervisory Mechanism in Europe is an example of such an organization.
Figure 1. Model of financial supervision regimes after the reforms (66 countries)

Source: Masiandaro & Quintyn 2011, p. 462.

Similarly in 2011, the new Banking Act in Germany dismantled the country’s unified financial supervisor (BAFIN) and delegated the main responsibility to the Bundesbank (Masiandaro 2012b). Analyzing institutional prudential and supervision structures in 98 high and middle income countries over the decade, Melecy & Podpiera (2013) find that integrated model of supervision appear more often in more developed, small open economies, as well as in more financially developed countries. Authors also find that greater degree of central bank independence could cause less integration of prudential supervision (Melecy & Podpiera 2013).

Any design of a financial supervision should ultimately lead to decreasing the probability of a crisis occurrence. This in turn is justified if it constrains distorting effects of monopoly power; protect ordinary people under information asymmetry; internalizes significant externalities (Brunnermeier 2009). These conditions stand in contrast to the still prevailing regulatory rules, which, as Brunnermeier (2009, p. 97) explains, encourage banks to grow even larger and become hugely interconnected. Blundell-Wignall and Atkinson (2008) phrase the search for next regulation underlying a different scope: when we consider the current crisis and the excess of public
money (taxpayers’ money) being used: “Can the effectiveness of markets as an allocator of capital amongst competing ends be relied upon in the future, when the trade-off between risk and return is now so asymmetric, and banks know they are too big to fail?”.

In one of their study, Barth, Caprio, Jr., & Levine (2001), using survey-based cross-country data on bank regulation and ownership, found that greater regulatory restrictions are positively related to higher probability of a country suffering a major banking crisis; and inversely related to banking sector efficiency. In general, authors, found no countervailing positive effects from restricting banking-sector activities. In fact, restrictions on the entry of bank and its activities hurt banking system performance. It has been emphasized (Dewatripont & Tirole 1994) that capital adequacy requirements have positive features, since capital works as a buffer against losses. Along with deposit insurance, they play a crucial role for bank owners and depositors and creditors. They do not, necessarily, imply reducing risk-taking incentives.

The major findings from a large cross-country database analysis, performed by Barth, Caprio, Jr. & Levine (2006b) are that it is difficult to find any connections between stricter capital requirements and better outcomes in the banking sector. Moreover, authors find that, in fact, stricter capital requirements lead to worse outcomes, with exceptions of very best institutional settings being present in a country. Therefore, the Basel 2 recommendations and its two pillars either, at best, do not harm the system, or actually may do some harm. Habbard, Coats & Watt (2011) explain that the Basel 2 Accord has been pro-cyclical, requiring less capital held by banks during a boom and more during stressed periods (more on pro-cyclicality of Basel 2 in Kashyap & Stein (2004); on mitigating this effect in Repullo, Saurina & Trucharte (2010)).

In the recent World Bank publication analyzing post-crisis development in supervisory regulations (Čihák et al. 2012) come to consensus that, until today, there is a lack of consistent information on the regulatory and supervisory approaches and the changes brought by the crisis. This come to a surprise, authors continue, as there

\[10\] Two pillars of Basel 2 are: minimum capital requirements and the supervisory review process (SRP).
has been high level of interest on the topic in the literature. Based on the World Bank 2011-12 Bank Regulation and Supervision Survey (BRSS)\(^{11}\) Čihák \textit{et al.} (2012) find significant differences between crisis and non-crisis countries in several aspects of regulation and supervision. Countries with mild effect of crisis had:

- stricter capital ratio requirements,
- stricter restrictions on non-bank activities, i.e. insurance or investment banking,
- more stringent regulations concerning the treatment of bad loans and loan losses,
- stronger incentives for the private sector to monitor banks’ risk.

When comparing pre- and post crisis regulation and supervision, Čihák \textit{et al.} (2012) conclude that the modifications in regulations were rather small. Similarly, using previous editions of the BRSS survey (Barth, Caprio & Levine 2008, Figure 2) conclude that many countries have followed Basel guidelines and strengthened their regulatory and supervisory frameworks between 1999-2005. However, authors indicate, these reforms were not likely to improve bank stability or efficiency. Čihák \textit{et al.} (2012) reports that while 80 percent of crisis countries introduced Tier 3 in regulatory capital, only 28 percent among non-crisis countries decided to do the same.

Post-crisis research concentrate on the issue of quality of financial regulation and supervision. However, it seems to be very difficult, or even impossible, to assess the quality of different regulatory frameworks around the world, operating in different institutional environments. Čihák & Tieman (2011) propose a broad survey of financial regulation quality by assessing the countries’ compliance with international standards\(^{12}\). The main findings of Čihák & Tieman (2011) research are:

1) on average, countries’ regulatory framework score one notch below full compliance with the standards,

2) per capita income is significantly linked to cross-country differences in regulatory regime,


\(^{12}\) The standards covered in research are the Basel Core Principles for Effective Banking Supervision, the Insurance Core Principles, Objectives and Principles of Security Regulation.
3) higher regulatory quality in the banking sector is correlated with better banking sector performance,

4) there are substantial differences in regulatory quality across countries and regions, some – but not all – can be explained by differences in economic development.

Although conclusions are important and might be used in assessing the practical implementation of regulation and supervision, the serious drawback is the background of methodology, which is built on the assumption that international standards are a good measure of regulatory and supervisory quality. International standards are evolving to take new challenges connected with the dynamics of financial system into account. However, these standards are usually changed on an ex-post basis (as a reaction to the financial or banking crisis).

The complicated nature of the US supervision structure can be a factor leading to the current crisis, as Dam (2010) reports. In the same paragraph, however, the author underlines the superiority of the integrated supervision in Germany, the country that also suffered from the crisis. Recent crisis has showed that balance sheets of leveraged financial institutions, such as banks, are an important transmission channel of financial contagion (Ahrend & Gourd 2011; Krugman 2008). Bank balance sheet contagion arises in the following cases (Ahrend & Goujard 2012):

- withdrawal of international funding due to a deteriorating risk profile of banks from a creditor country and the prudential rules such as capital adequacy,

- limits on loans to a country in response to suffering losses on loans in another country – “common-creditor transmission”.

Certain structural policies, regulating financial accounts of financial intermediaries may therefore also directly affect financial stability in situations of financial contagion. What kind of policies and to what extend can they affect financial stability is not entirely clear. Shimpalee & Breuer (2006) find strongest results regarding policies affecting corruption, a de facto fixed exchange rate regime and weak government stability to affect probability of occurrence of currency crisis. While, there is weak evidence that the removal of capital controls, lack of CBI and financial liberalization increase the risk of banking crises. Barth, Caprio & Levine (2008) find
that there is no robust evidence that stricter capital requirements contribute to greater banking sector stability and that stronger supervisory rules lead to worse outcomes, with an exception of very best institutional settings (Barth, Caprio & Levine 2008).

Using a panel of 184 developed and emerging economies from 1970 to 2009, using the empirical analysis, Ahrend & Gourd (2012) show that differentiated capital controls have an impact on contagion risk and by influencing the structure of external debt, they affect financial stability. On the other hand, policies leading to higher regulatory barriers to FDI and equity investment contribute to financial risk. Similarly, stricter domestic banking supervision appears to increase (short-term) borrowing from foreign banks, and at the same time reduce financial fragility overall (Ahrend & Goujard 2012).

1.3. Central bank policy and institutional framework – pre and post-crisis landscape

The institutional framework for central bank policy is evolving. Changes tend to occur after the most significant financial and economic crises. The period following the Great Depression saw a wave of state ownership of central banks (Capie et al. 1994, Elgie & Thompson 2002, Wood 2005), the period following the Great Inflation resulted in growing transparency and accountability of central bank policy (Capie et al. 1994, Elgie & Thompson 2002, Wood 2005). The global financial crisis will be another defining moment in the history of central banking.

Over the last several years many central banks have made significant strides towards greater accountability and transparency. Even though there is some disagreement how the accountability of central banks in their role of price stability should be arranged for, there is broad consensus that an independent central bank should be accountable. Greater accountability has run hand-in-hand with moves towards greater central bank independence (Fischer 1995, pp. 201-206, Eijffinger & Hoeberichts 2000, pp. 73-96, Wojtyna 2002, Lastra 2006). There is no one generally accepted definition of central bank accountability but, one can distinguish two separate dimensions of central bank accountability (Issing et al., 2001, p. 131):

– accountable for what?
accountable before whom?

The above distinction points out the need for precise definition of the central bank’s objectives and tasks and also necessity of setting up institutional relations and interdependence (between central bank, government, supervision authority, etc.). Additional crucial element of proper accountability arrangements relates to transparency. According to Cukierman (2001) both concepts should be even perceived as twin issue. Transparency is regarded as one of the tools of democratic accountability over the central bank (Eijffinger & Hoeberichts 2000). Although, it seems to be impossible to define the optimal level of central bank transparency, many researchers attempt to measure the current level of transparency and indicate current tendencies in this particular aspect of the central bank policy (Geraats 2001, Oosterloo, de Haan & Jong-A-Pin 2007, Dincer & Eichengreen 2009, Čihák et al. 2012).

Another important topic of modern central banking is credibility and reputation. Central bank credibility can be defined as a commitment to follow well-articulated and transparent rules and policy goals (Bordo & Siklos 2014). Cukierman (1986, p. 6) proposed more precise definition of credibility as “... extent to which the public believes that a shift in policy has taken place when, indeed, such a shift has actually occurred”. The second definition can be used in relation to evolving central bank policy regimes, although most of economists interpret credibility in terms of inflation performance (Bordo & Siklos 2014). It should be stressed that central banks’ policy credibility evolves in a non-linear manner, i.e. it is earned slowly but it is also susceptible to evaporate on a moment.

All these four qualitative aspects of central banks’ policy arrangement have been reinforced after the Great Inflation period, to increase effectiveness of monetary policy. But these aspects are also important from perspective of financial stability objective and in execution of macroprudential policy.

Communication during the recent crisis has been one of the important tools in restoring trust and certainty in the market. The pre-crisis increase in transparency in many central banks proves that institutions understand the importance of proper communicating of its policy. When central banks have finally learnt how and what
to inform the public about their actions, recent GFC force the banks to re-design their narrative structure. In result of recent events, Siklos (2014) suggests for central banks adopting a hybrid form of inflation and price level targeting together with a requirement that macroprudential regulators jointly communicate their will to act unanimously.

Just like the different has been approach to solving monetary and stability problems, including varying tools used since 2007, one can observe varying levels of information about these tools. In the end, market participants perceive communication, but also credibility of central banks in different ways.

Among key central banks worldwide that is the Federal Reserve System (Fed), the European Central Bank (ECB), the Bank of England (BoE) and the Bank of Japan (BoJ), the Fed is typically perceived as performing best in terms of communication and degree of credibility (Hayo & Neuenkirch 2014). The Fed is followed by the BoE, ECB and BoJ. Not all characteristics of transparency matter for financial stability; in fact, some information affecting positively price stability may actually increase financial instability.

Many tools used in communicating about price stability policy resulted in years of practice in achieving price stability. While some banks communicate in this matter better (FED) than others (ECB or BoJ) in general there is consensus that central bank transparency has increased in recent years. The challenges of GFC for monetary authorities, that is the necessity to use unconventional, unknown measures, which final outcome was different in varying countries (quantitative easing in US and Japan) required banks to find new ways of communication during the crisis. Communication about financial stability has been challenging for central banks (Born, Ehrmann & Fratzscher 2011a). Carney (2009), suggested that “an effective communications strategy for normal states may prove counterproductive in exuberant states”.

Market participants’ have especially expressed extreme views on communication and credibility during the crisis of the ECB. The supranational character of the ECB, while being a special feature of the bank, did not help to minimize uncertainty at the market. In general, however, higher quality of all central banks communica-
tion tends to increase the bank’s credibility, and improves the perceived success of unconventional policy tools (Hayo & Neuenkirch 2014)

In fact, Siklos (2015) argues that central bank communication has become a critical element of monetary policy after the financial crisis. Because defining financial stability is still a challenge, communicating about it is also troublesome. It is not enough to increase degree of transparency, it is also important how, and with what tools central banks inform about their actions\(^\text{13}\) (Siklos 2015).

During the GFC central bankers communicated in many different ways. It has now become a signature phrase of the ECB, who promised, “within [its] mandate, the ECB is ready to do whatever it takes to preserve the euro. And believe me, it will be enough” (Draghi 2012). Similarly, the Fed was announcing its quantitative easing without defining the final time span (only a tool, not how long).

According to BIS (1997) “Any pre-commitment to a particular course of action in support of a financial institution should be avoided by the authorities, who should retain discretion as to whether, when and under what conditions support would be provided.” Ambiguity regarding the actual intervention might be desirable either to avoid ‘imitation effect’ within the banking system or where, due to the bank’s size, the handling of an individual bank’s problem risks itself triggering systemic repercussions (Enoch, Stella & Khamis 1997). The downside of this discretion is that it places a large degree of discretion in the hands of the agency responsible for crisis management, as it can cause a time consistency problem: “while it is in the interest of the authorities to deny their willingness to provide a safety-net, ex post they may later find it optimal to intervene.” Lack of transparency enables them to avoid justification why they treat institutions differently, in generally perceived similar situations.

According to Schwartz (1986), all, important financial crises in the United States and the United Kingdom occurred because the monetary authorities did not clearly indicate their readiness in providing necessary liquidity.

\(^{13}\) Siklos (2014) writes that it is not enough to communicate more, but the content is as important.
Table 2. Diagnosis of pre-crisis and post-crisis landscape of central banking

<table>
<thead>
<tr>
<th>Pre-crisis consensus</th>
<th>Post-crisis landscape</th>
</tr>
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<tbody>
<tr>
<td>Neat separation between monetary and financial stability functions. Central banks as an ultimate source of liquidity have the classical lender of last resort role, but there was intellectual permission for decoupling of the two functions in crisis management process: monetary policy for prices stability goal, while regulation and supervision for financial stability goal.</td>
<td>There is no agreement on whether or how far monetary policy regimes should be adjusted to lean against the build-up of financial imbalances. One view is that monetary policy regime should focus on price stability and financial stability is best ensured through the established macroprudential framework, and central banks are not exposed to the risk of losing credibility (Bernanke 2009, Blanchard, Dell’Ariccia, Mauro 2010, Bean 2010, 2011). Another view is that macroprudential framework might not be sufficient, and central banks through the monetary policy should play active role in stabilizing the financial system (Cechetti et al. 2000, Borio &amp; Lowe 2002, Papademos &amp; Stark 2010).</td>
</tr>
<tr>
<td>Prices stability is sufficient for macroeconomic stability (i.e. price stability is the best monetary policy contribution to macroeconomic stability) – canonical macroeconomic models with the primary role of price rigidities(^{14}) as a form of departure from a fully equilibrating and well-functioning economy (Woodford 2003, Walsh 2010).</td>
<td>It is agreed that ‘cleaning’ the debris of financial crisis through monetary policy is costly and that interest rate policy is not enough. Central banks have introduced additional tools to influence longer-term interest rate and financial conditions, such as credit term and credit spread through so-called unconventional or balance-sheet policy(^{15}) (Bini-Smith 2009, Borio &amp; Disyatat 2010, Cudia &amp; Woodford 2010, Matysek-Jędrzejc 2013).</td>
</tr>
<tr>
<td>Short-term interest rate was sufficient to capture the impact of monetary policy on the economy. This was reinforced by the belief that central banks would not have to drive policy rates to zero in nominal terms(^{16}).</td>
<td>There is a broad consensus that financial regulation and supervision needs go beyond a microprudential perspective and adopt broad, macroprudential orientation. It is also widely believed that central banks should play a key role in the macroprudential policy.</td>
</tr>
<tr>
<td>The specific version of the ‘keep-your-house-in-order’ doctrine, which is analogues to the reasoning behind the microprudential approach: when each country on a stand-alone basis is sound, the world will be sound, as well. In a consequence, all central banks did everything to ensure price stability in their own economy.</td>
<td>There is general agreement that low and stable inflation does not guarantee financial and macroeconomic stability. The sources of global financial crisis emerged during the Great Moderation era.</td>
</tr>
<tr>
<td>There is no agreement on the primary tool of monetary in the aftermath of global financial crisis: interest rate or balance-sheet policy. One view is that policy should be accommodative as possible. Another view is highlights the collateral damage of such an accommodative policy kept beyond the crisis management phase (Borio &amp; Disyatat 2010, Hannoun 2010).</td>
<td></td>
</tr>
</tbody>
</table>

Source: Authors’ compilation on Borio 2011, Eichengreen et al. 2011.

\(^{14}\) The models allowed for other frictions, such as real wage rigidity (Blanchard & Gali 2010) and financial rigidities (Bernanke, Gertler & Gilchrist 1999), but these two played a secondary role.


\(^{16}\) The Japanese experience – although a long-term one – was treat as an aberration and the result of the policy mismanagement (Ahearne et al. 2002).
Although, central banks seem to be winners among policy institutions in the face of global financial crisis (internationally coordinated actions of liquidity support, interest rate cuts, and prevention the financial system from explosion), the crisis has shaken the fundamentals of the central banking world. Borio (2011) diagnoses pre and post-crisis landscape of central banking (Table 2).

Global financial crisis has significantly affected another aspect of central banking institutional arrangements, i.e. relations between central bank and government. Balance-sheet policies introduced by many central banks inevitably blur the line between monetary policy and fiscal policy. The independence of central banks is likely to come under growing pressure. Operational independence is necessary for macroprudential authorities, and central banks are indicated by many economists (Brunnermeier et al. 2009, Group of Twenty 2009, Blinder 2010, Feldstein 2010, Borio 2011, Caruna & Cohen 2014) as institutions, which play a key role in macroprudential policy. The political economy pressure might be low in the context of monetary stability, but it might be much stronger when financial booms are underway. This implies that there is and should be a clear distinction between governance arrangements for crisis prevention (where the autonomy of institutions in charge of macroprudential decisions is critical) and crisis management (where the role of government is inevitable).

The above mentioned political pressure on central bank policy can be reduced by designing the macroprudential policy of central bank by developing rules as far as possible. Rules – comparing to discretion – do not require continuous justification of decision. If well structured, rules can thus act as automatic stabilizers, they can also act as effective pre-commitment devices, especially in the time dimension of systemic risk management (Borio 2007, Reinhart & Rogoff 2009).
Table 3. Discussion on central banks’ prominent role in macroprudential policy

<table>
<thead>
<tr>
<th>ARGUMENTS FOR</th>
<th>ARGUMENTS AGAINST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effect of synergy and a more effective conduct of monetary policy as a result of combining financial supervision with monetary policy (Borio 2009)</td>
<td>Assigning macroprudential supervision to central banks may lead to conflict among different objectives (Goodhart &amp; Shoenmaker 2005, De Grauwe &amp; Gros 2009, Caruna &amp; Cohen 2014)</td>
</tr>
<tr>
<td>It may be usefully to connect macroprudential supervision with the central banks’ lender of last resort function (Blinder 2010)</td>
<td>Lack of effectiveness in macroprudential tasks may be costly for the reputation of central bank (Goodhart 2002)</td>
</tr>
<tr>
<td>Central banks could benefit from incorporating systemic risk considerations in the monetary policy process as far as the costs of asset price bubbles are concerned (Feldstein 2010)</td>
<td></td>
</tr>
<tr>
<td>Central banks have independence from political authorities along with arrangements to ensure public accountability. CB have experience and expertise in measuring and monitoring both business and financial cycles (Caruna &amp; Cohen 2014)</td>
<td></td>
</tr>
</tbody>
</table>

Source: Authors’ compilation.

Another issue related to the central bank policy and its institutional framework, which is widely discussed by economists and politicians relates to the role of central banks in macroprudential policy. Several arguments have been put for and against central bank involvement in macroprudential supervision (Table 3 and section 1.4).

1.4. Macroprudential approach

Macroprudential policy focuses on how collective behavior of banks increases riskiness of the whole financial system. It describes interaction between prudential policy and the economy. To define the micro- and macroprudential regulations, it is best to show how these perspectives differ in terms of objectives and the model used to describe risk (Borio 2003).

The primary objective of the macroprudential policy is to limit the risk of financial system, and connected with it losses of the real output. The pre-crisis literature, for example Borio (2003), suggests strengthening macroprudential orientation of the regulatory and supervisory framework. An alternative view of the goal is that macroprudential policy seeks to limit the risk of episodes of system-wide distress, which lead to significant macroeconomic loss (Borio & Drehmann 2009). Underlying the role of macroprudential policy for the stability of the whole financial system, Caruana (2010) explains this goal as reducing systemic risk by “explicitly address-
ing the interlinkages between, and common exposures of, all financial institutions, and the procyclicality of the financial system”.

Table 4. The macro- and microprudential perspective compared

<table>
<thead>
<tr>
<th>Features</th>
<th>MACROPRUDENTIAL</th>
<th>MICROPRUDENTIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proximate objective</td>
<td>limit financial system-wide distress</td>
<td>limit distress of individual institutions</td>
</tr>
<tr>
<td>Ultimate objective</td>
<td>avoid output (GDP) costs</td>
<td>consumer (investor/depositor) protection</td>
</tr>
<tr>
<td>Model of risk</td>
<td>(in part) endogenous</td>
<td>exogenous</td>
</tr>
<tr>
<td>Correlations and common exposures</td>
<td>important</td>
<td>irrelevant</td>
</tr>
<tr>
<td>across institutions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calibration of prudential controls</td>
<td>in terms of system-wide distress; top-down</td>
<td>in terms of risks of individual institutions; bottom-up</td>
</tr>
</tbody>
</table>

Source: Borio 2003

The prudential standards should be calibrated with respect to the marginal contribution of an institution to system-wide macro risk. The approach would make an explicit distinction between the “systematic risk” (common exposure) charge and the “idiosyncratic risk” charge (Borio 2003, p. 14).

One difficulty with identifying MPIs for use in surveillance work is that the research conducted so far has not produced a consensus on a core set of indicators. This is, in part, because different indicators may be relevant in different circumstances (Evans et al. 2000). Use of a single composite indicator, however, would be overly simplistic and could be misleading.

Existing international experience suggests there are differences in practice and the scope of macroprudential mandates (Haldane 2013). But these differences are not likely to be eliminated since the macroprudential policy framework depends on several factors like availability of resources to invest in technical know-how; the monetary policy regime and degree of monetary independence; the size and complexity of financial system; or already existing institutional structures among other (Nier et al. 2011). To fulfill macroprudential goal of protecting the financial system from swings, U.S. banks have been tested by the stress-tests to study the implications of a severe macroeconomic downturn for U.S. banks’ financial resilience.
On the other hand, to realize another goal of macroprudential policy that is protecting the real economy from swings and cycles, the Bank of England’s Financial Stability Committee has been equipped with statutory mandate to care about output and employment stabilization (as a secondary objective). In fact, the type of monetary and fiscal policy adapted in a country is also decisive on the shape of macroprudential tools and policy. Table 5 presents a set of varying tools fulfilling the general goal of fostering financial stability.

**Table 5. Alternative sets of tools to foster financial stability**

<table>
<thead>
<tr>
<th>Tool set</th>
<th>Goal</th>
<th>Instruments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prudential policy: microprudential</td>
<td>limit distress of individual institutions</td>
<td>quality/ quantity control, leverage ratio</td>
</tr>
<tr>
<td>Prudential policy: macroprudential</td>
<td>limit financial system-wide distress</td>
<td>countercyclical capital charges</td>
</tr>
<tr>
<td>Monetary policy</td>
<td>price stability</td>
<td>policy rate, standards repos</td>
</tr>
<tr>
<td></td>
<td>liquidity management</td>
<td>collateral policies, interest on reserve, policy corridors</td>
</tr>
<tr>
<td></td>
<td>lean against financial imbalances</td>
<td>policy rate, reserve requirements, mop-up of liquidity, FX reserve buffers</td>
</tr>
<tr>
<td>Fiscal policy</td>
<td>manage aggregate demand</td>
<td>taxes, automatic stabilizers, discretionary countercyclical measures</td>
</tr>
<tr>
<td></td>
<td>build fiscal buffers in good times</td>
<td>measures to reduce debt levels, taxes/levies on the financial system</td>
</tr>
<tr>
<td>Capital controls</td>
<td>limit system-wide currency mismatches</td>
<td>limits on open foreign exchange positions, constraints on the type of foreign currency assets</td>
</tr>
<tr>
<td>Infrastructure policies</td>
<td>strengthen the resilience of the infrastructure of the financial system</td>
<td>move derivative trading on exchange</td>
</tr>
</tbody>
</table>

Source: Galati and Moessner (2011) and Hannoun (2010)

The interconnectedness of policies indicates that macroprudential and supervisory bodies cannot work in isolation from other macroeconomic policies. The effectiveness of supervisory and regulatory framework will not only be dependent on its institutional structure, but also on the interactions among other governmental institutions. Hence, it can be very country-specific. These country-specific differences are seen while comparing tools used within macroprudential policies during the current crisis (for a survey see for example Lim et al. 2011). A number of countries (both
advanced and emerging) have used LTV (loan-to-value) instruments, others introduced methods of increasing the risk awareness or improving the risk bearing capacities (Austria), liquidity impositions (France), or introducing of a liquidity mismatch raise (New Zealand) (Lim et al. 2011).

Another characteristic feature of macroprudential policy, also the one differentiating it from monetary policy, is regional orientation. While a central bank sets one interest rate for the whole area of common currency, macroprudential tools can be targeted at particular regions or cities or loan types (Haldane 2013). Because of their distributional impact, these policies may raise questions about appropriate governance and democratic accountability.

The after-crisis literature has proliferated with analysis of the macroprudential policy. This shift in interest has been justified with the necessity to address the externalities of one bank being in distress. De Nicolo Favara, & Ratnovski (2012) explain the existence of three types of externalities leading to systemic risk. The first one relates to strategic interactions among banks and other financial institutions, which may lead to the build-up of vulnerabilities during the expansion. Externalities related to fire sales (a generalized sell-off of financial assets) may also occur, which cause a decline in asset prices and a deterioration of the balance sheets of institutions. Finally, externalities originating from interconnectedness may lead to a domino effect (De Nicolo, Favara, & Ratnovski 2012).

International coordination of macroprudential policies is not justified if small countries use prudential capital controls to redress domestic externalities (Korinek 2012). Bangui (2012) shows that the uncooperative equilibrium between national regulators is inefficient, as national regulators do not absorb the benefits of their country’s provision of liquidity to the rest of the world (Jeanne 2013). Redistribution of macroprudential responsibilities among many institutions in a country has negative impact on the efficiency and clarity of communication about this policy.

Table 6 summarizes recommendations for structuring the macroeconomic policy. All authors pay attention to the central banks’ prominent role in macroprudential policy, all of them stress the need for operational independence and clear and consistent mandate for macroprudential policy.
**Table 6. Selected recommendation for structuring macroprudential policy**

<table>
<thead>
<tr>
<th>Authors</th>
<th>Recommendations for institutional design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Borio 2010</td>
<td>Given their expertise, central banks should play a key role in macroprudential policy. Operational independence for crisis prevention should be assured, while recognizing that the government will inevitably have to be closely involved at the crisis management stage. Mandates should be consistent with the tools available to the authorities, erring on the side of caution.</td>
</tr>
<tr>
<td>IMF 2011</td>
<td>A macroprudential authority should be identified. It should have a clear mandate and objectives, and should be given adequate powers, matched with strong accountability. Its powers should encompass collection of information, establishing the perimeter of reporting and regulation, and activation—as well as calibration—of instruments under its direct control. The central bank should be given a prominent role in macroprudential policymaking. To ensure effective coordination and cooperation across policies in addressing systemic risks, a body or other formal mechanism should be in place to ensure consistency across the relevant policies.</td>
</tr>
<tr>
<td>Nier et al. 2011</td>
<td>The central bank should play an important role in macroprudential policymaking. Complex and fragmented regulatory structures are unlikely to be conducive to successful mitigation of systemic risk and should therefore be avoided. Participation of the treasury in the policy process is useful, but a leading role poses risks. Systemic risk prevention and crisis management are different policy functions that should be supported by separate organizational arrangements. Macropoprudential policy frameworks should not become a vehicle to compromise the autonomy of other established policies. Arrangements need to take account of country-specific circumstances.</td>
</tr>
<tr>
<td>Knot 2014</td>
<td>A clear objective is a necessary requirement for effective policy. Legislation should be clear about who is responsible for macroprudential policy, and should assign this authority specific tasks and adequate powers. The governance framework should also reflect the systems’ wide nature of macroprudential policy (a leading role of central banks in macroprudential policy because of their expertise and their existing responsibilities in the area of financial stability)</td>
</tr>
</tbody>
</table>

Source: Authors’ compilation.

Over the past years, many countries have recognized the importance of a strong governance framework, and have implemented specific macroprudential mandates. The European Union experiences with structuring macroprudential policy differ across countries (Table 7).
Table 7. Macroprudential authorities in the European Union

<table>
<thead>
<tr>
<th>Macroprudential authority</th>
<th>Belgium, Cyprus, Czech Republic, Estonia, Greece, Hungary, Ireland, Portugal, Slovakia, United Kingdom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central bank</td>
<td></td>
</tr>
<tr>
<td>Supervisor</td>
<td>Finland, Sweden</td>
</tr>
<tr>
<td>Government</td>
<td>Norway</td>
</tr>
<tr>
<td>Board</td>
<td>Austria, Bulgaria, Croatia, Denmark, France, Germany, Italy, Luxembourg, Netherlands, Poland, Romania, Slovenia, Spain</td>
</tr>
<tr>
<td>Board chaired by:</td>
<td></td>
</tr>
<tr>
<td>Central bank</td>
<td>Croatia, Denmark, Italy, Netherlands, Poland, Romania, Slovenia, Spain</td>
</tr>
<tr>
<td>Supervisor</td>
<td>-</td>
</tr>
<tr>
<td>Government</td>
<td>Austria, Bulgaria, France, Germany, Luxembourg</td>
</tr>
</tbody>
</table>

Source: Knot (2014).

In European Union Member States two models stand out: macroprudential mandates have been assigned either to a board, consisting of the relevant authorities, or to the central bank. Both models have advantages and disadvantages (Nier et al. 2011, Knot 2014) and we need time to assess the effectiveness of a chosen model.

1.5. Optimal design of safety net

The narrow definition of financial safety net is limited to the deposit insurance and a lender-of-last-resort function. A more widely definition includes other interactive elements, i.e. prudential regulatory and supervisory framework as well as failure resolution (comprehensive analysis of resolution process can be found in Szczepeńska, Dobrzyńska & Zdanowicz 2015) and the two above mentioned components (Financial Stability Forum 2001).

Each of the elements presented in Figure 2 faces a similar trade-off. First, these elements are designed and implemented to reduce the disruptions in the financial system stemming from bank failures. Second, they have to be designed in a way that reduce moral hazard risk that otherwise can result in the same fragility that the financial safety net is supposed to minimize (Schich 2008). Design of financial safety net differs across countries and most of arrangements are consequence of some national, internal decisions and past experience.
Figure 2. Elements of financial safety net and interrelations between them


Analyzing financial safety net from functional perspective, Kane (2000) defines it as a process of incurring monitoring costs and penalizing to some degree fraudulent and corrupt behavior in financial and government transactions. Financial safety nets, Kane continues, serve not only as a protection but also as encouragement for individual institutions to accept the risks associated with funding economically productive activities. Another role of safety nets is to guard against excessive risk-taking. This definition of safety net treats it as a multidimensional policy scheme balancing the costs and benefits originated from (Kane 2000):

1) protecting bank customers from unexpected bank insolvencies,
2) limiting aggressive risk-taking by banks,
3) preventing and controlling damage from bank runs,
4) detecting and resolving insolvent banks,
5) allocating across society whatever losses occur when an insolvent bank,
6) is closed.

Another understanding of safety net is a combination of regulatory officials and bank stakeholders connected by mutually reinforcing contracts (Kane 2000). In this scheme, top regulators must be hold accountable for measuring and managing
the social costs and risk-taking incentives generated by their decisions about the net’s various design features. Because even best-designed safety net would eventually fracture, authorities must additionally develop and review strategic plans for managing financial crises.

Safety net, according to Kane (2000), is a five-party contract between bankers, borrowers, depositors, safety-net managers and safety-net owners (principally healthy banks and taxpayers). Safety-net managers need to have expertise in six categories of regulatory instruments (Kane 2000):

− record-keeping and disclosure requirements,
− activity limitations,
− capital, loss-reserving, and other position limits,
− takeover rights and other enforcement powers,
− lines of credit,
− performance guarantees.

The three longest standing safety net elements are liquidity insurance, deposit insurance and capital insurance (Alessandri & Haldane 2009). Safety nets are also, as Kane (2014) argues, implicit contracts that offer loss-absorbing equity capital from taxpayers. They create an unsustainable disequilibrium between taxpayer and corporate property rights in firms, which are difficult to fail and unwind. Safety net – deposit insurance rationale – the socially optimal probability of bank failures is not zero (de Bandt & Hartmann 2002).

The ideal or optimal safety net must adapt promptly to changes in the market, legal, bureaucratic, and ethical/cultural problems the net is intended to alleviate (Kane 2000).

The safety net represent often the type of financial policy is being conducted in a country and reflect pursuing goals of this policy, rather than supporting financial stability (Schich & Kim 2011). Schich & Kim (2011) claim that the final effect of the safety net in terms of protection and risk-sharing is uncertain, while Calomiris (1999) argues that bank safety nets may in fact have destabilizing influence. The government protection of bank debts may encourage these banks to undertake excessive risk. De Bandt and Hartmann (2000, p. 260) argue: “It is now widely recog-
nized that public and private safety nets, whether they take the form of deposit insurance or lender of last resort facilities, bear the risk of creating moral hazard”. For example, if deposit insurance premiums do not reflect the banks’ relative portfolio risks, then the protection may incite the insured to take on higher risks. Also large banks with substantial clearing may create systems too big to fail or too sophisticated to fail. Such effects may be countered by very effective financial regulation and prudential supervision. But if the measures to control moral hazard are not successful, then the insured institutions could become more vulnerable to adverse shocks, so that the likelihood of propagation across institutions may rise as well (de Bandt & Hartmann 2002).

The theoretical literature is unambiguous in that the public safety net – providing assistance to banks in distress and protecting banks’ claim-holder from losses – increases the propensity by bank managers to take on excessive risk, i.e. the moral hazard issue (Boot & Greenbaum 1993, Dewatripont & Tirole 1993, Matutes & Vives 1995, Freixas & Rochet 1997). The problem of moral hazard is especially probable when safety-net is ill-designed. Safety net can be ill-designed simply when it is expanded without limits and thus, Schich & Kim (2011) argue, it can become very thin.

Deposit insurance institutions’ objective is to protect household savings in banks (i.e. the primary purpose is to prevent open runs on bank deposits). Although, the advantages and disadvantages of these institutions were and still are under discussion (Garcia 1999, Ketcha 1999, Gropp & Vesala 2004, Kahn & Santos 2005), many countries authorities reacted to the Global Financial Crisis by expanding the coverage of existing deposit insurance arrangements or adopting explicit deposit insurance where it was not already in place (e.g. Australia 2008)\(^\text{17}\).

\(^{17}\) The deposit insurance cost to taxpayers of the US savings and loan debacle exceeded in real magnitude the losses of all failed banks during the Great Depression, the event that had spurred the creation of deposit insurance (Calomiris & White 1994). The cost of bailing out Venezuelan banks in the early 1990s reached 16% of its GDP. The costs of earlier bailouts, normalized by GDP, have been large in many other countries: in Mauritania 15%, in Hungary 10%, in Finland 8%, in Ghana 6%, in Norway 4.5% and in Sweden 4% (Baer & Klingebiel 1995). The crises of the mid-to-late 1990s are turning out to be even costlier. The bailout costs for Thailand, Indonesia, Korea and Japan currently are estimated at between 20% and 50% of GDP.
Bank failure resolution – as well as other elements of financial safety net – has, from theoretical perspective, two conflicting policy objectives. First, it has the task of minimizing the disruption and cost of failing bank. Second, the incentive-compatible design of bank resolution is important to minimize aggressive risk-taking by banks (Beck 2003).

The European regulators went a step forward and broadly define the resolution objectives as (Directive 2014/59/EU):

- to ensure the continuity of critical functions,
- to avoid a significant adverse effect on the financial system,
- to protect public funds by minimizing reliance on extraordinary public financial support,
- to protect depositors,
- to protect client funds and client assets.

The above mentioned resolution objectives were supplemented by set of general principles, needed to be implemented during the resolution action (see more Art. 34 of Directive 2014/59/EU). These principles relates to different players of the resolution process (i.e. shareholders, management of the bank, depositors, creditors).

Foundations of successful resolution scheme lay in early recognition and intervention. Borio, Vane and von Peter (2010) explain that there is a general tendency to postpone recognition of the problem, both among bank managers and policymakers. This can lead financial sector to absorb an excessive amount of resources and misallocating them. In result, the cost to taxpayers grows, as well. Early recognition and intervention is supported with proper institutions, for example a special resolution regime for banks.

Both elements i.e. deposit insurance scheme and bank failure resolution are important in minimizing the risk of financial fragility, mainly through their profound impact on market discipline. What is also important, there is a synergy between these two elements, the proper functioning of one, depends on the proper functioning on the other.

Calomiris & Wilson (1998) argue that absent government assistance depositors require banks to limit default risk and to maintain a sufficient capital buffer. In
the event of adverse shock, a bank will often choose to contract the supply of credit. Safety net assistance to banks (either in the form of deposit insurance or bank recapitalization) insulates bank credit supply from the effects of adverse shock to bank capital, either by removing the constraint of low default risk on deposits or by replacing lost capital.

Similarly, Borio (2014) argues that the existence of a safety net leads to perceptions of official support in the event individual institutions, or the financial system as a whole, runs into trouble. The more liberalized financial system is, the weaker financial constraints, the greater possibility of such financial imbalances to occur. The official support can increase, what Borio calls, “the excess financial elasticity”, that is system’s inability to prevent the build-up of financial imbalances and lead to serious financial crises.

The structure of bank’s balance sheet makes banks vulnerable, not only to risks they actually take, but to incorrect (but rational) perceptions about those risks. Banks limit information about their health (delegated monitors) and suffer from a possible unwarranted run on solvent bank. The bank safety net makes runs less likely and limits the costs of runs. Uninformed depositors, having deposit insurance will have little incentive to run their banks in response to adverse news (Calomiris 1999).

According to Calomiris (1999) the public policy motivations behind the safety net can be divided into two categories. First, it may be desirable to assist distressed banks because of the social costs to bank borrowers of the decline in bank lending. Second, the safety net is designed to promote the efficiency of the banking system by limiting endogenous declines in the banking sector (avoidable disintermediation and bank failures that are attributable to asymmetric information and bank runs). The protection of private savings is another argument sometimes invoked to motivate the bank safety net, but this view is not defensible. One version of that argument emphasizes the lack of sophistication of small savers, and hence the desirability of creating a clearly riskless depository account. But deposit insurance is not necessary to provide a transparently riskless deposit opportunity for small (or large) savers.
Calomiris (1999) claims that the government safety net tends to produce net costs, not benefits, and the record of private alternatives to the safety net is much more favorable than is generally recognized. Private safety nets are private mutual-protection arrangements and “government” deposit insurance schemes that force banks to collectively bear much of the regulatory responsibility and risk of loss from insuring their fellow banks. They have shown themselves capable of limiting the potential for runs on solvent banks.

Moreover, the regulators and politicians have little incentive to monitor and enforce prudential guidelines, while bankers have strong incentives to take advantage of the lack of discipline. Borio (2013) suggests building up buffers during financial booms to create the necessary policy room for maneuver to address the bust. Prudential policy therefore should strengthen its macroprudential (systemic) orientation based on a sound microprudential foundation. Monetary policy should lean against the buildup of financial imbalances even if near-term inflation remains low and stable.

The safety net cannot be expanded without limits, argue Schich & Kim (2011), because the wider the net is the thinner it becomes. The optimal design of country’s safety net is its contracting environment, explains Kane (2000). The author’s basic message is that optimal regulation is not a one-size-fits-all proposition. Countries differ in the transparency and deterrence that banks afford their depositors. The optimal safety net depends on the ability of private and public sectors to value banks, discipline risk-taking, and to resolve financial difficulties promptly. Paradoxically, author explains, the more solid safety net, the less frequent but more devastating crises occur. The more effective safety net has a consequence in a less experienced in crisis management personnel.

Kane (2014) suggests reforming the current safety net designs by improving the accounting framework leading to strengthening examiners’ incentives to publicize and punish expropriation when they see it.

Imperfect transparency of financial institutions, Kane (2000) explains, allows individual bank an opportunity to gamble for resurrection at taxpayer and competitor expense, thus delaying regulators insolvency resolution. Maximal transparency de-
Scribes a framework of disclosure that would perfectly and without cost inform depositors about changes in bank performance and risk-taking activities. In this framework, establishing a team of centralized monitors and enforcers would be useless since depositors would possess sufficient expertise to deter bank failures. Therefore, Kane continues, the greater maximal transparency and maximal deterrence, the smaller benefits from a safety net. Otherwise, the existence of safety net is explained with difficulties of contract enforcement: blockages in information flows; differences in monitoring costs; variation in financial transaction costs; delays in appreciating and processing relevant information; and the costliness and inadequacy of the deterrent remedies that individual depositors have available to them (Kane, 2000). Because safety-net design must be environment-specific, also information systems and supervisory technology should be made transparent at least to outside experts and regulatory discipline should mimic specific market procedures (Kane, 2000).

Kane (2000) argues that also transparency of safety net is country-specific. Transparency (T) is a function of accounting integrity (AI), ethical norms (EN), press freedom (PF), and the quality and credibility of compensating restraints regulators place on financial transactions (R). No existing data set specifically documents cross-country differences in the design of financial safety nets, nor differences in the informational and contracting environments of individual countries (Kane 2001).

Lamfalussy (2000, p. 140) added “If such developments can take place in the model market of the world, what is the practical value of recommending that emerging markets copy this model?”

The greatest danger for supervision is that it will follow an unworkable, for this country, model suggested by general international standards. These recommendations, derived from advanced countries, represent a system with little or no empirical evidence (Barth, Caprio, Jr. & Levine 2006a).

Attempting at strengthening of democratic institutions or degree of transparency in supervisory system, further authors argue, may not be successful if central banks with supervisory powers adopt a model that is unworkable. Government restrictions in the form of too strict financial rules participation may decrease competi-
tion and innovation in financial markets (Gourinchas & Obstfeld 2012). In results, authors continue, the financial market is underdeveloped and limits the economy’s ability to absorb economic shocks.
2. Hypotheses

From the above literature review and observation of current economic and financial situation in different countries, the formulation of the following hypotheses seems reasonable:

*Hypothesis 1:*

Countries, which have introduced financial safety net institutional arrangements in central banks early enough (ex ante toward the Global Financial Crisis), to a lesser extent have suffered during the recent crisis.

According to the rational expectation theory (Muth 1961, Sargent & Wallace 1976), experiences connected with “learning mechanism” (Marcent & Sargent 1989, Evans & Honkapohja 2001), allow subjects to eliminate potential disequilibrium from individuals future behavior. Therefore we assume that countries, which have experienced large shocks to their economies, recessions or even crises in the near past, have corrected their supervisory and regulatory frameworks and succeeded in decreasing negative effects of the current crisis (for example Nordic countries). At the same time, examples of New Zealand and Canada prove that improvements in institutional design of the financial safety net made during normal and stable times lead countries to be immune from the current crisis (Haltom 2013, Bordo, Redish, Rockoff 2011).

*Hypothesis 2:*

Identification of the range (small versus large) and the method (formal versus informal) of a central bank's macro-prudential policy before the global crisis were crucial factors helping to minimize vulnerability of the financial system to the effects of this crisis.

The ‘post-crisis’ literature (Milne 2009, Lim *et al.* 2011, Nier *et al.* 2011) has underlined that central bank's responsibility for macro-prudential policy has been crucial for maintaining financial stability. Verification of hypothesis 2 will help to vindicate and supplement these conclusions with empirical analysis.
Hypothesis 3:
Ex ante, precise and unambiguous communication of central bank’s role in the process of financial market stabilization and high transparency of central bank’s policy during the crisis allowed for better absorption of shocks caused by financial crisis.

The key argument explaining increased intensification of central bank’s communication with markets has been desire to avoid potential crisis (Andersson 2008). Following Sweden, many other central banks increased their transparency in area of monetary and macro-prudential policy (Blinder et al. 2008). Empirical verification of potential benefits is so far inconclusive. The post-crisis literature question positive effect of communication on welfare (James & Lawler 2011) and point out that it leads to greater markets instabilities during the crisis (Horvath & Vasko 2013).

Hypothesis 4:
Including elements of independence, transparency and accountability, while designing institutions of the financial safety net improves effectiveness of this net. This is especially important in relations between a central bank and a government, as well as in aiming at decreasing the procyclicality in the financial system.

Qualitative aspects of institutional arrangements for financial safety net have been reinforced by the theoretical concept of political cycle and Public Choice (Wojtyna 1998), as well as rational expectation theory (Kowalski 2001).
3. Characteristics of the financial safety net – comparative study

Optimal design of supervisory system in the post-crisis perspective requires identifying elements that failed in helping predicting current slowdown, and those that directly or indirectly affected vulnerability of financial markets. Both tasks appear to be challenging.

Macroprudential policy, though present in many countries for years, has focused attention of economists and policymakers especially in the recent years, in result of the burst of financial crisis in 2008. One difficulty with identifying MPIs for use in surveillance work is that the research conducted so far has not produced a consensus on a core set of indicators. This is because different indicators may be relevant in different circumstances (Evans et al. 2000) Therefore, the data set describing instruments of macroprudential policy has some limits. First, the presence of such instruments is not recorded for many countries until 2007-2008. Second, once introduced, variability among countries is rather small. This may limit the degree of confidence in the statistical analysis. Finally, since our goal is not to analyze effectiveness of macroprudential policy after the crisis, but its ability to avoid large costs when the crisis started, the analysis period turns to be very limited.

For this reason, we have not limited our data set only for typically defined instruments (see for example Berntsson & Molin 2012) and for cases when such instruments were used (Lim et al. 2011 and recently Cerutti, Claessens, & Laeven 2015 among many). Our value-added is including a wide set of safety net characteristics retrieved from World Bank Banking Supervision Survey, performed on a regular basis since 2000.

Majority of analysis published recently include data set also for the post-crisis development. This way, their assessment of macroprudential instruments involves reaction to the burst of crisis. Since we include for the analysis data preceding the crisis and differentiate periods before and after, our value added is also assessment of effectiveness of these instruments in preventing the crisis.
3.1. Countries in sample

The post-crisis literature has been concerned with large sample of countries, including developed and developing states together. This cross-sectional framework typically is made under assumption of homogeneity despite the fact that large samples of more than 100 countries are likely to form a heterogeneous group. At the same time, studies focusing on advanced countries may suffer from invariant data and lack of crisis-event in the data set\(^8\).

Uneven occurrence of recent financial crisis across developed countries (with Australia, Canada or Finland not reporting significant losses or losses at all) constitutes our justification for focusing on quite homogenous group of OECD countries. Knowing that there is variability in crisis costs, our results are not biased towards effects drawn by emerging or developing states. Data is therefore collected for 34 OECD countries (Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, South Korea, Luxemburg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, Great Britain, United States).\(^9\)

### Table 8a. Country classification based on experiencing banking crisis in 2008

<table>
<thead>
<tr>
<th>Banking crisis</th>
<th>Borderline systemic crisis</th>
<th>Non-crisis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria, Belgium, Denmark, Germany, Iceland, Ireland, Luxemburg, Netherlands, United Kingdom, United States</td>
<td>France, Greece, Hungary, Italy, Portugal, Slovenia, Spain, Sweden, Switzerland</td>
<td>Australia, Canada, Chile, Czech Republic, Estonia, Finland, Israel, Japan, Korea, Mexico, New Zealand, Poland, Slovak Republic, Turkey</td>
</tr>
</tbody>
</table>

Notes:
Based on information from Laeven and Valencia (2012), World Bank (2014). Green (yellow) color indicate countries that experienced severe (mild) banking/ financial/ housing crisis after 1990 and before 2008 (Reinhart & Rogoff 2009, Table 10.8, p. 160; Table 13.1, p. 216, Table 15.1, pp. 243-244, and additionally a few transition countries (color grey), where banking sector suffered due to economic system change (Reinhart & Rogoff 2009, Table 15.1, pp. 243-244).

Source: Authors' compilation on basis of Reinhart & Rogoff (2009), Laeven and Valencia (2012).

\(^8\) For example, Babecyk et al. (2012) point to this problem.
\(^9\) Additionally, we augment this sample with Latvia and Lithuania to enlarge our sample with transition countries. This allows us to search for similarities and differences between Poland and similar countries.
Presence of a country in analysis depends on the availability of data.

The standard classification of crisis countries found in literature is shown in Table 8a. It utilizes data set assembled by Laeven and Valencia (2012) and World Bank (2014). Additionally, we highlight past crisis experience (with respective colors) according to the classification found in Reinhart & Rogoff (2009)\textsuperscript{20}.

Recent studies and analysis provided by the European Systemic Risk Board classify European Union countries slightly differently (Detken et al. 2014).

Table 8b. Country classification based on experiencing banking crisis in 2008 – European Union sample

<table>
<thead>
<tr>
<th>Crisis countries</th>
<th>Non-crisis countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denmark, France, Greece, Hungary, Ireland,</td>
<td>Austria, Belgium, Czech Republic, Estonia,</td>
</tr>
<tr>
<td>Latvia, Lithuania, Netherlands, Portugal,</td>
<td>Finland, Germany, Italy, Poland, Luxemburg,</td>
</tr>
<tr>
<td>Slovenia, Spain, Sweden, United Kingdom</td>
<td>Slovakia</td>
</tr>
</tbody>
</table>

Notes: Based on information Detken \textit{et al.} (2014), Table A1, p. 56 and data from the Bank of Finland. Green color indicates past crisis experience.

Source: Authors’ compilation based on Detken \textit{et al.} (2014)

Table 8b shows significant differences: Austria, Belgium, Germany, Italy and Luxemburg are classified as non-crisis countries. Spread of financial crisis in the past (after 1990s) is also different across these countries, for example Poland is classified as a country not experiencing any crisis during period 1970-2012q4. Although Laeven and Valencia (2012) classification has been used widely in similar analysis, we are drawn to the recent characterization provided by the ESRB.

This classification on one hand supports our general hypothesis that previous experience of financial crisis (especially in the closest future) encourages for regulation to avoid the next crisis. Most of the countries with severe past cost of financial busts avoided its repetition in 2008.

\textsuperscript{20} We choose 1990 to underline largely increased capital mobility that has been observed since.
Table 9. Characteristics of systemic banking crisis across countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Start</th>
<th>Output loss</th>
<th>Fiscal costs (of GDP)</th>
<th>Liquidity support</th>
<th>Peak NPLs 5)</th>
<th>Increase in public debt 6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>2008</td>
<td>14,0</td>
<td>4.9</td>
<td>7.7</td>
<td>2.8</td>
<td>14.8</td>
</tr>
<tr>
<td>Belgium</td>
<td>2008</td>
<td>19,0</td>
<td>6.0</td>
<td>14.1</td>
<td>3.1</td>
<td>18.7</td>
</tr>
<tr>
<td>Denmark</td>
<td>2008</td>
<td>36,0</td>
<td>3.1</td>
<td>11.4</td>
<td>4.5</td>
<td>24.9</td>
</tr>
<tr>
<td>France</td>
<td>2008</td>
<td>23,0</td>
<td>1.0</td>
<td>7.4</td>
<td>4.0</td>
<td>17.3</td>
</tr>
<tr>
<td>Germany</td>
<td>2008</td>
<td>11,0</td>
<td>1.8</td>
<td>3.6</td>
<td>3.7</td>
<td>17.8</td>
</tr>
<tr>
<td>Greece</td>
<td>2008</td>
<td>43,0</td>
<td>27.3</td>
<td>42.3</td>
<td>14.7</td>
<td>44.5</td>
</tr>
<tr>
<td>Hungary</td>
<td>2008</td>
<td>40,0</td>
<td>2.7</td>
<td>1.3</td>
<td>13.3</td>
<td>-0.3</td>
</tr>
<tr>
<td>Iceland</td>
<td>2008</td>
<td>43,0</td>
<td>44.2</td>
<td>16.8</td>
<td>61.2</td>
<td>72.2</td>
</tr>
<tr>
<td>Ireland</td>
<td>2008</td>
<td>106,0</td>
<td>40.7</td>
<td>16.3</td>
<td>12.9</td>
<td>72.8</td>
</tr>
<tr>
<td>Italy</td>
<td>2008</td>
<td>32,0</td>
<td>0.3</td>
<td>5.7</td>
<td>11.0</td>
<td>8.6</td>
</tr>
<tr>
<td>Luxembourg</td>
<td>2008</td>
<td>36,0</td>
<td>7.7</td>
<td>4.1</td>
<td>1.3</td>
<td>14.6</td>
</tr>
<tr>
<td>Netherlands</td>
<td>2008</td>
<td>23,0</td>
<td>12.7</td>
<td>3.7</td>
<td>3.2</td>
<td>26.8</td>
</tr>
<tr>
<td>Portugal</td>
<td>2008</td>
<td>37,0</td>
<td>0.0</td>
<td>16.7</td>
<td>7.3</td>
<td>33.6</td>
</tr>
<tr>
<td>Slovenia</td>
<td>2008</td>
<td>38,0</td>
<td>3.6</td>
<td>9.6</td>
<td>12.1</td>
<td>18.0</td>
</tr>
<tr>
<td>Spain</td>
<td>2008</td>
<td>39,0</td>
<td>3.8</td>
<td>6.4</td>
<td>5.8</td>
<td>30.7</td>
</tr>
<tr>
<td>Sweden</td>
<td>2008</td>
<td>25,0</td>
<td>0.7</td>
<td>13.0</td>
<td>2.0</td>
<td>11.1</td>
</tr>
<tr>
<td>Switzerland</td>
<td>2008</td>
<td>0.0</td>
<td>1.1</td>
<td>3.0</td>
<td>0.5</td>
<td>-0.2</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>2007</td>
<td>25,0</td>
<td>8.8</td>
<td>5.6</td>
<td>4.0</td>
<td>24.4</td>
</tr>
<tr>
<td>United States</td>
<td>2007</td>
<td>31,0</td>
<td>4.5</td>
<td>4.7</td>
<td>5.0</td>
<td>23.6</td>
</tr>
</tbody>
</table>

1) The following countries did not experience systemic banking crisis during the GFC: Australia, Canada, Chile, Czech Republic, Estonia, Finland, Israel, Japan, Mexico, New Zealand, Norway, Poland, Slovakia, South Korea, Turkey.
2) In percent of GDP. Output losses are computed as the cumulative sum of the differences between actual and trend real GDP over the period [T, T+3], expressed as a percentage of trend real GDP, with T the starting year of the crisis.
3) Fiscal costs are defined as the component of gross fiscal outlays related to the restructuring of the financial sector. They include fiscal costs associated with bank recapitalizations but exclude asset purchases and direct liquidity assistance from the treasury.
4) Liquidity is measured as the ratio of central bank claims on deposit money banks (line 12 in IFS) and liquidity support from the Treasury to total deposits and liabilities to non-residents.
5) In percent of total loans.
6) In percent of GDP. The increase in public debt is measured over [T-1, T+3], where T is the starting year of the crisis.


Additionally, Table 9 presents selected characteristics of the banking crises across countries. It can be seen that the crisis outcomes differ across countries a lot in relation to both output losses and increase in public debt. However, it can be also seen that some countries were classified as crisis countries, although – after data
review and with using a bit different methodology – ESRB classified them as non-crisis countries, as we did.

3.2. Finland – case study

Finland is a special case among Nordic countries. Finnish supervisory system, with a crucial role of the Bank of Finland, had experienced deep crisis at the beginning of the 1990s. Thanks to the active role of the Bank of Finland, which took over Skopbank, and the government’s assurance of deposit insurance covering all deposits regardless if the bank of origin participated in the system, crisis was short-lived and the “run on banks” prevented. This is admirable and important to analyze as a case study, since the gross fiscal costs of bank support were very large and accounted for 9% of GDP in 1997 (Honkapohja 2014).

Current supervisory structures in Nordic countries are described in Table 10. What is clear, systems are very similar with a single supervisor and formal mechanisms for cooperation between supervisors and governments. It seems, however, that experiencing crisis in the past and strengthening of supervisory system does not make a country immune to new financial busts.

Engagement of a central bank in supervision is one of the differentiating element: Swedish Riksbank is involved *ex officio*, whereas Finnish Suomen Pankki has in its institutional structure responsibility of macroprudential analysis and is involved in appointment of some of members of the supervisory system. The bank performs macro-level stress tests and analysis of early warning indicators on a macro-scale, whereas Finnish supervisory agency FIN-FSA makes analysis on the company level rather than sectoral one (for example bank-level data is gathered and provided for further analysis by FIN-FSA). FIN-FSA is also responsible for implementing of macroprudential policy. The co-division of responsibilities is complemented with the legislative responsibilities of the Ministry of Finance, who, after recom-

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21 This paragraph is based on a paper “The Nordic countries – the next super model Financial market supervisory models in the Nordic countries in the aftermath of the Great Recession”, Maslowska 2014, prepared for a monograph funded by the National Science Foundation under grant no 2011/01/B/HS4/05502. Monograph under preparation.

22 According to the chapter 1, section 3 – Tasks, of the Act on the Bank of Finland (1998), the task of the bank, among others, is to participate in maintaining the reliability and efficiency of the payment system and overall financial system, and to participate in their development.
mandations provided by the former two institutions, makes a decision about introducing particular macroprudential instruments (for example caps on loans)\textsuperscript{23}.

Table 10. Supervisory structures in the Nordic countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Sectoral model</th>
<th>Single supervisor model</th>
<th>Number of authorities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denmark</td>
<td>+</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Finland</td>
<td>+</td>
<td>+ change in 2009</td>
<td>from 2 to 1</td>
</tr>
<tr>
<td>Iceland</td>
<td>+</td>
<td>-</td>
<td>1 (1999)</td>
</tr>
<tr>
<td>Norway</td>
<td>+</td>
<td>-</td>
<td>1 (1986)</td>
</tr>
<tr>
<td>Sweden</td>
<td>+</td>
<td>-</td>
<td>1 (1991)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Country</th>
<th>Formal mechanism for cooperation</th>
<th>CB involved</th>
<th>Other resource sharing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denmark</td>
<td>MoU, C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Finland</td>
<td>MoU, A</td>
<td>+\textsuperscript{*}</td>
<td>+</td>
</tr>
<tr>
<td>Iceland</td>
<td>MoU, A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Norway</td>
<td>MoU, A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sweden</td>
<td>MoU</td>
<td>+\textsuperscript{**}</td>
<td></td>
</tr>
</tbody>
</table>

Notes:
MoU – memorandum of understanding
C – committee for cooperation
A – cooperation agreement
other resources – information, technology and database sharing
\textsuperscript{*} the central bank proposes the appointment of some of the members of the banking supervisor’s management board
\textsuperscript{**} the central bank is involved ex officio in the management of the banking sector


A unique feature differentiating Finland from others is cooperation among institutions in sharing a common pool of data required for regulation, supervision and macroprudential policy. The close connection of the supervisory institution and Bank of Finland is also an alternative way of achieving economies of scale. The Finnish FSA is administratively connected to the central bank, sharing its data collection, administrative support, and human resource functions (Taylor & Fleming 1999).

Co-division of supervisory obligations among key institutions (government, supervisory institution, central bank) is another important characteristic of the Finn-

\textsuperscript{23} We would like to thank professor Matti Virén (Bank of Finland and University of Turku) for providing this explanation of the tripartite division of macroprudential responsibilities.
ish supervisory system. Additionally, there are several advisory bodies that contribute to legislative development. These are organizations of experts, which are employed in financial services, mutual funds and dealers of securities, not involved in supervisory regulations on a daily basis. All organizations care about good information transfer among each other. This is represented, for example in the overlapping of members of boards. Key governments representatives, as well as those from the central bank are present on boards, for example in the Financial Supervision Authority (FIN-FSE) or other advisory body.

Until 2009 a variant of sectoral model prevailed in Finnish supervisory model with two key supervisory bodies. Rahoitustarkastus (Finnish Financial Supervision Authority) had been responsible for the banking and securities sectors, while the Vakuutusvalvontavirasto (Insurance Supervision Authority) for the insurance sector (ECB 2010). Benefits of an integrated financial market supervisory institution and a growing number of such designs across European countries led Finland to assign the task of supervising the entire financial system to a single authority other than the central bank in 2009, see for example ECB 2010 and Masciandaro & Quintyn (2009). The new authority was created from a merger of former Financial Supervision Authority and the Insurance Supervisory Authority. FIN-FSE operates administratively in connection with the Bank of Finland, but is independent in its decision making. Supervised entities provide 95% of the financing needed to cover the institution’s activities, and the remaining 5 percent comes from the Bank of Finland.

Bank of Finland and FIN-FSE share prudential responsibilities. The bank aims to identify risks to the financial system at the early stage using its macroprudential analysis, whereas FIN-FSA is responsible for institution-level micro prudential analysis.

3.3. Macroprudential policy instruments as the main explanatory variable

The comprehensive source of macroprudential instruments data can be found in Cerutti, Claessens & Laeven 2015. Using an IMF survey, authors document the use of macroprudential policies for 119 countries over 2000-13 period.

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24 See also Nier et al. 2011
### Table 11. Macroprudential policy instrument

<table>
<thead>
<tr>
<th>Instrument/ group</th>
<th>Abbreviation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loan-to-Value Ratio</td>
<td>LTV</td>
<td>Constrains highly levered mortgage downpayments by enforcing or encouraging a limit or by determining regulatory risk weights</td>
</tr>
<tr>
<td>Debt-to-Income Ratio</td>
<td>DTI</td>
<td>Constrains household indebtedness by enforcing or encouraging a limit</td>
</tr>
<tr>
<td>Time-Varying/ Dynamic Loan-Loss Provisioning</td>
<td>DP</td>
<td>Requires banks to hold more loan-loss provisions during upturns</td>
</tr>
<tr>
<td>General Countercyclical Capital Buffer/ Requirement</td>
<td>CTC</td>
<td>Requires banks to hold more capital during upturns</td>
</tr>
<tr>
<td>Leverage Ratio</td>
<td>LEV</td>
<td>Limits banks from exceeding a fixed minimum leverage ratio</td>
</tr>
<tr>
<td>Capital Surcharges on SIFIs</td>
<td>SIFI</td>
<td>Requires Systemically Important Financial Institutions to hold a higher capital level than other financial institutions</td>
</tr>
<tr>
<td>Limits on Interbank Exposures</td>
<td>INTER</td>
<td>Limits the fraction of liabilities held the banking sector or by individual banks</td>
</tr>
<tr>
<td>Concentration Limits</td>
<td>CONC</td>
<td>Limits the fraction of assets held by a limited number of borrowers</td>
</tr>
<tr>
<td>Limits on Foreign Currency Loans</td>
<td>FC</td>
<td>Reduces vulnerability to foreign-currency risks</td>
</tr>
<tr>
<td>Reserve Requirement Ratios</td>
<td>RR</td>
<td>Limits credit growth; can also be targeted to limit foreign-currency credit growth</td>
</tr>
<tr>
<td>Limits on Domestic Currency Loans</td>
<td>CG</td>
<td>Limits credit growth directly</td>
</tr>
<tr>
<td>Levy/ Tax on Financial Institutions</td>
<td>TAX</td>
<td>Taxes revenues of financial institutions</td>
</tr>
<tr>
<td>Loan-to-Value Ratio Caps</td>
<td>LTV-CAP</td>
<td>Restricts to LTV used as a strictly enforced cap on new loans, as opposed to a supervisory guideline or merely a determinant of risk weight</td>
</tr>
<tr>
<td>FX and/ or Countercyclical Reserve Requirements</td>
<td>RR – REV</td>
<td>Restricts to RR which imposes a wedge of on foreign currency deposits</td>
</tr>
<tr>
<td>Macropurudential Index (0-12)</td>
<td>MPI</td>
<td>LTV – CAP + DTI + DP + CTC + LEV + SIFI + INTER + CONC + FC + RR – REV + CG + TAX</td>
</tr>
<tr>
<td>Borrower-Targeted Instruments (0-2)</td>
<td>BORROWER</td>
<td>LTV – CAP + DTI</td>
</tr>
<tr>
<td>Financial Institution-Targeted Instruments (0-10)</td>
<td>FINANCIAL</td>
<td>DP + CTC + LEV + SIFI + INTER + CONC + FC + RR – REV + CG + TAX</td>
</tr>
</tbody>
</table>


The use of these instruments among the OECD countries has been rather limited. As mentioned above, some instruments do not appear at all in advanced countries. Limits on domestic currency loans or reserves of foreign loans are not used in industrial countries, whereas a few, like capital surcharge on SIFI or time-varying loan-loss provisioning the frequency of use is close to zero (see Cerutti et al. 2015).
Table 2, p. 24). In result, potentially wide range of instruments possible to use in empirical analysis is limited to a few, like general macroprudential index, and variables Borrower, Financial or LTV-CAP.

Table 12 presents frequency of appearance among the most popular instruments. From the list of 14, advanced countries the most often use only three of them:

1) LTV-CAP, which appears to be popular especially after the burst of the financial crisis,
2) CONC – present in quite many countries since 2000. Sample includes both crisis and non-crisis countries,
3) INTER – a few countries had used this instrument already in year 2000, others introduced it in result of GFC.

### Table 12. Macroprudential instruments – frequency of appearance of the most common instruments among the OECD countries

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Countries (year of introduction, value of index)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Macrop. index (MPI)(^*) (2000-2013)</td>
<td>Australia (1), Austria (1-2), Belgium (2), Canada (3-5), Chile (6), Czech Rep. (1), Estonia (0), Finland (1 – in 2013, otherwise 0), France (2-3), Germany (2 since 2010, otherwise 0), Hungary (3-4 since 2010, otherwise 0), Iceland (2), Ireland (0), Israel (5 in 2013, otherwise 1-4), Italy (2), Japan (1), Korea (1-4), Latvia (1-2 since 2007), Lithuania (2 since 2011, otherwise 0), Mexico (2), Netherlands (1-3 since 2012), New Zealand (1 in 2013), Norway (1-4), Poland (1-2) Portugal (1-2 since 2009), Slovakia (1-2), Slovenia (0), Spain (3), Sweden (1 since 2010), Switzerland (2-5 since 2007), Turkey (1-5), UK (0), US (2-3)</td>
</tr>
</tbody>
</table>

Notes:
* The higher the index the more macroprudential tools in use.
No information on Denmark, Greece, Luxemburg
Source: Authors’ compilation on Cerutti, Claessens & Laeven (2015).

\(^{25}\) In an IMF study from 2011, in the sample of 49 countries, 41% used caps on LTV, 39% – limits on net open currency (with only Hungary, Korea, Turkey from our sample) and the same number of countries used reserve requirements. The intensity of other instruments was less than 30% with none of those used in a few advanced countries as of 2010.
Cerutti, Claessens & Laeven (2015) additionally create a general measure of macroprudential instruments (Macroprudential Index – MPI). Figure 3 presents data for both Macroprudential Index (0-12) and Financial Institution-Targeted Instruments Index (0-10) for countries divided into two groups: non-crisis and crisis for the period 2000-2013. One can observe higher level of average and median for non-crisis countries.

The data originally analyzed by Barth, Caprio & Levine (2001) was collected by the World Bank first time in 2000, and included answered from bank supervisors, central bankers and policy makers on questions concerning ownership in banking system, auditing, liquidity, depositors protection and supervision, among others. It has been enriched with new information three times, with the most recent survey in 2011-2012. To our knowledge, these data have not been used in empirical analysis before, only in qualitative analysis describing developments of supervision standards across countries and within time.26

Figure 3. Average and median values of composite macroprudential indicators: MPI and FINANCIAL between 2000-2013

Source: Authors’ own presentation based on data in Cerutti, Claessens & Laeven (2015).

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26 For such analysis of the latest survey, see Čihák et al. (2012).
The World Bank Regulation Survey contains variety of questions, which may
not be directly treated as macroprudential instruments\textsuperscript{27}, but describe banking and
financial market regulations and stability. We indicate and later use in empirical
analysis a few following variables:

– responsibility for bank supervision – there is a wide discussion nowadays
about the form and model of financial supervision; major question is: who
should be responsible for such actions (central bank or perhaps a separate in-
stitution) and should this supervision be concentrated in hands of one institu-
tion or should there be several, depending on the type of financial actions,

– reserve requirement at central bank,

– bank risk management disclosure to public – ever since discussion over in-
creased central bank independence appeared in literature, economists won-
dered about level of transparency, not only public institutions but also level of
disclosure among financial institutions, which, after all, are also bearing public
trust,

– average tenure of supervisors – experience among supervisors cannot be over-
estimated when talking about its effectiveness; however, this variable can be
flawed due to different length of existence of such a supervisory body,

– limits of bank's engagement in securities, real estate or insurance.

Connected with macro indicators of crisis incidence, there is a set of early
warning indicators, which are alternatively included in our analysis: money
measures – money and quasi money as percent of GDP; equity returns as percentage
of GDP; reserves of months of imports.

3.4. The architecture of deposit insurance schemes – comparative qualitative study
Deposit insurance schemes (DIS) are important element of financial safety net (cf.
section 1.5). Using the databases build upon works by Demirg"uc-Kunt, Karacaoglu,
& Laeven (2005) and Demirg"uc-Kunt, Kane & Laeven (2015) and Barth, Nolle &
Probha (2014) this study presents a comprehensive comparative analysis of deposit

\textsuperscript{27} As already described, however, there is no final list of macroprudential instruments.
insurance arrangements across two groups of countries: ‘crisis’ and ‘non-crisis’ countries.

In the period before the Global Financial Crisis only three countries out of the whole sample lacked an explicit deposit insurance scheme (i.e. Australia, Israel and New Zealand). As literature explains, such insurance can work in two ways. Major idea behind deposit insurance is to cover potential losses of depositors in the event of bank insolvency, hence creates a protecting shield for depositors. Large literature, however, underline threat of moral hazard among banks. For example, by measuring the effects of the design of deposit insurance on bank fragility, Demirgüç-Kunt and Detragiache (2002) find that certain design features like high coverage limits and scope or an existence of a funded scheme contribute to a greater likelihood of a crisis and, in weak institutional environments, less bank development. During the financial crisis period, Australia (2008) was the only country, out of the sample, that introduced explicit deposit insurance scheme.

Table 13 reports coverage limits both in US dollars (end-of-year exchange rate was used) and in relation to GDP per capita for three points in time: 2003, 2010 and 2013.

With one exception (i.e. Mexico\textsuperscript{28}), the general trend is an increase in coverage (measured in US$) between 2003 and 2010. It seems to be triggered by the global financial crisis and – in relation to the EU countries – by harmonization of Deposit Insurance Schemes and implementation of 2009/14/EC directive.

However, it should be stressed that there are significant differences between non-crisis and crisis countries in relation to the average coverage level in 2003 (before the crisis) and 2010 and 2013 (after the crisis).

\textsuperscript{28} Mexico was excluded from analysis due to a specific situation in Mexican DIS and especially due to the exchange rate which determined the value of coverage limit in US$.
Table 13. Coverage of explicit deposit insurance schemes

<table>
<thead>
<tr>
<th>Country</th>
<th>Statutory limit (coverage including government guarantees, USS)</th>
<th>Coverage limit/ GDP per capita (in %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>n.a.</td>
<td>917431</td>
</tr>
<tr>
<td>Austria</td>
<td>22727</td>
<td>133333</td>
</tr>
<tr>
<td>Belgium</td>
<td>22727</td>
<td>133333</td>
</tr>
<tr>
<td>Canada</td>
<td>42857</td>
<td>97087</td>
</tr>
<tr>
<td>Chile</td>
<td>2643</td>
<td>4542</td>
</tr>
<tr>
<td>Czech Rep.</td>
<td>28409</td>
<td>133333</td>
</tr>
<tr>
<td>Denmark</td>
<td>45524</td>
<td>133333</td>
</tr>
<tr>
<td>Estonia</td>
<td>7263</td>
<td>133333</td>
</tr>
<tr>
<td>Finland</td>
<td>28409</td>
<td>133333</td>
</tr>
<tr>
<td>France</td>
<td>79545</td>
<td>133333</td>
</tr>
<tr>
<td>Germany</td>
<td>22727</td>
<td>133333</td>
</tr>
<tr>
<td>Greece</td>
<td>22727</td>
<td>133333</td>
</tr>
<tr>
<td>Hungary</td>
<td>13374</td>
<td>133333</td>
</tr>
<tr>
<td>Iceland</td>
<td>22259</td>
<td>28019</td>
</tr>
<tr>
<td>Ireland</td>
<td>22727</td>
<td>133333</td>
</tr>
<tr>
<td>Italy</td>
<td>117376</td>
<td>133333</td>
</tr>
<tr>
<td>Japan</td>
<td>86259</td>
<td>133333</td>
</tr>
<tr>
<td>Korea, Rep.</td>
<td>41960</td>
<td>43250</td>
</tr>
<tr>
<td>Latvia</td>
<td>5227</td>
<td>133333</td>
</tr>
<tr>
<td>Lithuania</td>
<td>14706</td>
<td>133333</td>
</tr>
<tr>
<td>Luxembourg</td>
<td>22727</td>
<td>133333</td>
</tr>
<tr>
<td>Mexico</td>
<td>2984865</td>
<td>146515</td>
</tr>
<tr>
<td>Netherlands</td>
<td>22727</td>
<td>133333</td>
</tr>
<tr>
<td>Norway</td>
<td>282486</td>
<td>331126</td>
</tr>
<tr>
<td>Poland</td>
<td>25568</td>
<td>133333</td>
</tr>
<tr>
<td>Portugal</td>
<td>28409</td>
<td>133333</td>
</tr>
<tr>
<td>Slovak Rep.</td>
<td>22727</td>
<td>133333</td>
</tr>
<tr>
<td>Slovenia</td>
<td>21023</td>
<td>133333</td>
</tr>
<tr>
<td>Spain</td>
<td>22727</td>
<td>133333</td>
</tr>
<tr>
<td>Sweden</td>
<td>30902</td>
<td>133333</td>
</tr>
<tr>
<td>Switzerland</td>
<td>22222</td>
<td>96154</td>
</tr>
<tr>
<td>Turkey</td>
<td>33333</td>
<td>33333</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>51967</td>
<td>130769</td>
</tr>
<tr>
<td>United States</td>
<td>100000</td>
<td>250000</td>
</tr>
</tbody>
</table>

Notes: non-crisis countries are dark-shaded

* On October 12, 2008, Australia announced an unlimited guarantee scheme for deposits in excess of A$1 million, the Australian Government Guarantee Scheme for Large Deposits and Wholesale Funding (the Guarantee Scheme). The Guarantee Scheme was to remain in place for a period of three years, and was voluntary and subject to a fee (for deposits exceeding A$1 million per person and bank). The Scheme formally commenced on 28 November 2008, and closed for new liabilities at the end of March 2010.

** On October 8, 2008, the Slovak government announced a blanket guarantee on deposits, which became effective as of November 1, 2009. Blanket guarantee expired at the end of 2010.

Source: Demirgüç-Kunt, Kane & Laeven (2015).
Before the Global Financial Crisis, non-crisis countries extended more coverage on depositors (52 119 US$ and 246% of GDP per capita) comparing to crisis countries (32 616,18 US$ and 151,06% of GDP per capita). Similar variation exists in 2010, although the gap between non-crisis and crisis countries was reduced (cf. Figure 4 and 5) in relation to the coverage limit in US$ but it increased in relation to coverage limit as % of GDP per capita\textsuperscript{29}.

**Figure 4. Coverage of explicit deposit insurance scheme (statutory limit, US$)**

![Coverage of explicit deposit insurance scheme (statutory limit, US$)](chart1)

Source: Authors’ calculation on basis of Demirgüç-Kunt, Karacaoglu, & Laeven (2005) and Demirgüç-Kunt, Kane & Laeven (2015).

**Figure 5. Coverage of explicit deposit insurance scheme (statutory limit/ GDP per capita, in %)**

![Coverage of explicit deposit insurance scheme (statutory limit/ GDP per capita, in %)](chart2)

Source: Authors’ calculation on basis of Demirgüç-Kunt, Karacaoglu, & Laeven (2005) and Demirgüç-Kunt, Kane & Laeven (2015).

\textsuperscript{29} This trend is a consequence of substantial decrease in GDP per capita level in crisis countries.
The tendency has turned in 2013, when average coverage limit was a bit higher in relation to crisis countries, comparing to non-crisis ones (136 631 US$ and 132 477 US$ respectively), however, measured by % GDP per capita the coverage limit was still higher, almost twice higher, in non-crisis countries (818 and 488,82 % of GDP per capita respectively).

On the one hand higher statutory limit for coverage might have the potentially negative effects in the form of moral hazard and incentives for aggressive risk-taking activities. On the other hand, however, it seems that higher coverage limit was a feature of non-crisis countries, which might play significant role in protecting household savings in banking sector and thus stabilizing the financial system.

Another important element of our analysis is comprehensive comparative analysis of selected design features of DIS (cf. Tables 14 and 15). The majority of analyzed DIS are legally separate from any public institution: central bank, ministry of finance or supervisory institution. A minority of schemes is not legally separate from these government institutions, but the number varies by two groups of countries (cf. Tables 14 and 15): non-crisis (11,76%) and crisis (29,41%).

There is a wide variation across ‘2008 crisis experience’ in relation to the administration of deposit insurance scheme. In a non-crisis countries group most of DIS are administrated jointly between the public and private sectors (52,94%), while 35,29% of DIS are administrated publicly and 11,76% are administrated privately. In the group of ‘crisis’ countries, on the other hand, only 35,29% of schemes are administrated jointly, while 47,06% are administrated publicly and 11,76% privately. The difference between the two separated groups of countries relates to the ‘public’ involvement in administrating deposit insurance schemes. ‘Non-crisis’ countries are less publicly-dominated, while ‘crisis countries’ seem to be more publicly-dominated in relation to the institutional arrangements of DIS. There is an important question whether government administration is adequate to support the promises of DIS in the stress periods (Demirgüç-Kunt et al. 2015).

However, this ‘public’ involvement in DIS funding differs from administration. Although, the funding as such derives primarily from contributions from the insured banks, some schemes are funded partly (11,76% of crisis countries) or in a
whole (11.76% of non-crisis countries) publicly. Most of DIS in both groups of countries are funded privately (88.24% in both cases).

Institutional arrangements of deposit insurance schemes differ just slightly between non-crisis and crisis countries as far as the participation and coverage is concerned. Domestic banks and local subsidiaries of foreign banks are obliged to participate in DIS in all countries in the sample (cf. Tables 14 and 15). Slight differences between non-crisis and crises countries appear in relation to participation of local branches of foreign banks (76.47% and 88.24% respectively). The DIS usually does not extend the same coverage to all types of deposits. Coverage of foreign currency deposits is common in both groups of countries (a bit more in relation to crisis countries – 88.24% comparing to 76.47% for non-crisis countries). The coverage of interbank deposits is rather uncommon – due to an assumption that asymmetry of information is less significant in case of financial institutions comparing to individual customers – and exist only in respectively three (Australia, Canada, Norway) and two (Iceland, United States) countries classified as non-crisis and crisis countries.

Most of countries introduced changes in deposit insurance schemes and depositor protection, often in response to the global financial crisis. The exceptions are Canada, Japan, Norway and Turkey and all four countries are classified as non-crisis countries.
Table 14. Design of explicit deposit insurance schemes (DIS) – non-crisis countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Type of DIS</th>
<th>Administration</th>
<th>Participation and coverage</th>
<th>Funded</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>legally</td>
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<td>CB. supervisor or ministry</td>
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<tr>
<td>Australia</td>
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<td>Japan</td>
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<tr>
<td>Turkey</td>
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</tbody>
</table>

Notes:
+ data for 1995
x data for 2013

Source: Authors’ calculation on basis of Demirgüç-Kunt, Karacaoglu, & Laeven (2005) and Demirgüç-Kunt, Kane & Laeven (2015) and Barth, Caprio & Levine (2014).
Table 15. Design of explicit deposit insurance schemes (DIS) – crisis countries

<table>
<thead>
<tr>
<th>Country</th>
<th>Type of DIS</th>
<th>Administration</th>
<th>Participation and coverage</th>
<th>Funded</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>legally</td>
<td>CB, supervisor</td>
<td>domestic</td>
<td></td>
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<tr>
<td></td>
<td>separated</td>
<td>ministry</td>
<td>banks</td>
<td></td>
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<tr>
<td></td>
<td>public-</td>
<td>privately</td>
<td>local subsidiaries of</td>
<td></td>
</tr>
<tr>
<td></td>
<td>jointly</td>
<td></td>
<td>foreign banks</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>local branches of foreign</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>banks</td>
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<td></td>
<td>foreign currency deposits</td>
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<td>interbank deposits</td>
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<td></td>
<td>public-</td>
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<td></td>
<td>jointly</td>
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<tr>
<td>Czech Rep.</td>
<td>x</td>
<td></td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Denmark</td>
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<td>x</td>
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<td>France</td>
<td>x</td>
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<td>Greece</td>
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<td>Hungary</td>
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<td>Latvia</td>
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<td>Lithuania</td>
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<td>Netherlands</td>
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<td>Portugal</td>
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<td>Slovenia</td>
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<tr>
<td>Spain</td>
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<td>x</td>
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<td>Switzerland</td>
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<td>US</td>
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</tr>
</tbody>
</table>

Notes:
+ data for 1995
x data for 2013

Source: Authors’ calculation on basis of Demirgüç-Kunt, Karacaoglu, & Laeven (2005) and Demirgüç-Kunt, Kane & Laeven (2015) and Barth, Caprio & Levine (2014)
Figure 6 shows the percentage of countries that expanded deposit protection in one of seven ways:

- a) introducing explicit DIS,
- b) increasing statutory coverage,
- c) abolishing co-insurance,
- d) introducing a government guarantee on deposits,
- e) introducing a government guarantee on non-deposit liabilities,
- f) introducing a government guarantee on bank assets or
- g) undertaking significant nationalizations of banks.

We report these actions separately for crisis and non-crisis countries.

The only country, which introduced explicit DIS during the period 2007-2013 was Australia. In relation to the rest of analyzed countries, it can be seen that changes were introduced more frequently and widespread by crisis countries comparing to non-crisis countries.

**Figure 6. Changes in depositor protection 2007-2013 (% of countries)**

Source: Authors’ calculation on basis of Demirgüç-Kunt, Karacaovlı, & Laeven (2005) and Demirgüç-Kunt, Kane & Laeven (2015).
Almost all countries that experienced banking crisis over this period increased statutory coverage limit (94.12% comparing to 70.59% for non-crisis countries). More crisis countries decided to abolish co-insurance (35.29% and 23.53% respectively). The case of different types of government guarantees also shows that countries experiencing banking crisis more often decided on changes (especially in relation to the guarantees on bank liabilities introduced in 82.35% crisis countries). Bank nationalizations were also widespread, occurring in 47.06% of countries experiencing a banking crisis.

Although – as we stress in the title of our paper – ‘one-size does not fit all’, one might indicate institutional arrangements which seem to be crucial in safeguarding financial stability and help countries to succeed in decreasing negative effects of the current crisis. These elements seem to be: high coverage limit and wide private involvement in the deposit insurance scheme (both in administration and funding).

3.5. Resolution30 – comparative study
The institutional arrangements in failure resolution differ across countries. First of all, according to Barth, Caprio & Levine (2014) in 2011, a lot of countries did not introduce a separate bank insolvency framework, that was distinct from framework prepared for nonfinancial firms. Table 16 reports the two groups of countries, with and without separate bank insolvency framework. It can be seen that more than 36% countries under survey did not use such a separate framework and that this group was slightly dominated by non-crisis countries (above 50% of countries).

Table 16. Separate bank insolvency framework

<table>
<thead>
<tr>
<th>Countries with separate bank insolvency framework</th>
<th>Countries without separate bank insolvency framework</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada, Chile, Denmark, Estonia, France, Iceland, Israel, Italy, Latvia, Luxembourg, Netherland, New Zealand, Norway, Poland, Portugal, Slovakia, Slovenia, Switzerland, Turkey, United Kingdom, United States</td>
<td>Australia, Austria, Belgium, Finland, Germany, Greece, Hungary, Ireland, Korea, Lithuania, Mexico, Spain</td>
</tr>
</tbody>
</table>

Notes: Non-crisis countries are marked by green color
Source: Authors’ compilation on basis of Barth, Caprio & Levine (2014).

### Table 17. Mechanisms for failure resolution in non-crisis countries (2011)

<table>
<thead>
<tr>
<th>Country</th>
<th>Open bank assistance</th>
<th>Purchase and assumption transaction</th>
<th>Government intervention</th>
<th>Bridge bank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Austria</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
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<tr>
<td>Belgium</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Canada</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
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<tr>
<td>Chile</td>
<td>1</td>
<td>1</td>
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<td>Estonia</td>
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<tr>
<td>Finland</td>
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<tr>
<td>Germany</td>
<td>0</td>
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<td>0</td>
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<tr>
<td>Israel</td>
<td>1</td>
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<tr>
<td>Italy</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
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<tr>
<td>Korea, Rep.</td>
<td>1</td>
<td>1</td>
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<td>Luxembourg</td>
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<tr>
<td>Mexico</td>
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<tr>
<td>Norway</td>
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<td>Poland</td>
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<tr>
<td>Slovak Rep.</td>
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<td>Turkey</td>
<td>0</td>
<td>1</td>
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<td>0</td>
</tr>
</tbody>
</table>

Source: Authors’ calculation on basis of Barth, Caprio & Levine (2014).

### Table 18. Mechanisms for failure resolution in crisis countries (2011)

<table>
<thead>
<tr>
<th>Country</th>
<th>Open bank assistance</th>
<th>Purchase and assumption transaction</th>
<th>Government intervention</th>
<th>Bridge bank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denmark</td>
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<td>France</td>
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<td>Greece</td>
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<td>Hungary</td>
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<td>Iceland</td>
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<td>Ireland</td>
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<td>Latvia</td>
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<td>Lithuania</td>
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<td>Netherlands</td>
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<td>Portugal</td>
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<td>Slovenia</td>
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<td>Spain</td>
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<td>Switzerland</td>
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<td>United Kingdom</td>
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<tr>
<td>United States</td>
<td>1</td>
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<td>1</td>
</tr>
</tbody>
</table>

Source: Authors’ calculation on basis of Barth, Caprio & Levine (2014).
While comparing the scope of mechanisms provided in legislation to resolve a problem bank prior to its closure and liquidation (Tables 17 and 18) in the two groups of countries (non-crisis and crisis), it can be stressed that in all cases (open bank assistance, purchase and assumption transaction, government intervention and bridge banks) the legislation was more often implemented in crisis-countries. The highest variation is in case of government intervention, which exist in legislation of 80% of crisis countries and 64.71% of non-crisis countries.

3.6. Resolution – the case study of Denmark

Danish banking sector suffered greatly during the GFC. From summer 2008, Denmark has lived through an actual systemic financial crisis in the banking sector. Severe liquidity problems, great losses and write-downs of the banking sector resulted in a collapse of 62 banks (Denmark Ministry of Business and Growth 2013). Economic conditions in Denmark, prior to the crisis were very positive with low unemployment and sustainable growth. Two key elements, however, contributed to the burst of the crisis: mounting complexity of the financial system and substantial risk in the so-called “shadow banking” sector.

Danish banking sector had been characterized by strict capital adequacy rules provided by domestic supervisory authority. In the years prior to the crisis, however, these rules were eased by the new International Financial Reporting Standard (IFRS) and capital adequacy requirements (Basel II). The new rules meant reducing the financial institutions' cushioning against losses and were followed by the considerable credit expansion (Ministry of Business and Growth 2013). The new compromising regulations, introduced at an inappropriate point in time, have been tightened, since.

The winding-up company was established by the Ministry for Economic and Business Affairs in October 2008. Financial Stability Company (FSC, Finansiel Stabilitet), though established firstly only for two years, continues its operations by fulfilling plans of subsequent Bank Packages (2-4). The company's major task was to ensure that unsubordinated, unsecured creditors (as defined in the FS Act) in participating Danish banks will be covered in full (the Danksebank presentation 2009). The Act describes this task in detail stating that “If a bank comprised by the guarantee scheme fails to meet the capital adequacy requirements of the Danish Financial
Business Act, and if the FSA has determined a deadline in pursuance of section 225(1) of the Danish Financial Business Act, such bank shall declare to the Winding-Up Company that it wishes to transfer its activities to a buyer designated by the Winding-Up Company if the capital has not been restored before the expiry of the deadline determined by the FSA" (Danish Parliament 2008, Part 2.7.- (1)). Finansiel Stabilitet, apart from taking over assets from banks in distress, offers own activities and exposures for trade under market conditions and through open, transparent sales processes (Finansiel Stabilitet Annual Report 2009).

Bank Rescue Packages

The Danish resolution scheme for handling distressed banks put Denmark ahead of Europe in designing institutions securing long-run financial stability. The government support mechanism consists of three stages. The Bank Rescue Package 1, as already described, aimed at providing necessary liquidity fast and for limited time of two years. The Bank rescue Package 2 involved government capital injections and individual guarantees. Incentives for this package were similar: difficulties to raise capital in the international capital markets. The scheme was intended to facilitate the transition to funding on normal market terms.

Bank Rescue Package 3 introduces novelty in handling the effects of financial crisis. Although government guarantee in the form of first two packages was inevitable, it could have led to inappropriate incentive structure in the sector in the long term. The bank package 3 is based on the Danish Insolvency Act, and came into force on 1 October 2010, at which date the general government guarantee expired. The resolution applies that ordinary customers will not notice any difference in the practical side of their day-to-day banking business (Poulsen and Andreasen 2011). The general resolution scheme is fast and efficient: failed bank closes on a Friday afternoon and a new bank is opened on Monday. During a weekend, the distressed bank can transfer its activities to the Financial Stability Company. A fast transfer of assets reduces the risk of a run on the bank.

31 This is of worry to many that general bailing out schemes raise the problem of moral hazard and adverse selection
32 A detailed description of this mechanism can be found in the Danmarks Nationbanken Monetary Policy report, 3rd Quarter 2011, p.81
**Private Contingency Association**

The FS Act additionally assumed an active role of the Private Contingency Association (PCA) in providing capital to the Winding-Up Company. The PCA was established in June 2007 by the Danish Bankers for the winding-up and transfer of failing commercial banks, savings banks and cooperative banks (Det Private Beredskab statute 2007, in Danish). The PCA pays an annual guarantee commission, payable in monthly installments (FS Act Part 3.9.(2)).

**The supervisory diamond**

The key financial policy initiative of the Danish FSA was an introduction of the “Supervisory diamond” in 2010.

**Figure 7. The supervisory diamond for mortgage-credit institutions**

![Supervisory Diamond Diagram](image_url)

Source: Own preparation based on The Danish Financial Supervisory Authority (2014)

This diamond sets limit values for banks in a number of special risk areas. It helps to identify, and ultimately prevent banks pursuing a more risky strategy at an early stage. Buchholst and Rangvid (2013) call it a forward-looking mechanism. The criteria of the supervisory diamond were adjusted to reflect the European regulatory changes and were phased in to end-2012. The criteria include (Xiao 2013): sum of large exposures less than 125 percent of total capital; lending growth less than 20
percent per year; commercial property exposure less than 25 percent of total loans; 
stable funding less than 1; and excess liquidity coverage greater than 50 percent.

3.7. Basel regulation and other capital requirements

Capital regulations have long been important in the banking industry so as to limit 
the extent to which individual banks are able to leverage. Higher capital require-
ments lead to lower leverage. Setting minimum capital requirements is therefore a 
way to provide a cushion to lessen the likelihood of insolvency of a bank due to 
losses (Barth, Nolle & Prabha 2014). That is why, the Basel Committee on Banking 
Supervision issued in 1988 first guidelines calling for a minimum capital require-
ment, known as Basel I. In 2004 the same Basel Committee proposed Basel II as an 
improvement of Basel I.

All countries in the sample have claimed that Basel I capital adequacy re-
quirements were implemented from 2000 until 2010\(^{33}\). In the most recent Survey IV 
(2011, with some corrections in 2012), countries informed of introducing Basel II 
requirements, as well. Similarly, there was not much differentials in minimum capi-
tal-asset ratio requirement announced by countries (in majority of cases it was 8%). 
There were a few exceptions:

- Canada – until 1999, Tier1 requirement was 7%, whereas for all capital – 
  10%,
- Estonia – 10%,
- Germany – 12,5% for newly established banks during first three years of ex-
  istence,
- Israel – unchanged 9%,
- Poland informed of a higher capital-asset requirement for banks in their first 
  and second year of existence (15% and 12% respectively).

Hence, in non-crisis countries we have observed tendency for higher capital-
ratio requirement. The actual Tier1 capital ratio of the banking sector in 2007 was 
also in many cases higher in non-crisis countries: Canada – 10,2%, Chile – 10%,

\(^{33}\) Capital-asset requirements ratios and other information concerning implementing of Basel 1 re-
quirements are included in part 3 of the IMF Survey “Capital”.

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Estonia – 10.5%, Finland – 15%, Poland – 13.3%, Slovakia – 15%, whereas in crisis-countries this ratio was on average less than 10%.

Higher capital ratios for non-crisis countries can be seen on Figure 8. Both risk based capital ratio and Tier 1 capital ratio were higher on average in 2008, 2009 and 2010. It should be stressed that the highest variation across these two groups of countries existed in 2008 (in cases of both ratios the difference was about 10%), in 2009 the difference dropped to respectively 8.3% and 5.7% for risk based and Tier1 capital ratios, and in 2010 it continued to fall to 3.1% and 0.5% respectively.

**Figure 8. Risk based and Tier1 capital ratios (actual value, end of year)**

![Graph showing capital ratios](image)

Source: Authors’ calculation on basis of Barth, Caprio & Levine (2014).

Differences in the actual level of capital ratios are important, but there are also significant differences in the composition of capital satisfying the requirements. Tables 19 and 20 present a comparison of capital requirements’ composition, separately for non-crisis and crisis countries.

In relation to the Tier1 capital, most of countries allowed hybrid debt capital instruments to be included as a component of regulatory capital (77.78% and 78.57% for non-crisis and crisis countries respectively). However, the other two analyzed components (asset revaluation gains – 27.78% and 21.43% and subordinated debt – 16.67% and 7.14% of non-crisis and crisis countries respectively) were hardly ever allowed to be included as components.
Table 19. Capital regulations across non-crisis countries (2011)

<table>
<thead>
<tr>
<th>AUS</th>
<th>AT</th>
<th>BE</th>
<th>CAN</th>
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Source: Authors’ compilation using Barth, Caprio & Levine (2014)
Table 20. Capital regulations across crisis countries (2011)

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Source: Authors’ compilation using Barth, Caprio & Levine (2014)
Components of Tier2 capital differ, because most of them are allowed in all countries. Among items deducted from regulatory capital the highest variation exists in relation to deferred tax assets (61.11% for non-crisis countries and 26.67% for crisis countries).

This means that although all the countries may have reported that banks met the minimum capital requirement, the degree of leverage allowed still could have differed fairly widely due to the variation in the items that were allowed to satisfy this requirement.

Table 21 describes restrictiveness of domestic regulations in engaging commercial banks in various non-bank activities. This restrictiveness is defined in four levels – action is:

- unrestricted – a full range of these activities can be conducted directly in banks,
- permitted – a full range of these activities are offered but all or some of these activities must be conducted in subsidiaries, or in another part of a common holding company or parent,
- restricted – less than the full range of activities can be conducted in banks, or subsidiaries, or in another part of a common holding company or parent,
- prohibited – none of these activities can be done in either banks or subsidiaries, or in another part of a common holding company or parent.

Information included in the table shows that crisis countries imposed smaller restrictions on banks in regard to their non-banking activity during the pre-crisis period. Involvement of banks in securities market was almost in all cases non-limited by any regulation before the crisis and remained so after the bust. Similarly, during pre- and post-crisis periods, banking sector's involvements in real estate was regulated to a smaller degree among crisis-countries, than in the rest of countries in the sample.
Table 21. Restrictiveness in engagement of non-banking activities, pre-crisis (2007), and post-crisis (2010)

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Non crisis countries

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Notes: Restrictiveness of regulation is classified in the following way: unrestricted (0), permitted (1), restricted (2), prohibited (3)
Source: Authors’ coding based on Yes/No answer in the World Bank surveys (Survey IV, 2011).

In conclusion, it has been found already in earlier studies (for example, Barth, Caprio & Levine. 2008) that following the Basel guidelines and strengthening capital regulations and empowering supervisory agencies to a greater degree do not always improve banking-system stability.
4. Econometric analysis – methodology and results

4.1. Methodology and results of econometric analysis – panel data approach

We choose a panel data approach (whenever possible) as our major tool of estimation. By doing so, we want to receive an answer, if a certain institutional design of safety nets and the degree to which a central bank engages in supervisory process matter for financial stability.

In formulating regression models, we followed two ways. First, it was crucial to include in the models the relevant supervisory instruments as explanatory variables, in accordance with assumptions of our hypothesis. Second, we have reviewed previous empirical analysis on the use of macroprudential instruments and considered authors’ suggestions in building the models. We refer to a few sources later in the analysis.

There are several advantages of using panel data over cross-section or time-series analysis. Baltagi (2005, pp. 4-5) explains that techniques of panel data estimation can take heterogeneity among units into account by allowing for individual-specific variables. Panel data give more informative data, provides more variability, less collinearity among variables, as well as adds on degrees of freedom and more efficiency. Panel data are also better suited to study the dynamics of change, which is especially important to capture and underline in the study like ours.

By having a large size of the country sample and a short time period, we relate to the “standard” form of panel data. In such forms N (number of units) is very large, and often tends to infinity, whereas T (number of time periods) is fixed, and usually very small (T can be even 2 or 3 periods long). As Greene (2003, p. 284) explains, standard panel analysis techniques focus on cross-sectional variation, and the time-series (in case of “long series”) may be problematic.

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34 Detken et al. (2014) provide a discussion on various methodology used in similar research studies on early warning indicators. They favour signalling or discrete model approach over, for example classification trees. The trees, as authors indicate, although having some advantages, require still further research in order to assess this method’s adequacy and robustness.

35 This form is sometimes called ”short” panel data, although we would like to underline here the difference between normal, standard panel data and time-series cross-section framework (on TSCS see for example Beck and Katz, 1995; and for discussion on panel data and TSCS estimation with institutional variables see Maslowska, 2012), in which T tends to be larger than N. Most of the classical panel data books (Hsiao 2003; Baltagi 2005; Wooldridge 2002) focus their methodology on ”standard” panels, that is large N and T fixed (and small).
We use a fixed effect estimator. Hsiao (2003, pp. 41-43) explains that fixed effects are appropriate when one makes inference conditional on the effects that are in the sample. Considering degree of homogeneity of our sample and large differences from the rest of countries worldwide, we cannot treat our group of countries as a sample from a larger population or make inference about the larger population. Neither the choice of the sample can be viewed as a random draw. Additionally, standard errors are estimated using a White-type robust estimator, allowing for both heteroskedasticity and correlation over time.

As a robustness check we use an instrumental variable (IV) approach (and the usual Generalized Method of Moments (GMM) introduced by Hansen (1982) and Arellano-Bond (1991)). To use the OLS estimation method, errors must be homoscedastic and serially uncorrelated. One may expect to find heteroskedasticity in the disturbance term even in analysis including only OECD countries (Hsiao 2003, 269). GMM regression techniques additionally mitigate endogeneity concerns (independent variable being correlated with error term) and are recommended for panels built like ours: small T and large N.

A set of our key explanatory variables, design of deposit insurance, use of macroprudential instruments or central bank transparency naming a few, may have characteristics of slowly changing variables. Changing banking legislature allows us to observe some variability within time and across countries, but these legislation updates occur rarely. Persistent (or “quasi-persistent) variables create a problem of estimation using GMM because it is difficult to have first-difference equation with such variables. Wooldridge (2002, pp. 422-423) explains it is problematic, when explanatory variables do not change over time for any cross-sectional observations, or if they change by the same amount for every observations. Even though estimation with GMM are said to be more consistent than alternative methods (for example Two-Stage-Least-Square), we will make a set of robustness check using alternative methods.
4.2. Financial and economic instability – dependent variable

There is no one definition of financial stability but there are several early warning indicators, which inform about the potential threat of instability. Major indicators used in previous data analyses are those regarding growth in credit (total values or in relation to GDP) and asset price growth, for instance house prices.

The European Systemic Risk Board suggests another type of early warning indicator, a credit-to-GDP gap (Detken et al. 2014). Authors construct this variable from quarterly nominal credit and nominal GDP data. We use this ESRB recommendation and use it as an alternative definition of the dependent variable. Based on the data availability, we construct credit-to-GDP gap using credit-to-GDP data (both total credit and bank credit) using quarterly data whenever possible (data from BIS), or annual data found for a few countries from the World Bank via Macrobond. Gaps are calculated as follows:

1. The long-term trend is calculated using Hodrick-Prescott (HP) filter, where smoothing parameter lambda (λ) is set at 400000 for quarterly data, and 100 for annual data\(^{36}\).

2. The credit-to-GDP gap is the difference between the credit-to-GDP ratio and its long-term trend, resulting in a gap in percentage points.

The idea of this variable is to show how the actual size of credit (measured as a ratio of GDP) fluctuates around its potential, long-term size of required credit in comparison to each country’s economic size. Positive numbers, above its potential, indicate larger credit creation than necessary for the economy, considering its size. Negative values indicate shortage of such credit required by economies.

Figure 9 presents annual developments of total credit-to-GDP gaps (%) by dividing sample into crisis and non-crisis countries. Differences in credit-to-GDP gaps between two groups of countries are significant.

\(^{36}\) Detken et al. (2014) include a discussion on the right value of λ. In their opinion, its value should be greater for financial data. That’s why, although suggestions for annual data have been around λ=5-10, we also use here a greater value of 100.
Firstly, size of created credit in non-crisis countries recorded smaller variability during 2000-2014. Gaps are smaller, which means that the size of money available for growth was consistent with economies’ needs. Second, crisis countries observe growing trend of credit starting around 2005 with a peak in 2010. Difference between credit-to GDP gaps in 2005 and 2010 for crisis countries is approximately 30%. At the same time, non-crisis countries’ credit growth was negative and started uprising trend around 2007, with a small peak at the 5% level. Finally, we observe a quick drop in credit-to-GDP gap among crisis economies.

Similar developments in credit-to-GDP gaps are seen on the Figure 10, where we focus on the EU countries only. Here, differences between two samples are even greater. Growing trend for crisis-countries, although started similarly around 2005, reached positive gap values around one year earlier than crisis countries including non-EU countries.
Finally, Figure 11 presents credit-to-GDP gaps focus on transition countries, where non-crisis states are Estonia, Poland and Slovakia, whereas crisis-countries are Czech Republic, Hungary, Latvia, Lithuania and Slovenia. Detken et al. (2014) underline that these gaps for transition countries are usually smaller than for other EU countries. Additionally, major source of credit is usually a banking sector. This is visible also in our presentation of data. Dynamics of gaps among crisis countries are rather small, with a growing trend starting slowly around year 2003 and peaking in 2010. More striking is variability of gaps for three non-crisis countries, which is mainly driven by large negative gaps values before the crisis in Estonia, and much greater credit creation in this country starting from 2011. We explain this latter change with a need of recovering for a short-lived recession that occurred in Estonia soon after the burst of GFC.

Other competing variables, which could be considered as dependent variables are those connected with the banks’ balance sheets and informing about a threat of instability: size of bank’s nonperforming loans to gross loans, bank credit to bank deposit or a bank Z-score, assessing directly bank insolvency risk.
Finally, a separate group of measures informing about instability is a set of macroeconomic indicators, recently forgotten in favor of balance-sheet variables. Macro variables consist, for example, percentage change in the level of real GDP, percentage change in industrial production, reserves at central bank or equity market returns. We use these variables as our robustness check.

4.3. Early macroprudential and safety net institutional change and its effect on financial stability

We now analyze how the usage of various macroprudential and safety net instruments relates to developments in (bank) credit-to-GDP gaps and credit-to-GDP growth. For this purpose, we use the following base regression model:

\[ y_{i_t} = \text{GDP p. c.} + \text{Liquidity} + \text{External position} + \text{Banking sector concentration} + \text{Safety} \]  

where \( Y_{i,t} \) captures our dependent variable (aggregate or sectoral)\(^{37}\). Set of explanatory variables includes the following variables: GDP per capita; systemic liquidity, external position, banking sector concentration and a set of safety net variables. Sys-

\(^{37}\) We refer to credit by all institutions or banking sector.
Systemic liquidity is defined as bank’s credit as a fraction of total deposits. External position is a variable measuring external loans and deposits as percentage of domestic bank deposits. Safety is a set of variables, which describes a standard model of safety net. Throughout, we report White cross-section standard errors.

Size of economy, and especially values of GDP per capita is said to be positively correlated with the size of credit in a country. It means that the larger individuals income, the greater proneness to take loans and increase one’s consumption. Systemic liquidity captures non-core funding that is credit expansion funded from sources other than deposits. Since it is argued that non-banking credit institutions played the key role in providing extra credit to the market, we expect this variable to be positively correlated with the credit-to-GDP gaps.

External position is a variable describing cross-border capital flows; how much domestic individuals borrow and invest abroad. Here again, we expect a positive relation with a dependent variable. Finally, banking sector concentration is a measure of 5-bank asset concentration and explains how much the size of credit depends on the type of a banking sector. Larger values mean that there are just a few key banking institutions in the market; smaller values indicate that the banking sector is rather non-concentrated.

Safety defines our major explanatory variable set: macroprudential instruments; monetary policy instrument – obligatory reserves at a central bank; risk-disclosure requirement (especially important due to Basel III requirements); Tier 1 capital requirement; division of supervisory roles among institutions; deposit insurance coverage as % of country’s GDP.

Thanks to the collection of large and varying data set, we have estimated many similar models just changing the key explanatory variable – macroprudential or safety net instrument. The table shows only these outcomes of estimations, where we found interesting and significant results. By distinguishing countries with past crisis experience, we want to relate to our assumption that learning process is important in creating stable financial markets.
Table 22, describing variability of macroprudential instruments indicates that, at least for a combination of all instruments – MPI, there are significant differences among countries, also before year 200838.

Table 22. Bank credit-to-GDP gaps and macroprudential instruments during 2000-2007

<table>
<thead>
<tr>
<th></th>
<th>FE-estimator</th>
<th>FE-estimator</th>
<th>FE-estimator</th>
<th>FE-estimator (2000-2010)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP per capita</td>
<td>-0.001** (0.00)</td>
<td>0.00 (0.00)</td>
<td>0.00*** (0.00)</td>
<td>-0.00 (0.00)</td>
</tr>
<tr>
<td>Liquidity</td>
<td>0.09** (0.03)</td>
<td>0.06 (0.04)</td>
<td>0.04 (0.03)</td>
<td>0.25** (0.09)</td>
</tr>
<tr>
<td>External pos.</td>
<td>0.27*** (0.05)</td>
<td>0.15*** (0.03)</td>
<td>0.15*** (0.03)</td>
<td>0.02 (0.04)</td>
</tr>
<tr>
<td>Banking system</td>
<td>-0.21** (0.07)</td>
<td>-0.19* (0.09)</td>
<td>-0.21** (0.07)</td>
<td>-0.16** (0.07)</td>
</tr>
<tr>
<td>MPI</td>
<td>-0.26 (0.69)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MPI (past-crisis)</td>
<td>-0.79* (0.40)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reserves at CB</td>
<td></td>
<td>-1.55 (2.05)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reserves at CB (past-crisis)</td>
<td></td>
<td>-7.11** (2.82)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disclosure req.</td>
<td></td>
<td></td>
<td>-4.13 (3.69)</td>
<td></td>
</tr>
<tr>
<td>Disclosure req. (past-crisis)</td>
<td></td>
<td></td>
<td>-6.68** (3.05)</td>
<td></td>
</tr>
<tr>
<td>Deposit insurance</td>
<td></td>
<td></td>
<td></td>
<td>-2.84* (1.51)</td>
</tr>
<tr>
<td>Deposit insurance (past-crisis)</td>
<td></td>
<td></td>
<td></td>
<td>-10.28** (3.25)</td>
</tr>
<tr>
<td>R²</td>
<td>0.34</td>
<td>0.34</td>
<td>0.36</td>
<td>0.49</td>
</tr>
<tr>
<td>No. of observations</td>
<td>224</td>
<td>236</td>
<td>235</td>
<td>226</td>
</tr>
</tbody>
</table>

Notes:  
Liquidity – bank’s credit as a fraction of total deposits  
External pos. – a measure of external loans and deposits as a percentage of domestic bank deposits  
Banking system – a measure of 5 bank asset concentration  
MPI – macroprudential policy index  
Reserves at CB – reserve requirement  
Disclosure req. – risk management disclosure requirement  
Deposit insurance – deposit insurance coverage (dummy for above sample median)  
Tier 1 – Basel requirement for capital adequacy requirement  
Past-crisis – a dummy for countries that experienced financial crisis before between 1990-2007  
***, **, * Stand for significant at the 0.001, 0.05, 0.1 level  
Instruments: measure of financial openness, size of population, trade growth, dummy for crisis countries  
Source: Authors’ calculation.

38 At least sufficient for panel FE estimator. Some individual instruments appear only after the start of the GFC.
This justifies including it as an explanatory variable. The outcome is as expected, estimated coefficient has a negative sign (although insignificantly different from zero). Correcting the sample only for countries with past crisis experience suggests, that countries, which recovered from a crisis by focusing on macroprudential policy could manage sufficient quantity of credit better than others.

Variable Reserves at CB describing obligation of keeping reserves at the central bank has a negative estimated coefficient, however insignificant from zero. Again to highlight past crisis experience and at the same give information about the type of countries, where obligatory reserves could be important, we repeated estimation by adding dummy for past-crisis countries. This change indicates that one of the key instruments of monetary policy had been actively used before 2008, especially among countries, which experienced financial turmoil before 2008. To additionally detect, which countries, crisis or non-crisis used this instrument prior to the crisis and what is its relation to bank (credit)-to-GDP gaps, we performed estimations limiting sample to a particular group of countries. Results show (not shown in the table) that this negative relation is visibly significant from zero (at 0.05 level) among non-crisis countries. Expanding period of estimation until 2013 confirms our results that this monetary policy instrument was present especially among non-crisis countries.

We draw similar observations from estimation results using requirement to disclose risk management by banks. Presence of such a requirement (hence higher transparency of banks) was associated with negative gaps of bank (credit)-to-GDP gaps, Estimated coefficient was again significant in a subsample of past-crisis countries. Finally, a large data set of safety net design allowed us to construct a variable describing deposit insurance coverage, with respect to country’s GDP (see Figures 4 and 5 for data descriptive). Data for coverage was recorded three times: in 2003, 2010 and 2013 and is not sufficient for our panel. To overcome this problem, we create a new variable that describes, which countries had their coverage values above (or below) median for all countries in our sample. Later we assume that this information doesn’t change between 2003 and 2010. By stretching estimation period over 2007, we are able to catch changes before and after the burst of GFC and

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39 Our assumption originates from sluggishness of data, which requires legislation process for its variability.
keep original differences in spread of these variables between crisis and non-crisis countries. Results in Table 23 indicate that countries with greater DIS coverage have also observed smaller bank credit-to-GDP growth before the GFC soon after its burst. This effect is strengthen among, so-called past-crisis countries, indicating that a learning mechanism may play an important role in designing an effective safety net.

Additionally we have estimated models with:

1. Risk adjustment ratio – insignificant results
2. Tier 1 capital defined according to Basel requirements (I and II) – significant positive coefficient indicating higher capital requirement and positive values of credit-to-GDP gaps.

We draw our conclusion here cautiously because this variable changes rarely and in fact most of countries have similar 8% level. When corrected for past-crisis countries, estimated coefficient has expected negative sign (but insignificantly different from zero).

3. Central bank responsible for supervision – inconclusive, however results drawn towards positive values
4. Single supervision – similarly inconclusive, past-crisis countries estimated coefficient has a negative sign (as expected)
5. Presence of nonperforming loans definition (with all consequences) - negative sign regardless the sample.

4.3.1 Robustness check

We are most interested if our variables characterizing safety net and macroprudential instruments have a strong explanatory power also in our models and being estimated with alternative methods. To do so, we follow models constructed by Lim et al. (2011), where authors use credit growth to GDP as a dependent variable describing financial instability. Among explanatory variables, authors include lagged credit growth to GDP, GDP growth, interest rate and respective macroprudential instrument.
Table 23. Bank credit-to-GDP growth and macroprudential instruments during 2001-2008

<table>
<thead>
<tr>
<th>Model</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y(-1)</td>
<td>0.44*</td>
<td>0.64**</td>
<td>0.56**</td>
<td>0.82***</td>
<td>0.74**</td>
</tr>
<tr>
<td></td>
<td>(0.025)</td>
<td>(0.19)</td>
<td>(0.18)</td>
<td>(0.22)</td>
<td>(0.26)</td>
</tr>
<tr>
<td>GDP growth</td>
<td>0.015**</td>
<td>0.016**</td>
<td>0.017**</td>
<td>0.011***</td>
<td>0.014**</td>
</tr>
<tr>
<td></td>
<td>(0.005)</td>
<td>(0.005)</td>
<td>(0.007)</td>
<td>(0.002)</td>
<td>(0.005)</td>
</tr>
<tr>
<td>Interest rate</td>
<td>-0.006*</td>
<td>-0.01**</td>
<td>-0.009**</td>
<td>-0.009</td>
<td>-0.01**</td>
</tr>
<tr>
<td></td>
<td>(0.003)</td>
<td>(0.004)</td>
<td>(0.004)</td>
<td>(0.006)</td>
<td>(0.004)</td>
</tr>
<tr>
<td>MPI</td>
<td>-0.01**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.005)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reserves at CB</td>
<td></td>
<td>-0.044*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(past crisis)</td>
<td></td>
<td>(0.02)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disclosure req.</td>
<td></td>
<td></td>
<td>-0.057</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(past crisis)</td>
<td></td>
<td></td>
<td>(0.04)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deposit insurance</td>
<td></td>
<td></td>
<td>-0.015**</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.007)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tier 1</td>
<td></td>
<td></td>
<td></td>
<td>-0.002*</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.001)</td>
<td></td>
</tr>
<tr>
<td>J-stat</td>
<td>0.26</td>
<td>0.012</td>
<td>0.015</td>
<td>0.917</td>
<td>0.011</td>
</tr>
<tr>
<td>Sargan p-value</td>
<td>0.606</td>
<td>0.912</td>
<td>0.901</td>
<td>0.34</td>
<td>0.917</td>
</tr>
<tr>
<td>No of obs.</td>
<td>200</td>
<td>213</td>
<td>216</td>
<td>156</td>
<td>158</td>
</tr>
</tbody>
</table>

Notes:
Y(-1) is one-year lagged bank credit-to-GDP growth
Interest rate – Overnight interbank interest rate corrected for inflation
MPI – macroprudential policy index
Disclosure req. – risk managements disclosure requirement
Deposit insurance – deposit insurance coverage (dummy for above sample median)
Tier 1 – Basel requirement for capital adequacy requirement
***, **, * Stand for significant at the 0.001, 0.05, 0.1 level
J-stat – Hansen’s J statistics for over-identification test
Sargan p-value – Sargan test for over-identifying restrictions

Source: Authors’ calculation.

The use of lagged values of the dependent variable among explanatory creates a dynamic panel framework. The suggested Arellano Bond (AB) strategy of estimation is suggested in such a framework, and additionally in situations with small T-large N panels, RH variables not strictly exogenous, and unobserved heterogeneity. Results of estimation are presented in Table together with the list of instruments used in estimation and statistics for J-value and Sargan p-value, determining the validity of the over-identifying restrictions.
Our results confirm the role of safety net instruments in explaining variability of bank credit prior the crisis. Estimated coefficients of other explanatory variables, their direction of relationship are also in line with Lim et al. (2011) results (scale may differ to differences in data frequencies – annual in our case). All in all, cautiousness of financial system expressed in institutional barriers imposed by legislators seems to coincide with smaller credit growth.

4.4 Increased degree of central bank transparency and its effect on minimizing the costs of financial crisis

Importance of clear communication between central banks and financial markets has been widely discussed for many years. Although high transparency is considered a positive factor improving market efficiency, there are doubts whether transparency size is limitless. Analyzing central banks’ behavior after the burst of financial crisis in 2007, one cannot keep unnoticed a fact of sudden backward trend. Monetary policy-makers found themselves in an unknown territory and decided at first to limit the amount of information sent to the public. Soon after that, several central banks (Reserve Bank of New Zealand, Norges Bank- Norway, Riksbank-Sweden and Federal Reserve in U.S.) decided to increase their transparency by publishing a variety of macroeconomic predictions. These actions prove that degree of central bank communication is evolving and gives us the basis for our next hypothesis: clear central bank communication ex-ante and ex-post financial crisis about monetary and supervisory policy helped to decrease the proneness of financial market to that crisis.

The key explanatory variable, central bank transparency, originates from two sources and relates to two different types of transparency:

- (Monetary policy) Central Bank Transparency index (Dincer & Eichengreen 2014) – this index covers questions regarding information on the goals of central banks, the goal’s precise quantification, availability of economic data required for monetary policy decisions, etc.,

- Financial Stability Transparency Index (Horváth & Vaško 2016) – the index focuses in depth on communication with financial market by means of publishing Financial Stability Report, frequency of its publication, precise indica-
tion of financial stability as a goal of central bank, existence of communication in macro-prudential policy, etc.

Table 24. Effect of central bank transparency on real macroeconomic variable - output gap and debt to GDP ratio

<table>
<thead>
<tr>
<th></th>
<th>FE estimator</th>
<th>FE estimator</th>
<th>FE estimator</th>
<th>GMM estimator</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP per capita</td>
<td>0.001* (0.0009)</td>
<td>0.001**(0.000)</td>
<td>0.001* (0.000)</td>
<td>-0.000</td>
</tr>
<tr>
<td>Credit/ deposit</td>
<td>0.10**(0.046)</td>
<td>0.22**(0.067)</td>
<td>0.06 (0.05)</td>
<td>0.10**(0.03)</td>
</tr>
<tr>
<td>External position</td>
<td>0.01 (0.14)</td>
<td>0.08 (0.22)</td>
<td>0.10 (0.14)</td>
<td>-1.86**(0.76)</td>
</tr>
<tr>
<td>Banking system</td>
<td>-0.20**(0.07)</td>
<td>-0.27*** (0.07)</td>
<td>-0.22*** (0.06)</td>
<td>-0.41**(0.13)</td>
</tr>
<tr>
<td>Transparency – levels</td>
<td>-1.83*** (0.69)</td>
<td></td>
<td></td>
<td>-2.79(1.82)</td>
</tr>
<tr>
<td>Transparency – difference</td>
<td></td>
<td>-1.27 (0.98)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transparency – non-crisis</td>
<td></td>
<td></td>
<td>-1.65*** (0.36)</td>
<td></td>
</tr>
<tr>
<td>Number of observations</td>
<td>255</td>
<td>255</td>
<td>255</td>
<td>215</td>
</tr>
</tbody>
</table>

Notes:
- Credit/deposit – ratio of banks’ credits to their deposit
- External position – a measure of external loans and deposits as a percentage of domestic bank deposits
- Banking system – a measure of 5 bank asset concentration
- Transparency – measure (in levels or first-difference) of financial transparency, as defined by Horváth & Vaško (2016)
- Non-crisis – a dummy variable describing countries classified as non-crisis during GFC
- ***, **, * Stand for significant at the 0.001, 0.05, 0.1 level

Source: Authors’ calculation.

Analyzing effects of varying degree of central bank transparency we assume that clear central bank communication contribute to greater financial stability and prevent fast increase in credit growth or large positive fluctuation of credit from its potential level.

As previously, we choose credit-to-GDP gap and credit-to-GDP growth as variables defining financial instability. Tests are performed using alternative techniques of Fixed Effects (FE) estimator and GMM. Other explanatory variables, as previously, describe systemic liquidity, size of capital flight and banking sector concentration.
Based on the results summarized in Table 24, we can draw a conclusion that smaller growth of credit/GDP is present in countries having more open central banks. Greater communication of a central bank, especially in the area of financial stability, disclosure of its financial forecasts and stability report is associated with smaller credit growth. This effect is especially visible among countries classified after 2008 as non-crisis.

4.4.1 Robustness check
Entering FST variable with greater lags is at the cost of number of observations. To correct for this loss and still to underline importance of transparency on real macroeconomic values, we have created two dummy variables: one that indicates 1 for period before 2008, and second that indicates 1 for period after 2007.

We perform a robustness check of financial transparency by checking its association with costs of economy; in particular output gap and public indebtedness (debt/GDP). Table 25 reports results of model estimation, where one of explanatory variables is lagged dependent variable and second is a measure of financial or monetary transparency corrected for time dummy variable.

Table 25. Effect of central bank transparency on real macroeconomic variable - output gap and debt to GDP ratio

<table>
<thead>
<tr>
<th></th>
<th>Output gap</th>
<th>Debt/GDP</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FST (before 2008)</td>
<td>Monetary (before 2008)</td>
</tr>
<tr>
<td></td>
<td>1.5992***</td>
<td>Monetary (after 2008)</td>
</tr>
<tr>
<td></td>
<td>FST (after 2008)</td>
<td>Monetary (after 2008)</td>
</tr>
<tr>
<td></td>
<td>-1.2623***</td>
<td>Monetary (after 2008)</td>
</tr>
</tbody>
</table>

Notes:
Panel Generalized Method of Moments with fixed effects and White cross-section standard errors. Instrumental variables for output gap: trade growth, credit growth/GDP, size of population; and for debt/GDP: trade growth, population size, growth of domestic expenditure. ***, **, * Stand for significant at the 0.001, 0.05, 0.1 level
Source: Authors’ calculation.
Econometric analysis – methodology and results

This time dummy approach indicates that there is a change in relations between transparency and output gap (debt/GDP) after the burst of the crisis. After 2007 greater transparency was associated with negative output gap and positively with greater debt/GDP ratio. Based on the data we know that degree of central bank transparency have increased since the burst of the crisis. At the same time we know that there are many other elements, spillover of financial crisis that affected worsening of these two macroeconomic variables.

We perform one more test to underline the evolution of central bank transparency over time and its importance ahead of the crisis by modifying the data and calculating changes in levels of variables in question. The general form of this model, a form of ‘comparative-static’ is

\[ \Delta y_i = \beta \Delta Transparency_i + \gamma \Delta Z_i + \varepsilon_i \]  \hspace{1cm} (2)

where the dependent variable \( \Delta y_i \) reflects the change in the macroeconomic leading indicator (change in output gap or Debt/GDP ratio) between 2000 and 2009 (alternatively we have two other periods 2005- 2009 and 2007-2009). Large changes in macroeconomic variables represent large economic loss that originates from the financial crisis. \( \Delta Transparency_i \) stands for a change in degree of central bank transparency and hence represents its evolution over time. By keeping three periods, we underline the importance of early introduction of greater transparency for the whole economy. \( \Delta Z_i \) represents a set of other explanatory variables according to theory suggestions, and \( \varepsilon_i \) stands for error.

Such defined model is similar to First-Difference Model, which allows for diminishing possible omitted variable bias. According to our hypothesis and previous results, we would expect greater central bank transparency to decrease the costs of crisis. Table 26 reports estimation results. Neither Financial Transparency Index (FST) nor Monetary Transparency Index (Monetary) have their estimated coefficients different from zero (they have expected positive signs, though) in a model explaining changes of output gap (hence not reported). Since previous analysis showed a bit different results, we have decided to combine effects of these two indices by introducing an interrelation variable \( FST \times Monetary \).
Table 26. Effect of central bank transparency on real macroeconomic variable – ‘comparative-static model’

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Period</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employment growth</td>
<td>0.4995**(0.20)</td>
<td>0.5291**(0.24)</td>
<td>0.7524**(0.23)</td>
</tr>
<tr>
<td>Trade growth</td>
<td>0.1362**(0.05)</td>
<td>0.1359**(0.05)</td>
<td>0.2373*** (0.05)</td>
</tr>
<tr>
<td>FST*Monet</td>
<td>0.0881*(0.14)</td>
<td>0.0713(0.39)</td>
<td>0.5041(0.79)</td>
</tr>
<tr>
<td>Adjusted R²</td>
<td>0.14</td>
<td>0.37</td>
<td>0.44</td>
</tr>
<tr>
<td>No. of countries</td>
<td>29</td>
<td>29</td>
<td>29</td>
</tr>
</tbody>
</table>

Notes:
OLS, HAC standard errors in parentheses.
***, **, * Stand for significant at the 0.001, 0.05, 0.1 level
Source: Authors’ calculation.

Based on the results in the first column, we conclude that countries, which increased level of communication and general transparency in both monetary and financial areas way, observed smaller variability in their output gap.

Figure 12. Cross-country relation between change in output gap and change in Financial Transparency and Monetary Transparency Indices (the sum of) between 2000 and 2009

Source: Authors’ calculation.
In period 2007-2009 the magnitude of this relation is increasing, but estimated coefficients are not significantly different from zero. We depict relationship between combined transparency types and output gap changes in Figure 12.

4.5 Development of independence, transparency and accountability of central bank and supervisory institutions and their effect on financial stability

Importance of institutional quality on economic performance is widely known and discussed. Until today, literature has proven many such relations on macroeconomic variables, for example seminal study on relationship between central bank independence and inflation; or the existence of checks and balances (general rule of law) on economic performance. Our analysis contributes to this area of studies by analyzing effects of independence, transparency and accountability of supervisory institutions. Majority of such indices are constructed for central banks to underline its importance. In the course of data extraction, we were able to identify also certain qualitative characteristics for other supervisory agencies.

Measures of transparency are the same as previously mentioned. Additionally, Liedorp et al. (2013) provides a new measure of banking supervisors’ transparency. Their index is constructed for 24 institutions in year 2010 and include political transparency (goals and objectives), economic (laws and regulations), procedural (strategy), policy (formal interventions) and operational (self-assessment). We include this variable in our post-crisis analysis with a caution, since, as authors explain, it is in general difficult to identify factors that explain differences across supervisors (including crisis event).

As previously, we define proneness to financial instability as change in credit growth. Our unchanged independent variables are: GDP growth and short-term interbank interest rate (both extracted from OECD Statistics). We define pre-crisis as year 2007, whereas 2009 is taken as post-crisis period (2010 if data comes from IMF Survey).

Measure of accountability enters the model with a negative sign; countries with greater central bank accountability have also observed slower credit growth.

40 Here, institutions included in the analysis are non-central bank institutions, which are responsible for banking supervision.
Expectations about government effectiveness enter also with a negative sign. These results are difficult to analyze. In general one could expect that positive opinion about government's work should create certainty in the market and increase willingness to take loans. We have checked this estimation using panel data and longer series and we have received a positive sign and statistically significant at 5% level. Additionally, supervisory system where there are two supervisors and one of them is a central bank seems also, at least in 2007 be negatively correlated with banking credit growth. Financial transparency, as previously, has an estimated coefficient with a negative sign.

Table 27. Cross-country analysis – effect of qualitative measures on financial stability (banking sector credit growth – dependent variable), pre-crisis

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(5)</th>
<th>(6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP growth</td>
<td>0.0266**</td>
<td>0.0311**</td>
<td>0.0246*</td>
<td>0.0192*</td>
<td>0.0165**</td>
</tr>
<tr>
<td></td>
<td>(0.01)</td>
<td>(0.01)</td>
<td>(0.01)</td>
<td>(0.01)</td>
<td>(0.007)</td>
</tr>
<tr>
<td>Interest rate</td>
<td>0.0035</td>
<td>0.004</td>
<td>0.0015</td>
<td>0.0015</td>
<td>0.0004**</td>
</tr>
<tr>
<td></td>
<td>(0.004)</td>
<td>(0.02)</td>
<td>(0.004)</td>
<td></td>
<td>(0.00)</td>
</tr>
<tr>
<td>M2GDP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.0004**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.00)</td>
</tr>
<tr>
<td>FST</td>
<td>-0.0123**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.005)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Account</td>
<td></td>
<td></td>
<td>-0.009**</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.004)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GEfffect</td>
<td></td>
<td></td>
<td></td>
<td>-0.258*</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.01)</td>
<td></td>
</tr>
<tr>
<td>Supervision-</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>multijCB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjusted $R^2$</td>
<td>0.45</td>
<td>0.47</td>
<td>0.30</td>
<td>0.30</td>
<td>0.67</td>
</tr>
<tr>
<td>Countries</td>
<td>26</td>
<td>17</td>
<td>26</td>
<td>26</td>
<td>24</td>
</tr>
</tbody>
</table>

Notes:
FST – Financial Transparency Index (Horváth & Vaško 2016)
MonetTrans – Monetary Transparency Index (Dincer & Eichengreen 2014)
Account – Accountability Index (Matysek-Jędrzych 2014)
GEfffect – Government Effectiveness (Kaufmann, Kraay & Mastruzzi 2010), Supervision-MultiCB – type of supervision, where there are two supervisory agencies and one of them is a central bank (IMF Survey)
***, **, * Stand for significant at the 0.001, 0.05, 0.1 level
Source: Authors’ calculation.

Other qualitative variables tested but not mentioned in the table due to inconclusive results were: number of supervisors, political stability (people's expectations of), regulatory quality (expectations), rule of law (expectations), other forms of su-
pervision model (central bank alone, multi without central bank, single), length of tenure of supervisors.

Last column eliminates interest rate and replaces with growth of M2 as percentage of GDP and includes these explanatory variables, which had the strongest relationship on the speed of credit growth and included larger set of countries, that is FST and Supervision-MultiCB.

Estimation results made for data in 2009 do not provide conclusive results. In general, the signs of estimated coefficients were similar to those in 2007, but none of those was significantly different zero. The fact of having a single supervisory body being a central bank was positively correlated with credit growth in 2009. This and previous result lead us to conclusion that the period after 2008 is very difficult to analyze. There has been a regime change, and therefore it is difficult to draw conclusions based on the same models.\textsuperscript{41} This suggests need for further analysis.

\textsuperscript{41} We draw this conclusion based on raw data analysis rather than, for example, Chow test for structural break.
Conclusions, discussion and recommendations

In a 2012 recommendation about liberalization and management of capital, the International Monetary Fund adjusts its opinion favoring high capital mobility to correct for each country's institutional development (IMF 2012). Doing so, the IMF underlines that even their recommendations stopped being general and suited for all.

The purpose of this study was to identify differences among seemingly similar countries (OECD) in respect to their safety net design and a supervisory role played by central banks. The literature review on financial safety net design, macroprudential instruments and the role of central banks before and after the start of the GFC is followed with an extensive characterization of countries’ financial regulations.

Benefiting from the data collected from different sources (IMF Surveys and Cerutti et al. 2015, among others) we were able to prove our major theme of this study: designing general “one for all” supervisory and macroprudential standards does not make a country immune to the crisis. Similarity of various supervisory standards across countries was substantial, leading us to search for a few differences and institutional arrangements, which we are often hasty to reject (standard reserve requirement for banks or increased central bank transparency, just to mention a few).

Based on the literature review we find that there is a growing intensity of both theoretical discussion and practical implementation of macroprudential approach in supervisory and regulatory architecture. The institutional structure of financial supervision is evolving, but there is no consensus and no dominance of any of existing regulatory regimes (conservative vs. innovative). However, it can be observed that countries, which were able to avoid the Global Financial Crisis, did not introduce any significant changes in supervisory structures in the period of decade before the crisis. What can be also observed are the evolving institutional arrangements in relation to the central bank. The new perspective of central banking will be defined by, among others: the possibility of targeting financial stability, the trade-off between central bank credibility, independence and the policy of financial system
procyclicality reduction and the arrangements for relations between central bank and government.

Widespread compatibility of Basel I and II capital requirements in all countries brings us to a conclusion that fulfilling general, “one size for all” prudential rules do not always help a country avoid the crisis. An example of Denmark, described in a sub-section regarding resolution scheme, could act as a warning for other countries (and a recommendation for institutions of financial safety net) to adjust their capital requirements based on individual assessment rather than international standards.

We have not noticed large differences in various leverage components, either, although they were slightly stricter among non-crisis countries. Data comparison showed, however that five countries (among them Poland), all classified by ESRB as non-crisis, had their capital requirements prior the crisis higher than the standard 8 percent. Additionally, non-crisis countries imposed stricter restrictions on banks in regard to their non-banking activities prior the crisis (securities, insurance and real estate activities). Although estimation with FE-estimator were inconclusive, estimations with an alternative model and the GMM estimator showed that there may be negative relationship between size of capital requirements and growth of banking credit (the higher credit requirement, the smaller credit growth). Adding risk-management disclosure requirement as one of the safety net variable we wanted to refer to the newest Basel III requirements. Based on the estimation results (negative sign of the coefficient) we would support introduction of this instrument and highlight the need for greater commercial banks (financial institutions) transparency.

Deposit insurance scheme (DIS) is one of the key elements of the financial safety net. We devoted a large sub-section to this matter due to controversial nature of the deposit insurance (compare sub-section 3.4.). Some studies claim it creates a moral hazard problem and led banks to indebted to a greater extent. On the other hand, Finland is an example, where the government’s assurance of covering all deposits

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42 Based on the report of Danish Ministry of Business and Growth, which mentions easing of capital adequacy requirements to the international standards as one – among many – causes of recent banking crisis.
(also those in co-operative banks) stopped the “run on banks” during the 1990s crisis.

In the period before the Global Financial Crisis only three countries out of the whole sample lacked an explicit deposit insurance scheme (i.e. Australia, Israel and New Zealand, although Australia introduced an explicit DIS during period 2007-2013). However, analyzing the size of explicit deposit insurance coverage, we have noticed large differences with non-crisis largely outperforming crisis countries, especially a few years prior the crisis. This gap between two groups disappears in 2013 in absolute terms (crisis countries increase coverage as measured in US $), but the size of coverage as % of GDP per capita is still significantly larger in non-crisis countries.

There are also large differences in relation to the administration of deposit insurance. In non-crisis countries group most of DIS are administrated jointly between the public and private sectors (52,94%), whereas in the group of ‘crisis’ countries, on the other hand, only 35,29% of schemes are administrated jointly (almost half of them have DIS administered publicly).

To verify, which theory may be true among the OECD countries and during the GFC, we estimated our general model using a DIS-based variable. Our safety net variable describes the size of coverage of explicit deposit insurance defined as statutory limit as a percentage of GDP per capita. As expected, estimated coefficient for DIS suggests that this element of the safety net is important in controlling the speed of credit growth both before and during the crisis (our analysis stretched till 2010). This correlation is even stronger (and statistically significant) for countries, which experienced crisis in the past; again indicating that learning mechanism matters.

Results of previous empirical studies are rather inconclusive. A study focusing solely on 15 European Union countries, performing an analysis for 128 banks from 1992 to 1998 find that the establishment of explicit deposit insurance significantly reduces the risk taking of banks (Gropp and Vesala 2001). Based on a panel of 61 countries (both developed and emerging economies) from 1980 to 1997, Demirgúc-Kunt and Detragiache (2002) find that explicit deposit insurance tends to be detrimental to bank stability. However, using a microdata of 4000 banks in 96 countries,
Anginer, Demirgüç-Kunt and Zhu (2014) show that especially during systemic instability period 2007-2009 that DIS works stabilizing on the financial system.

Reasons for such a diverse scope of results can be traced in several analysis design elements. First, the choice of sample matters significantly. Our results confirm study by Gropp and Vesala (2001) and the choice of sample is similar, since we also focus on developed countries with strong institutional structures. Second, the time-span is important, as well. Analysis of our study covers the most recent period since year 2000 to assure that there is no large institutional diversity within the analysed period in each country. By stretching our analysis over the recent crisis, we add the value-added to the literature by indicating the importance of DIS. Therefore, based on results from our study, as well as those previous ones focusing mainly on EU member states, we make a recommendation of strengthening the importance of the explicit deposit insurance scheme for the sake of financial stability.

Literature on GFC causes and consequences announces possible changes in the way monetary policy is made in the future. Our empirical analysis showed that “death of classical monetary policy” might have been called too soon. Based on estimations (together with an alternative model and two different estimators), we have showed that countries, which had reserve requirement (RR) present prior to the crisis had observed smaller growth of banking credit, as well as their credit-to-GDP gaps were not rising before the crisis. By introducing a dummy for countries, which experienced crisis before 2007, we have shown that learning mechanism might be working here.

Walsh (2012) explains that reserve requirements can be analyzed as a tax on bank intermediation, and therefore the role of RR depends on the market structure of the banking system. The less developed financial system, the more effective RR is in suppressing credit growth. This has been shown in a study analyzing Latin American experience prior and post GFC. Tovar, Garcia-Escribano and Vera Martin (2012) show that RR have a moderate and transitory impact in slowing the pace of credit growth. Particularly in Colombia and Peru, unsuccessful interest rate tightening in response to an unsustainable flow-driven credit boom in Colombia and Peru during 2006-2008 was supported with reserve requirement to contain the risk. Re-
serve requirements were also successfully used in the aftermath of the 2009-09 global crisis to manage excessive liquidity (Montoro & Moreno 2011). In a more heterogeneous sample of 49 countries and period 2000-2010, Lim et al. (2010) find RR to be effective in reducing the procyclicality of credit growth, at least in the short run.

Raising reserve requirements decreases probability of attracting capital inflows, which might occur in result of an increase in policy rate. They tighten domestic financing conditions, while keeping deposit rates stable. Hence RR can be used individually or to strengthen the effectiveness of monetary policy. Especially during periods of rising inflation or rapid credit growth, raising RR may be more effective because they directly affect the supply of credit (Montoro & Moreno 2011). Moreno (2008) underlines this to be important in countries where financial markets are less developed and pass-through mechanism is smaller.

Since our report, using the most recent data confirmed results of previous studies, we think that a decision to eliminate reserve requirements from a monetary policy array may be ill-conceived. Polish financial market is still considered as underdeveloped and faces threats of excessive capital flows similarly to other emerging markets. Therefore, central banks, including the Polish one, should actively adjust its reserve requirements accordingly to the size of credit growth, because next to being a typical instrument of monetary policy, it seems to be effective as a macroprudential policy instrument.

Although we perform our analysis by introducing one safety net instrument at the time, it is difficult to imagine they would stop working if a country would introduce several of them simultaneously. Additionally, we use a complex measure describing size of macroprudential instruments used across countries. Estimated coefficient has a negative sign indicating that the larger number of instruments used (the greater MPI), the smaller credit growth and negative credit-to-GDP gap.

The effect of central bank transparency (CBT) on macroeconomic indicators has been studied in depth only in recent years. We have not found, however, many studies, which would focus on the role of CBT in financial stability. Analyzing the role of CBT for guiding private sector forecasts, Ehrmann, Eijffinger and Fratzscher
(2010) find empirical evidence that several of transparency measures are effective in smoothing forecasts updates and in result reducing of forecasters’ disagreement. The role of publishing the Financial Stability Reports (FSRs) on stock market stability has been analyzed by Born, Ehrmann and Fratzscher (2011b). Authors show that CB financial transparency contains important information for the financial market; such communication eliminates noise and move stock markets in the expected direction. FSRs are in this respect superior to speeches and interviews, since, as authors explain, the latter affect the market only moderately and cannot reduce market volatility.

By including indicators of CBT (especially transparency regarding financial stability) into the model explaining variability in credit, we contribute to the existing literature with new recommendations. Based on the estimations for the period prior the crisis, we conclude that CBT worked as an additional cushion against excess credit growth. This effect is especially visible among non-crisis countries. By testing for effect of CBT on output gap, we contributed to this area of studies, which measure macroeconomic costs of the GFC. Our tests showed that introducing greater monetary and financial transparency early enough (for example in 2000) is associated with output staying above its potential level also during the crisis. Based on our results and those mentioned above, we underlined the importance of proper central bank communication, also in the area of financial stability (e.g. central banks covering financial stability issue; publishing financial stability reports, their coverage and forward-looking character; publishing stress test results). Central banks financial stability reports have become more and more important for financial markets and hence, we strongly recommend the central banks to follow the similar path of communication.

In a series of cross-country analysis, we incorporated several other institutional arrangements that could improve financial stability. These were variables measuring central bank accountability and independence, government effectiveness, division of responsibility for supervision in a country, as well as a measure describing transparency of banking supervisors. In general, results help us to draw a conclusion that it is important to care for high quality of institutions since they send a signal to
many market participants, also to those at financial markets. We find that high degree of central bank accountability is negatively related with banking sector credit growth. Similarly, a central bank playing an active role in a supervisory process may help in controlling the speed of credit growth. Recent financial crisis revealed that strict division of financial supervision duties among institutions involved is ineffective. Therefore, we underline the importance of their cooperation, sharing of expertise and flow of macroeconomic and financial information.

We underline the problem of “one size does not fit all” in relation to the institutional arrangements, but at the same time it is possible to identify some common characteristics of financial safety net, helping to avoid financial turmoil.
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