

The effectiveness of policy interventions in CEE countries

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Abstract

This paper assesses the effectiveness of intervention measures adopted by central authorities during 2005-2012 in CEE. We investigate their impact on bank stability in 15 countries from CEE using bank-level data and OLS estimation method. The bank stability is proxied by the natural logarithm of the Z-Score and the non-performing loans to gross loans ratio. Empirical findings suggest that interest rates cuts, as well as domestic and foreign liquidity injections have a significant impact on bank stability in Emerging Europe. Moreover, their effectiveness differs according to several bank characteristics. Policy measures adopted by CEE countries significantly reduced the stability of domestic banks, but increased the stability of banks with a lower level of capitalization. The impact on the Z-score of banking system liquidity policy measures and the policy interest rates cuts is significantly lower in the case of domestic banks, amplified for less-capitalized banks (except for the category regarding banks' solvency), while their impact on large banks remains statistically insignificant.

Keywords: crisis, policy interventions, bank stability, CEE

1. Introduction

Countries around the globe were affected differently by the 2008 global financial crisis, based on their financial and economic particularities. The main distinction refers to advanced economies and emerging economies. While the crisis began in one of the most important global economies, it spread rapidly to Western European economies and finally to Emerging European countries.

As noted by Bakker and Klingen (2012), Emerging Europe was hit hard due to the dependence on capital flows from Western countries, particularly from

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parent banks. After a long period of continued credit growth and prosperous years in early 2000, the lack of liquidity in the banking system after 2008 led to the destabilization of the financial system and economic contraction. Based on World Bank data, the Baltic States were the most affected countries, recording an economic contraction of over 14% and unprecedented levels of nonperforming loans in 2009 (e.g., 24% in Lithuania, 14% in Latvia). On the other hand, Poland succeeded in managing the consequences of the financial crisis, being the only country with economic growth (2.6%) and limited nonperforming loans (4.3%) in 2009.

In order to manage the consequences of the financial crisis and restore the confidence in financial markets, central authorities adopted a series of extraordinary measures. The priority of European policy interventions was to stabilize the banking system. The aid offered by national authorities amounted to 13.1% of European Member States GDP from September 2008 to December 2011 (International Monetary Fund, 2013).

The differences across economies imposed different actions taken by national central authorities. While in advanced economies, the predominant policy measures, according to Petrovic and Tutsch (2009), refer to state guarantees (Sweden, Spain, Austria, Belgium, Germany etc.), state loans (Denmark, France etc.), acquisition of impaired assets (Ireland, Italy, Denmark etc.) or even nationalization (Austria, Germany, Ireland, The Netherlands, Portugal, United Kingdom), in emerging countries the most used measure was the relaxation of reserves requirements, followed by an increase in deposit insurance coverage (Bakker and Klingen, 2012).

Bakker and Klingen (2012) have studied and gathered the measures adopted by emerging European countries and divided them into three categories: banking system liquidity policy measures, policy measures to protect bank solvency and monetary policy rate changes for the period 2008Q4 to 2009Q2. We focus our attention on the following Central and Eastern European countries: Albania, Bosnia and Herzegovina, Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Macedonia, Montenegro, Poland, Romania, Serbia and Ukraine.

National authorities intervened to provide liquidity to emerging Europe through different types of measures. As already noted, the most commonly used tool was the relaxation of reserves requirements, which was implemented in the majority of our sample countries, except Albania, Estonia and Macedonia. This measure was used several times in each country, at the end of 2008 or beginning of 2009. For example, in Bulgaria, this was adopted in October and December 2008, and also in January 2009. In Latvia, central authorities eased the levels of required capital three months in a row: October, November and December 2008 (see Table 1 from Annexes).

Several countries introduced domestic and foreign liquidity injections, based on swap and repo arrangements with Western central banks. According to Allen and Moessner (2010), Hungary and Poland received euro swap lines from ECB, amounting to €5, and, respectively €10 billion, and also Swiss franc swap lines. The Central banks of Latvia and Estonia entered into an agreement with the central banks of Sweden and Denmark. To avoid bank runs, deposit insurance coverage was increased in all countries. After the collapse of Lehman Brothers, the level of deposit insurance was raised to a minimum of €50,000 from €20,000 in Europe. To prevent depositor concerns and massive withdrawals, Lithuania raised this level to €100,000 (Stolz and Wedow, 2010).

Latvia's financial difficulties called for interventions in individual institutions, through liquidity and capital injections. This was the only country from our sample which was forced to recourse to nationalization, taking over the second largest bank from the system (Parex Bank). According to Laeven and Valencia's (2012) definition of systemic banking crises, Latvia and Ukraine were a systemic case, extensive liquidity support and significant guarantees on liabilities, in addition to bank nationalization, being necessary to stabilize the banking system. Hungary met only two of the criteria established by the authors, being classified as a borderline systemic banking crisis.

In order to strengthen the bank's capital position, Hungary set up recapitalization funds, while Bulgaria and Montenegro called for relaxation of loans classification and provisioning requirements, thus making it less costly for banks to renegotiate loan terms with their customers.

Interest rates were lowered at unprecedented levels, not only in Europe, but globally. The Fed's policy rate was reduced to 0.25% in December 2008, level maintained until December 2015 when it was raised to 0.50% (Global, 2016). ECB's interest rate was 1% in May 2009 and was recently reduced to 0.00% (European Central Bank, March 2016).

Central authorities from Central and Eastern Europe also adopted an expansionary monetary policy (see Table 1, from Annexes). Hungary's first interest rate cut was in November 2008 to 11.00% from 11.50%, going further to 3% in December 2013, reaching in March 2016 a 1.20% level (Magyar Nemzeti Bank, 2016). In Latvia, interest rates were gradually reduced to 0.25% (November 2013) from 6% in May 2007 (Latvijas Banka, 2016). Other countries that gradually dropped their main interest rates were Poland, Romania, Czech Republic, Serbia, Macedonia, Ukraine. Poland lost 4.25% from November 2008 (5.75%) until March 2016 (Narodowy Bank Polski, 2016), while Romania 8.50%, from 10.25% in February 2009, to 1.75% in May 2015 (Banca Nationala a Romaniei, 2015).

The aim of this paper is to determine the effectiveness of the measures adopted in Central and Eastern European countries during the 2008Q4 – 2009Q2 period based on their impact on financial stability. Further, we analyze the banks'

responses to policy interventions based on their characteristics, i.e. ownership, size and capital structure. We chose this period because the first government reactions to financial difficulties have a long-term impact on market behavior and the following measures adopted.

We alternatively proxy financial stability by the natural logarithm of Z-score and by the non-performing loans to gross loans ratio. Policy interventions are defined as dummy variables at country-level, for each category and sub-category of measures, taking value one if the measure was implemented in a specific country (from the implementation year until the end of our period) and zero otherwise. Further, we computed an aggregate index which covers the three main categories, taking values from 0 to 3, normalized to take values between 0 and 1. In addition, the empirical specifications include control variables, such as: bank size, capital structure, asset structure, liquid assets, banking concentration, bank deposit to GDP, net interest margin, GDP growth and inflation.

Our results highlight the effectiveness of the following measures in increasing banking stability in emerging European countries: interest rates cuts, as well as domestic and foreign liquidity injections. If we are taking into account banks' structure, our results suggest that the policy measures adopted by CEE countries reduce the stability of domestic banks (expressed by Z-score), but increase it for those with a lower level of capitalization. The impact on the Z – score of the banking system liquidity policy measures, the policy measures meant to protect bank solvency and the policy interest rates cuts, is significantly lower in the case of domestic banks and amplified for less-capitalized banks (except for the policies regarding banks' solvency).

Our contribution to the literature refers to the policy interventions analyzed, the methodology used and, finally, the sample of countries. First, to our knowledge, the measures presented in Bakker and Klingen (2012) are not the subject of previous studies. These interventions reflect the central authorities' response in the first crisis-phase, having a long-term impact on stability and on the following measures adopted. Second, we compute an index that provides evidence for the aggregate impact of all the measures adopted by CEE countries. Additionally, we account for ownership (domestic/foreign), size and capitalization to assess the policy intervention intensity based on different structures of banks. Finally, there is a lack of studies that assess the effects of policy interventions in emerging European countries, which suffered significant losses during the crisis.

The paper is organized as follows. Section 2 presents the existing literature related to government interventions and banking stability. Section 3 describes the data and methodology used in this paper. Section 4 highlights our empirical findings, and, finally Section 5 concludes.

2. Literature review

During the global financial crisis, European authorities and national central authorities were forced to adopt several extraordinary measures to improve financial soundness. These measures drew the attention of financial researchers to empirically establish the effectiveness of these interventions in diminishing crisis consequences. Therefore, there are a number of studies that assess the impact of bank regulations on bank stability (Klomp and de Haan, 2015; Fratzscher, König and Lambert, 2016), bank lending (Dietrich and Hauck, 2012; Carpeter, Demiralp and Eisenschmidt, 2014), bank risk-taking (Dietrich and Hauck, 2012; Anginer, Demirguc-Kunt and Zhu, 2014; Gropp, Gruendl and Guettler, 2014; Andrieş, Cocriş and Pleşcău, 2015), interbank liquidity and liquidity risk (Brunetti, di Filippo and Harris, 2011; Ait-Sahalia, Andritzky, Jobst, Nowak and Tamirisa, 2012), and systemic risk (Londono and Tian, 2014; Mutu and Ongena, 2015).

Most of the previous studies are focused on advanced countries (e.g. Ait-Sahalia et al., 2012; Carpeter et al., 2014) or groups of advanced and emerging countries (e.g. Barth, Lin, Ma, Seade and Song, 2013; Anginer, 2014; Fratzscher et al., 2016). Just a small number of studies examine emerging and developing countries (Agoraki, Delis and Pasiouras, 2011; Klomp and de Haan, 2015).

The existing literature does not offer a general accepted rescue package. Moreover, it offers inconclusive results regarding the impact of the same intervention on financial stability. There are studies that encourage government interventions due to their positive impact. By analyzing 94 developing and emerging countries during 2002 – 2008, Klomp and de Haan (2015) found that stricter regulation significantly reduces banking risk. This result is also confirmed on a sample of 50 advanced and emerging economies by Fratzscher et al. (2016). The latter study concludes that tighter regulation improved banking stability after the Global Financial Crisis, exactly during 2010–2013. These studies use as a proxy for banking stability Z-score, defined as the distance-to-insolvency of an individual institution.

Other researchers argue that central authorities' interventions trigger more banking distress. Hryckiewicz (2014) shows, on a sample of 92 banking institutions subject to government support, that interventions lead to a banking risk increase. The arguments for this effect refer to the fact that these interventions may increase moral hazard due to inefficient bank management, insufficiently large amounts to improve bank's situation (Hryckiewicz, 2014) or the anticipated government aid that may encourage risky behavior (Keister, 2016). Similarly, Dam and Koetter (2012) provide empirical evidence that an increase by 1% of bailout expectations (capital injections) enhances risk taking (probability of distress) by 7.1 basis points.

Hakenes and Schnabel (2010) state that some categories of banks, such as public banks or 'too big to fail' banks are more likely to receive government support rather than those in most need and demonstrate that non-assisted banks

tend to engage in riskier activities. Another study that undermines the efficiency of government interventions highlights that regulatory measures decreased the liquidity creation between 1999 and 2009 in the German banking system (Berger, Bouwman, Kick and Schaeck, 2016). Bonaccorsi di Patti and Kashyap (2014) provide empirical evidence that only one-third of Italian banks recovered after they received government aid.

Another strand of literature focuses on the effect of country level interventions on banking stability. Canon and Margaretic (2014) show that the existence of a central bank and the reserve requirements decrease the probability of a bank run. An important number of emerging countries responded to the 2008 financial turmoil by reducing the level of reserve requirements in order to provide liquidity to their banking system. The advantage of this measure, compared to e.g. state loans, is that it does not require additional collateral to be offered by the banks (Gray, 2011; Hoffmann and Loffler, 2014).

There are also inconclusive results regarding the capital and liquidity injections impact on banking risk. Duchin and Sosyura (2014) pointed out in their study that capital support improves banks' capitalization, but determines an increase of default risk. The negative effects of nationalizations and public guarantees on Z-score are highlighted by Hryckiewicz (2014). In contrast with these results, Berger et al. (2016) show that capital support reduced bank risk taking, but dragged declines in the lending activity in the German banking system. For the UK banking system, capital injections and nationalizations resulted in being effective in managing crisis consequences (Rose and Wieladek, 2012).

Ait-Sahalia et al. (2012) state that interventions in individual institutions from advanced economies lead to an increase in the distress in interbank markets during the crisis.

Brei, Gambacorta and Peter (2013) find that recapitalization determines greater lending and, therefore recover only if the injected capital exceeds a critical value and a bank's balance sheet is sufficiently strong. The positive impact of recapitalizations and nationalizations on reducing banks' contribution and exposure to systemic risk is also demonstrated in Mutu and Ongena (2015) by analyzing 118 European financial institutions during the period 2005 – 2011.

The majority of the countries from our sample decreased their interest rates in order to increase financial stability. The literature presents the adverse effects of this measure, increasing bank risk-taking substantially in advanced economies (Delis and Kouretas, 2011; Andrieș et al., 2015). The impact of interest rates on bank risk-taking for emerging European countries is analyzed by Drakos, Kouratas and Tsoumas (2014). Their findings sustain that the risk-taking appetite of foreign banks increased as long as the interest rates were very low. Dell'Ariccia, Laeven and Marquez (2014) found that the impact of low interest rates on bank-risk taking depends on the banking capital structure, concluding that well

capitalized banks increase their risk, while the highly leveraged ones decrease it, when the loan demand is linear or concave.

3. Data and methodology

3.1. Data and variables

In order to determine the effectiveness of policy interventions in improving banking stability, we analyze a sample of 135 commercial banks from 15 Central and Eastern European countries¹ during 2005-2012. The period captures both the financial situation before crisis (2005 - 2008) and the period during the financial crisis manifested in CEE (2009-2012).

We proxy banking stability by the natural logarithm of the Z-score (as, e.g. in Laeven and Levine, 2009; Hryckiewicz, 2014) and use as an alternative stability measure the ratio of non-performing loans to gross loans (Fratzscher et al., 2016). Z-score at the bank level is computed as the ratio between the sum of return on assets and level of capitalization for each bank (equity/total assets) and the standard deviation of return on assets for every three years as below. A high level of Z-score denotes the fact that the bank is more stable.

$$Z - score_{i,t} = \frac{ROA_{i,t} + \frac{Eq_{i,t}}{TA_{i,t}}}{\sigma_{ROA}} \quad (1)$$

Where:

Z-score_{i,t} – Financial stability of bank *i*, in year *t*;

ROA_{i,t} - return on assets of bank *i*, in year *t*;

Eq_{i,t} / TA_{i,t} – denotes the total shareholder equity to total assets ratio for bank *i* in year *t*;

σ_{ROA} – standard deviation of return on assets over three years of the sample.

The indicators of interest are constructed using dummy variables based on the measures presented in Bakker and Klingen (2012) paper. These measures were adopted during the 2008Q₄ – 2009Q₂ period and were divided into the following categories, based on their objective (see Table 1 and Table 2 from Annexes): (1) Banking system liquidity policy measures: System-wide policy measures (relaxation of reserve requirements, domestic currency liquidity injections, foreign exchange liquidity injections, increase in deposit insurance scheme) and Interventions in individual institutions (liquidity injection); (2) Policy measures to protect bank solvency: System-wide policy measures (recapitalization fund, relaxation of capital/ provisioning requirements) and Interventions in individual institutions (capital injections); and, (3) Monetary policy rate changes: policy interest rate cuts.

¹ Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Macedonia, Montenegro, Poland, Romania, Serbia and Ukraine

We define country-level dummy variables for each category and sub-category of intervention measure by taking value 1 if the measure was implemented in a specific country (from the implementation year till the end of our period) and 0 otherwise. Therefore, the first category – banking system liquidity policy measures – takes values from 0 to 5 and the second category from 0 to 3. To allow comparison, these values were normalized to $[0,1]$ range. Further, we computed an aggregate index which covers the three main categories, taking values from 0 to 3, also normalized to $[0,1]$ range.

We included in our analysis a number of variables in order to control for bank or country characteristics that may have an impact on banking stability, such as: bank specific variables, banking industry variables and macroeconomic variables (see Table 2 from annexes for details).

A) *Bank specific variables*

Empirical specifications control for the *bank size* (determined as logarithm of total assets) as there are differences between the behavior of large and small banks. Larger banks may engage in riskier activities in order to diversify their portfolios (non-traditional activities), while smaller banks are more conservative (De Jonghe, 2010; Duchin and Sosyura, 2014). An argument pointed out in the recent financial crisis is that larger banks increase their risk-taking level due to their status of ‘Too big to fail’ (Rose and Wieladek, 2012). This variable was also used by Hryckiewicz (2014), Klomp and de Haan (2015), Berger et al. (2016).

Capital structure, defined as equity to total assets, was considered by Duchin and Sosyura (2014). Their findings suggest that capital injections lead to higher capital ratios for the beneficiary banks, but, at the same time, to an increase in the probability of default, measured by Z-score.

Several studies consider important to control for lending activity (Hryckiewicz, 2014) and investment strategy (De Jonghe, 2010; Berger et al., 2016). The government aid may be conditioned by increasing banks loans Vol. in a difficult environment to diminish a credit crunch. This situation could lead to additional bank risk-taking for banks already in trouble. De Jonghe (2010) concludes that banks with traditional activity are less risky than diversified banks. Therefore, we included in our regression *asset structure*, computed as loans to total assets.

Liquid assets to total assets is another bank-level variable included in our estimation, which controls for liquidity risk. The lack of banking liquidity in the first crisis phase, due to massive withdrawals, contributed to the late crisis depth. Dam and Koetter (2012) concluded in their paper that liquidity risk (sum of cash and overnight interbank assets to total assets) has a negative impact on Z-score and non-performing loans, but significant at 10% only on Z-score.

B) *Banking industry variables*

We control for *banking sector concentration*, defined as the share of the three largest commercial banks’ assets in total commercial banking system assets.

We expect a high level of concentration to have a negative impact on banking stability. This situation may allow a few banks to dominate the entire banking system and expose it to system-wide shocks (Vallascas and Keasey, 2012). Usually, larger banks have diversified activities which implies a high risk-taking (De Jonghe, 2010) and, also, cross-border activities making them more exposed to contagion risk (Pais and Stork, 2013). There is also evidence for a positive relation between banking concentration and banking stability, due to closer supervision and monitoring (Beck et al., 2006; Hryckiewicz, 2014). To control for financial development, we included *bank deposits to GDP ratio*. A developed financial system can manage better financial shocks, having a positive impact on bank stability. As a measure of investment decision quality and profitability, we include *Net interest margin* defined as difference between interest income and interest costs to interest – earning assets.

C) Macroeconomic variables

Macroeconomic shocks spread rapidly to the financial sector, harming banking stability. Therefore, we include annual GDP growth and inflation, as country variables. *GDP growth rates* may have a positive impact, but also a negative one, because countries with higher growth rates are more exposed to increased risk in the banking sector (Hryckiewicz, 2014; Mutu and Ongena, 2015). This variable is also used by Hoffmann and Löffler (2014), while Klomp and de Haan (2015) use real GDP per capita to control for the country development level and the impact on banking risk. The impact of *inflation* depends on whether it is anticipated or not. If it is anticipated then revenues will increase faster than costs (high inflation rates are associated with high loan interest rates), improving profitability and, therefore, banking stability (Naceur and Omran, 2011).

The main data source for a bank-level variable is Bankscope Bureau Van Dijk, and for macroeconomic and banking sector specific variables International Monetary Fund Database, World Bank, and Eurostat.

3.2. Descriptive statistics

Table 1 presents the descriptive statistics of the variables included in the empirical specifications, while Table 2 provides difference in mean analysis with respect to crisis period and ownership. Our stability variables indicate banks with high stability levels, but also banks with high probability of insolvency. The highest level of bank stability recorded in the sample is highlighted by a Z-score with 9.25 and 0.12% share of non-performing loans in gross loans. The probability of default is increased for banks with negative Z-score and high levels of non-performing loans (the maximum value in our sample is 58.86%). Emerging Europe's banking system has, on average, a 3.95 level of stability based on Z-score and a 10.35% share of non-performing loans in gross loans.

Table 1. Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
<i>Dependent variables</i>					
Z-score	907	3.9512	2.1384	-0.0617	9.2538
NPL	897	10.3529	11.0654	0.1200	58.8600
<i>Independent variables</i>					
<i>Bank specific variables</i>					
Bank size	1226	14.3665	1.5255	10.6164	17.3732
Capital structure	1220	11.6729	5.7632	3.4390	35.7280
Asset structure	1225	0.6233	0.1461	0.1682	0.8947
Liquid assets/ Total assets	1226	0.2196	0.1407	0.0233	0.7304
<i>Banking industry variables</i>					
Bank concentration (%)	1092	60.7907	15.7155	26.1627	99.6444
Bank deposits to GDP (%)	1072	44.2223	11.4952	19.8791	66.9551
Net interest margin (%)	1092	4.0932	1.5026	1.2622	8.4118
<i>Macroeconomic variables</i>					
GDP growth (annual %)	1248	2.6205	5.0708	-17.9550	12.2332
Inflation	1248	4.7133	3.7297	-2.1670	22.3110

Note. Definitions of variables are given in Annexes – Table 2.

The banking system in Emerging Europe is also characterized by a 11.67% level of capital adequacy and a lack of liquid assets. As we can notice, the average of liquid assets in total assets represents 21.96%. Banks earnings are, predominantly, from traditional activities (loans represents 62.33% in total assets).

There are also differences between the financial and economic development level for the countries considered. There are systems where only three banks dominate the entire national banking sector (bank concentration mean is over 50%) and systems where bank deposits represent less than 44% from national GDP. The economic development recorded in the 2005-2012 period for the analyzed region represents, on average, 2.62%, with economies that suffered economic contraction of over 17%. The most developed country has an annual GDP growth of 12.23%.

Tables 2 presents the values for the variables considered in the pre-crisis (2005-2008) and crisis period (2009-2012). There are significant differences between the two periods for the stability variables (stability decreases in crisis years), for banking characteristics and macroeconomic indicators (in crisis years, the average economic contraction amounted to 0.42%).

Table 2. Difference in mean analysis

Variable	Pre-crisis period	Crisis period	Difference	Domestic banks	Foreign banks	Difference
Dependent variables						
Z-score	4.4392	3.7148	0,724***	3.4711	4.1153	-0,644***
NPL	4.8825	14.5609	-9,678***	12.9086	9.3654	3,543***
Independent variables						
<i>Bank - specific variables</i>						
Bank size	14.1709	14.5596	-0,389***	13.8113	14.5727	-0,761***
Capital structure	11.4813	11.8627	-0.381	13.0121	11.1846	1,827***
Asset structure	0.6079	0.6384	-0,0304***	0.5684	0.6436	-0,0751***
Liquid assets	0.2595	0.1802	0,0793***	0.2616	0.2040	0,0576***
<i>Banking industry variables</i>						
Bank concentration (%)	61.5269	59.8090	1,718*			
Bank deposits to GDP (%)	41.0222	48.3525	-7,330***			
Net interest margin (%)	4.2468	3.8884	0,358***			
<i>Macroeconomic variables</i>						
GDP growth (annual %)	5.6576	-0.4167	6,074***			
Inflation	4.0315	5.3951	-1,364***			

Note. Definitions of variables are given in Annexes – Table 2.

As noted by Havrylchyk and Jurzyk (2011), Bonin, Hasan and Wachtel (2014) and Bonin and Louie (2015), the banking systems from emerging Europe countries are dominated by foreign owned banks. For example, according to Bonin et al. (2014) in 2010, in Poland there were 57 foreign owned banks out of 67, those assets shares accounted for 72.3% of the system assets, while in Croatia, assets share of foreign banks represented 91%. Our statistics denote the fact that, even if the number of foreign banks is higher than the number of domestic ones, they were more stable in the 2005-2012 period, according to Z-score and non-performing loans values. They are also bigger than the domestic ones based on total assets Vol. and their activities are focused on lending, which means that they adapted to host countries conditions. Foreign banks that activate in the analyzed countries are less capitalized and have less liquid assets than domestic banks relying on parent-bank resources.

3.3. Methodology

In order to determine the relationship between policy interventions and banking stability, we divided the analysis into two stages. In the first instance, we computed a dynamic multiple linear regression model (see below). This model includes, at a time, the aggregate index of all three categories mentioned above, then a policy intervention index for each category measure and, finally, we applied

regression analysis for each component of the three measure categories. Our basic regression equation takes the following form:

$$\text{Stability measure}_{i,j,t} = \alpha + \beta_1 \times \text{Policy interventions}_{j,t} + \beta_2 \times \text{Bank}_{i,j,t} + \beta_3 \times \text{BI}_{j,t} + \beta_4 \times \text{Macro}_{j,t} + \varepsilon \quad (1)$$

where $\text{Stability measure}_{i,j,t}$ – Z-score or NPLs/gross loans for bank i from country j in year t ; $\text{Policy interventions}_{j,t}$ – index of measures adopted in year t /measures adopted by country j in year t , $\text{Bank}_{i,j,t}$ – bank - specific variables; $\text{BI}_{j,t}$ – banking industry variables; $\text{Macro}_{j,t}$ – macroeconomic variables; ε – error term.

The second part of the analysis uses difference-in-difference methodology in order to highlight the impact of policy interventions on different bank structures. Therefore, we considered the impact on domestic, large and less capitalized banks.

$$\text{Stability measure}_{i,j,t} = \alpha + \beta_1 \times \text{Policy interventions}_{j,t} + \beta_2 \times \text{Policy intervention}_{j,t} * Z_{j,t} + \beta_3 \times \text{Bank}_{i,j,t} + \beta_4 \times \text{BS}_{j,t} + \beta_5 \times \text{Macro}_{j,t} + \varepsilon \quad (2)$$

where $Z_{i,t}$ represents domestic banks, less capitalized banks and large banks.

We consider as large banks those financial institutions with more than 4 billion EUR assets and less capitalized banks, those institutions with equity to total assets ratio less than or equal to 8%. Domestic banks are banks with more than 51% national ownership. In assessing the policy interventions impact on these banks, we assess the following hypothesis:

Hypothesis 1: Domestic banks are more reliant on national support than foreign banks.

This assumption is based on the fact that foreign banks will receive aid from parent-banks, in order to reach stability. Therefore, national policy interventions target the financial stability of domestic banks. We expect that liquidity and capital injections to manifest a positive and important impact on the financial stability of these banks.

Hypothesis 2. Banks with a weak capital structure responded strongly to policy interventions during crisis.

Well capitalized banks should be less reliant on capital or liquidity injections, as they have their own funds to regain their stability. Therefore, these injections are meant to provide liquidity to less-well capitalized banks.

Hypothesis 3: Large banks may need support more than small banks, as they engage in riskier activities.

Larger banks may engage in riskier activities in order to diversify their portfolios and due to the fact that they are ‘Too big to fail’ (Rose and Wieladek, 2012; Keister, 2016). Therefore, the impact of policy interventions may conduct to moral hazard. We will assess the impact of liquidity and capital measures on large banks in order to establish their effectiveness in restoring financial stability. As noted by Vallascas and Keasey (2012), large banks are more likely to fail than small ones.

The coefficients of the above equations are estimated by *Ordinary Least Squares*. In all specifications we included bank fixed effects and time (year) fixed effects to control for omitted variables. We also used lagged values of banking system and macroeconomic control variables.

4. Results

4.1. Basic estimation results

The results of our estimations can be found in Annexes, beginning with Table 3. Tables 3 – 6 present the results of the basic equation, with Z-score and non-performing loans to gross loans as stability measures.

We start by including the aggregate measure of policy interventions, which is the average of the (normalized) three categories of policy measures adopted. The overall impact of this variable on stability measures has contradictory results, generating an increase in banking stability measured by Z-score and, at the same time, an increase in non-performing loans, but these results are statistically insignificant (see Table 3). Further, we will discuss only the significant results and their implications on banking stability.

If we were to look at the impact of the three measure categories (Table 4), we can notice that policy interest rate cuts and policy measures to protect bank solvency become significant when considering Z-score and non-performing loans, respectively. Therefore, we can note the effectiveness of interest rates cuts in emerging European countries in increasing banking stability, expressed by Z-score. In literature, low interest rates are reflected in supplementary bank risk-taking and decreased banking stability. The positive impact of our analysis, significant at 10% level, may be explained by the fact that banks from CEE countries do not entirely reflect the changes in monetary interest rates on their lending rates. As noted by Dell' Ariccia et al. (2014), the effect of official interest rates changes on the banking system depends on the banking market structure: if we are dealing with a monopolistic market, where a few banks dominate the market, the pass-through onto the lending rate is near to zero, and they are fully reflected when the market is characterized by perfect competition. Therefore, the effect of interest rates cuts depends on the national banking system structure and, as we have already mentioned above, the emerging European banking system is characterized by a high level of concentration, when only three banks dominate the entire national system.

Turning to the impact of the policy measures that protect bank solvency on non-performing loans, results show that these measures had an adverse impact, leading to an important increase in non-performing loans level. This result is also confirmed if we consider the measure components of this category, more precisely, by the impact of capital injection in individual institutions, the other measures impact being insignificant (see Table 5 and Table 6). This tool is

reflected on financial markets through an increase in non-performing loans and a decrease in banking stability in Bulgaria and Montenegro. In literature, Ait-Sahalia et al. (2012) and Duchin and Sosyura (2014) concluded that individual interventions lead to an increase of distress in interbank markets during the crisis and that capital support determines an increase of default risk.

Relating to the banking system liquidity policy measures category, results highlight that its overall impact on banking stability is insignificant (see Table 4), but when we analyze the impact of each component (Table 5 and Table 6), there are some interesting results. Based on these results, we can assess the effectiveness of liquidity measures adopted in emerging Europe. Therefore, the positive effects of domestic and foreign liquidity injections in increasing banking stability are highlighted. The effect of foreign exchange liquidity injections is also confirmed by their impact on credit risk (Table 6, Model 3). Banks from emerging Europe have an important Vol. of loans denominated in foreign currencies (Andrieș, Fischer and Yesin, 2015), and foreign exchange injections allowed them to maintain the confidence in the banking system.

Once more, based on the empirical results of the individual liquidity interventions on Z-score, we can confirm the inefficiency of individual institution measures, which conducted to the manifestation of moral hazard in Latvia.

Our results regarding the control variables included suggest that the most important variables that explain banking stability (z - score) are: bank size, asset structure, financial development expressed by bank deposit to GDP and economic development (GDP growth rate). The non-performing loans level is mainly influenced by asset structure and economic development.

4.2 Estimation results based on bank structure

Table 7 (annexes) summarizes the results of the difference-in-difference estimations, for the three types of banks. We started by including a policy intervention index to assess the overall impact of policies on Z-score and non-performing loans. Our results suggest that the policy measures adopted by CEE countries reduced the stability of domestic banks, expressed by Z-score but increased it for those with less capital structure. These results confirm hypothesis 3, but contradict hypothesis 1. Indeed, less-capitalized banks are relying on policy support in distress times in order to re-gain depositors' confidence in the banking system. Regarding domestic banks, they are usually better capitalized than foreign ones, being more conservative and less risk-taking. With respect to policy interventions' impact on large banks, we can notice that this impact was amplified, on both Z-score and non-performing loans, but in the Z-score case, this result is statistically insignificant. Therefore, hypothesis 3 is true in the non-performing loans estimation, the impact of policy interventions being amplified for large banks.

Our analysis for each category of measures confirms those already noted. The impact on Z – score of banking system liquidity policy measures, the policy

measures meant to protect bank solvency and the policy interest rates cuts (Table 8 from Annexes, Models 1-3), was lower in the case of domestic banks and amplified for less-capitalized banks (Models 7 - 9), except for the category regarding banks' solvency. When we consider credit risk as stability measure, we find significant results for banking system liquidity policy measures, which has amplified the impact on large banks (Table 9, Model 4).

Tables 10-15 present results regarding the individual policy interventions' impact on stability measures based on banks structure. The findings denote the fact that foreign exchange liquidity injections and liquidity injections for individual institutions had less effect in increasing banking stability (measured by Z-score) in domestic banks than in foreign ones. This effect is also noticed with respect to bank solvency measures, namely recapitalization fund and capital injections, their effect being reduced in the case of domestic banks. When measuring banking stability by NPL ratio, the only significant impact is obtained for relaxation of provisions requirements, whose effect is amplified for local banks.

The positive impact of foreign exchange liquidity injection was also confirmed by the results of difference-in-difference estimation, the coefficient being equal to 1.76. However, the interaction of this measure and banks' size highlights that the measure impact was amplified for large banks (see Table 12, Model 3). Another measure whose impact was amplified for large banks was recapitalization (Table 12, Model 6). These results confirm hypothesis 2. Turning to the NPL model used as a stability measure, we can notice that the impact of several measures was more efficient for large banks than for small ones (Table 13, Models 1, 2 and 4). Small banks benefit more from recapitalization funds.

Hypothesis 3 states that banks with a weak capital structure responded strongly to policy interventions during crisis. The interaction of individual policy interventions and less-capitalized banks shows that, indeed, the impact of relaxation of reserve requirements, foreign exchange liquidity injections and increases in deposit insurance coverage was more amplified for these banks than for those with a good capital structure (Table 14, Model 1, Model 3 and Model 4).

To sum up, we can note the effectiveness of the following measures in increasing banking stability in emerging European countries: interest rates cuts, domestic and foreign liquidity injections. If we are taking into account banks' structure, the results obtained confirm hypothesis 2 and 3, and contradict hypothesis 1. Our results suggest that the policy measures adopted by CEE countries lowered the stability of domestic banks, expressed by Z-score, but increased it for those with less capital structure. The impact on Z-score of banking system liquidity policy measures, of policy measures meant to protect bank solvency and the policy interest rates cuts (Table 8 from Annexes, Models 1- 3) was lower in the case of domestic banks and amplified for less-capitalized banks (Models 7 - 9), except for the category regarding banks' solvency.

5. Conclusion

In this paper, we analyze the effectiveness of intervention measures to ensure financial stability adopted in Central and Eastern European countries in the 2008Q4 – 2009Q2 period. Further, we analyze the banks' responses to policy interventions based on their characteristics, i.e. ownership, size and capital structure and several assumptions.

The most efficient measures adopted in emerging Europe during crisis were: interest rates cuts, domestic and foreign liquidity injections. Based on banks' structure, the results obtained sustain that the policy measures adopted by CEE countries decreased the stability of domestic banks, expressed by Z-score, but increased it for those with less capital structure. The impact on Z-score of banking system liquidity policy measures, the policy measures meant to protect bank solvency and the policy interest rates cuts was lower in the case of domestic banks and amplified for less-capitalized banks, except for the category regarding banks' solvency. The impact of these measure categories on large banks remains statistically insignificant.

If we are looking at the individual measures impact, we can observe that the impact of foreign exchange liquidity injections and recapitalizations on large banks was more important than the impact on small ones. The interaction of individual policy interventions and less-capitalized banks shows that the impact of relaxation of reserve requirements, foreign exchange liquidity injections and increases in deposit insurance coverage was more amplified for these banks than for those with a good capital structure.

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Annexes

Table 1. Measures adopted by national authorities across the Central and Eastern European countries

	Banking System Liquidity Policy Measures					Policy Measures to Protect Bank Solvency			Monetary Policy Rate Changes
	Relaxation of reserve requirements	Domestic currency liquidity injections	Foreign exchange liquidity injections	Increase in deposit insurance coverage	Interventions in individual institutions – liquidity injection	Recapitalization fund	Relaxation of capital/provisioning requirements	Interventions in individual institutions – capital injection	Policy interest rate cuts
Albania		Nov. 2008 onward		Mar. 09					Jan. 09
Bosnia and Herzegovina	Oct. 08, Dec. 08, May 09			Dec. 08					
Bulgaria	Oct. 08, Dec. 08, Jan. 09			Nov. 08			Mar. 09		
Croatia	Oct. 08, Dec. 08, Jan. 09			Oct. 08					
Czech Republic	Oct. 08	Oct. 08 onward		Oct. 08					Aug. 08 onward
Estonia				Oct. 08					
Hungary	Nov. 08		Oct. 08 onward, Mar. 09	Oct. 08		Feb. 09			Nov. 08 onward
Latvia	Oct. 08, Nov. 08, Dec. 08			Oct. 08	Nov. 08, Feb. 09			Nov. 08	Mar. 09, May 09
Lithuania	Nov. 08			Oct. 08					
Macedonia									Sep. 08 onward
Montenegro	Oct. 08, Feb. 09, Jan. 09						Aug. 09		
Poland	Jun. 09	Oct.08 onward	Oct. 08 onward	Oct. 08					Nov. 08 onward
Romania	Nov. 08, May. 09	Oct. 08 onward		Oct. 08					Feb. 09 onward
Serbia	Oct. 08	Apr. 09	Apr. 09	Dec. 08					Jan. 09, Apr. 09, Jun. 09
Ukraine	Oct. 08, Dec. 08, Feb. 09	Oct. 08 onward		Oct. 08				Apr. 09	Jan. 09, Jun. 09
No countries	12	6	3	13	1	1	2	2	9

Source: Bakker, B. B. and Klingen, C., 2012. How Emerging Europe Came Through the 2008/09 Crisis. An Account by the Staff of the IMF's European Department. *International Monetary Fund*

Table 2. Variables included in our model and their calculations

Variable	Variable	Computation
Dependent variable		
Z-score	Banking stability	The ratio between the sum of return on assets and the level of capitalization for each bank and standard deviation of return on assets for every three years
NPL	Banking stability	Non-performing loans/gross loans
Independent variables		
<i>Policy interventions</i>		
Policy intervention index		Dummy variable, taking values from 0 to 3, and after normalization from 0 to 1
Banking System Liquidity Policy Measures		Dummy variable, taking values from 0 to 5, and after normalization from 0 to 1
Relaxation of reserve requirements		Dummy variable, taking values from 0 to 1 (if a country adopted this measure; from the implementation year to the final year of our sample)
Domestic currency liquidity injections		Dummy variable, taking values from 0 to 1 (if a country adopted this measure; from the implementation year to the final year of our sample)
Foreign exchange liquidity injections		Dummy variable, taking values from 0 to 1 (if a country adopted this measure; from the implementation year to the final year of our sample)
Increase in deposit insurance coverage		Dummy variable, taking values from 0 to 1 (if a country adopted this measure; from the implementation year to the final year of our sample)
Interventions in individual institution		Dummy variable, taking values from 0 to 1 (if a country adopted this measure; from the implementation year to the final year of our sample)
Policy Measures to Protect Bank Solvency		Dummy variable, taking values from 0 to 3, and after normalization from 0 to 1
Recapitalization fund		Dummy variable, taking values from 0 to 1 (if a country adopted this measure; from the implementation year to the final year of our sample)
Relaxation of capital/provisioning requirements		Dummy variable, taking values from 0 to 1 (if a country adopted this measure; from the implementation year to the final year of our sample)
Interventions in individual institutions – capital injection		Dummy variable, taking values from 0 to 1 (if a country adopted this measure; from the implementation year to the final year of our sample)
Policy interest rate cuts		Dummy variable, taking values from 0 to 1 (if a country adopted this measure; from the implementation year to the final year of our sample)
<i>Bank specific variables</i>		
Bank size	Bank size	Logarithm of total assets
Capital structure	Capital adequacy	Equity/Total assets
Asset structure	Bank activity (traditional vs. non-traditional)	Loans/Total assets
Liquid assets	Liquidity	Liquid assets/Total assets
<i>Banking industry variables</i>		
Bank concentration (%)	Banking sector concentration	Assets of three largest commercial banks as a share of total commercial banking assets
Bank deposit to GDP (%)	Financial development	Bank deposits/GDP
Net interest margin (%)	Funding strategy	(Interest income - interest costs)/ interest-earning assets
<i>Macroeconomic variables</i>		
GDP growth (annual %)	Economic growth	GDP
Inflation	Inflation	Inflation, end of period consumer prices

Table 3. Regression estimation results policy measure index (Z-score and NPL stability measure)

Dependent variable	Z-score		NPL	
	Model 1	Model 2	Model 1	Model 2
<i>Policy interventions</i>				
<i>Policy interventions index</i>	1.1836		4.2669	
	(0.7747)		(4.9825)	
<i>Bank - specific variables</i>				
Bank size	1.2894***		-5.0798	
	(0.4257)		(3.1236)	
Capital structure	0.0203		-0.0249	
	(0.0314)		(0.2411)	
Asset structure	3.3278***		-18.4672*	
	(1.1430)		(10.4351)	
Liquid assets	-1.0419		1.6576	
	(1.2626)		(8.7740)	
<i>Banking industry variables (%)</i>				
Bank concentration	0.0014		0.0524	
	(0.0172)		(0.0831)	
Bank deposits to GDP	0.1093***		0.0451	
	(0.0254)		(0.1892)	
Net interest margin	-0.0081		0.8018	
	(0.1000)		(0.6830)	
<i>Macroeconomic variables</i>				
GDP growth (annual %)	0.0723***		-0.2784**	
	(0.0190)		(0.1110)	
Inflation	-0.0068		0.1141	
	(0.0209)		(0.1005)	
Constant	-20.6729***		80.9248	
	(6.8302)		(51.5422)	
R-squared	0.2167		0.4100	
N. of cases	779		693	

Stability measures: Z-score computed as the ratio between the sum of return on assets and the level of capitalization for each bank and standard deviation of return on assets for every three years and NPL defined as Non-performing loans/gross loans; Policy interventions are defined as dummy variables at country-level, for each category and sub-category of measure, taking value one if the measure was implemented in a specific country (from the implementation year till the end of our period) and zero otherwise. Therefore, the first category – banking system liquidity policy measures – takes values from 0 to 5 and the second category from 0 to 3. To allow comparison, these values were normalized to [0,1] range. Further, we computed an aggregate index which covers the three main categories, taking values from 0 to 3, also normalized to [0,1] range. Bank specific variables: Bank size defined as Logarithm of total assets, Capital structure defined as Equity/Total assets, Asset structure calculated as Loans/Total assets and Liquid assets as Liquid assets/Total assets; Banking industry variables: Bank concentration (%) defined as Assets of three largest commercial banks as a share of total commercial banking assets, Bank deposit to GDP (%) computed as Bank deposits/GDP, Net interest margin (%) defined as (Interest income - interest costs)/ interest-earning assets; Macroeconomic variables: GDP growth (annual %) and Inflation, end of period consumer prices. We include bank fixed effects and time (year) fixed effects in all specifications to control for omitted variables. Standard errors are reported in brackets and account for clustering at the bank level. We use ***, **, and * to denote statistical significance at the 1%, 5%, and 10% levels, respectively. We used lagged values of banking system and macroeconomic control variables.

Table 4. Regression estimation results each policy measure category (Z – score and NPL stability measure)

Dependent variable	Z-score			NPL		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
<i>Alternative Policy interventions</i>	<i>Banking System Liquidity Policy Measures</i>	<i>Policy Measures to Protect Bank Solvency</i>	<i>Policy interest rate cuts</i>	<i>Banking System Liquidity Policy Measures</i>	<i>Policy Measures to Protect Bank Solvency</i>	<i>Policy interest rate cuts</i>
Policy interventions						
Alternative Policy interventions	1.0137 (0.7639)	-1.3492 (0.9067)	0.5551* (0.2883)	-0.4321 (6.0464)	18.7627*** (6.1220)	0.0031 (1.7384)
Bank - specific variables						
Bank size	1.3044*** (0.4228)	1.3448*** (0.4093)	1.2951*** (0.4251)	-4.8792 (3.1973)	-5.3605* (2.9751)	-4.8917 (3.1543)
Capital structure	0.0217 (0.0309)	0.0292 (0.0311)	0.0226 (0.0316)	-0.0128 (0.2457)	-0.1284 (0.2322)	-0.0139 (0.2440)
Asset structure	3.1957*** (1.1430)	3.0191*** (1.1235)	3.3172*** (1.1376)	-19.0365* (10.2618)	-16.2629 (10.3263)	-19.0409* (10.3420)
Liquid assets/ Total assets	-0.8965 (1.2593)	-1.0684 (1.2717)	-1.1000 (1.2696)	1.4730 (8.6265)	0.7092 (8.2170)	1.5429 (8.7329)
Banking industry variables						
Bank concentration (%)	-0.0008 (0.0168)	0.0027 (0.0160)	0.0047 (0.0170)	0.0350 (0.0766)	-0.0630 (0.0712)	0.0360 (0.0829)
Bank deposits to GDP (%)	0.1056*** (0.0259)	0.0936*** (0.0246)	0.1089*** (0.0246)	-0.0372 (0.1652)	-0.0441 (0.1630)	-0.0307 (0.1982)
Net interest margin (%)	0.0269 (0.1114)	-0.0199 (0.1019)	-0.0281 (0.1008)	0.7482 (0.7326)	0.6826 (0.6537)	0.7683 (0.6539)
Macroeconomic variables						
GDP growth (annual %)	0.0697*** (0.0186)	0.0662*** (0.0187)	0.0722*** (0.0187)	-0.2928*** (0.1097)	-0.2613** (0.1099)	-0.2924** (0.1118)
Inflation	-0.0093 (0.0208)	-0.0017 (0.0207)	-0.0033 (0.0211)	0.1173 (0.1004)	0.0393 (0.0995)	0.1161 (0.0978)
Constant	-20.7347*** (6.6902)	-20.8046*** (6.4081)	-20.8703*** (6.7745)	82.5551 (51.5286)	96.1051* (48.6285)	82.3621 (52.4193)
R-squared	0.2154	0.2161	0.2184	0.4082	0.4326	0.4082
N. of cases	779	779	779	693	693	693

Table 5. Regression estimation results for individual policy measures (Z – score stability measure)

Z-score	Banking System Liquidity Policy Measures					Policy measures to Protect Bank Solvency		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
<i>Alternative Policy interventions</i>	<i>Relaxation of reserve requirements</i>	<i>Domestic currency liquidity injections</i>	<i>Foreign exchange liquidity injections</i>	<i>Increase in deposit insurance coverage</i>	<i>Interventions in individual institutions –liquidity injection</i>	<i>Recapitalization fund</i>	<i>Relaxation of capital/provisioning requirements</i>	<i>Interventions in individual institutions – capital injection</i>
Policy interventions								
Alternative Policy interventions	-0.0404 (0.3118)	0.5570* (0.3352)	1.0359*** (0.3892)	-0.5766 (0.5682)	-0.9448* (0.5684)	-0.5236 (0.7429)	0.0998 (0.5881)	-0.6261* (0.3507)

<i>Bank - specific variables</i>								
Bank size	1.3233*** (0.4199)	1.2761*** (0.4199)	1.3347*** (0.4158)	1.3344*** (0.4163)	1.2859*** (0.4171)	1.2882*** (0.4200)	1.3135*** (0.4194)	1.3411*** (0.4019)
Capital structure	0.0230 (0.0312)	0.0230 (0.0310)	0.0305 (0.0309)	0.0235 (0.0304)	0.0225 (0.0304)	0.0222 (0.0305)	0.0217 (0.0316)	0.0270 (0.0296)
Asset structure	3.1680*** (1.1432)	3.0457*** (1.1396)	3.4077*** (1.1404)	3.1228*** (1.1469)	3.0371*** (1.1425)	3.0445*** (1.1411)	3.1545*** (1.1502)	3.0408*** (1.1325)
Liquid assets	-1.1662 (1.2940)	-0.9617 (1.2700)	-0.4015 (1.2423)	-1.2095 (1.2855)	-1.1749 (1.2737)	-1.2123 (1.2941)	-1.1634 (1.2927)	-0.9828 (1.2842)
<i>Banking industry variables (%)</i>								
Bank concentration	-0.0048 (0.0172)	0.0001 (0.0168)	-0.0007 (0.0170)	-0.0066 (0.0165)	-0.0090 (0.0174)	-0.0019 (0.0168)	-0.0060 (0.0164)	-0.0059 (0.0170)
Bank deposits to GDP	0.0943*** (0.0249)	0.0998*** (0.0251)	0.1032*** (0.0247)	0.0815*** (0.0250)	0.0840*** (0.0258)	0.0898*** (0.0239)	0.0927*** (0.0244)	0.0880*** (0.0249)
Net interest margin	-0.0250 (0.1041)	-0.0196 (0.1023)	0.0913 (0.1101)	-0.0600 (0.1020)	-0.0485 (0.1015)	-0.0439 (0.0986)	-0.0239 (0.1012)	0.0022 (0.1036)
<i>Macroeconomic variables</i>								
GDP growth (annual %)	0.0688*** (0.0185)	0.0658*** (0.0183)	0.0632*** (0.0184)	0.0661*** (0.0190)	0.0598*** (0.0186)	0.0717*** (0.0183)	0.0687*** (0.0185)	0.0609*** (0.0193)
Inflation	-0.0068 (0.0209)	-0.0073 (0.0211)	-0.0109 (0.0204)	-0.0062 (0.0210)	-0.0040 (0.0209)	-0.0062 (0.0209)	-0.0077 (0.0213)	-0.0051 (0.0208)
Constant	-20.0329** * (6.6582)	-19.8264** * (6.6335)	-21.6861** * (6.4991)	-19.3815** * (6.5975)	-18.6021** * (6.7696)	-19.3763*** (6.6423)	-19.7324*** (6.6198)	-20.0814*** (6.4039)
R-squared	0.2124	0.2173	0.2263	0.2144	0.2155	0.2139	0.2125	0.2162
N. of cases	779	779	779	779	779	779	779	779

Table 6. Regression estimation results for individual policy measures (NPL stability measure)

NPL	Banking System Liquidity Policy Measures					Policy measures to Protect Bank Solvency		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
<i>Alternative Policy interventions</i>	<i>Relaxation of reserve requirements</i>	<i>Domestic currency liquidity injections</i>	<i>Foreign exchange liquidity injections</i>	<i>Increase in deposit insurance coverage</i>	<i>Interventions in individual institutions – liquidity injection</i>	<i>Recapitalization fund</i>	<i>Relaxation of capital/provisioning requirements</i>	<i>Interventions in individual institutions – capital injection</i>
<i>Policy interventions</i>								
Alternative Policy interventions	1.2618 (2.5797)	0.1996 (2.0362)	-5.7748*** (1.7421)	5.9272 (4.1093)	3.1092 (2.9003)	-1.1347 (2.1135)	4.1045 (2.9634)	8.6726** (3.3280)
<i>Bank - specific variables</i>								
Bank size	-4.9596 (3.1956)	-4.9110 (3.1789)	-4.9554 (3.1141)	-5.1142 (3.2051)	-4.7745 (3.1778)	-4.9598 (3.2240)	-5.1089 (3.2719)	-5.6053* (2.8943)
Capital structure	-0.0278 (0.2540)	-0.0144 (0.2433)	-0.0649 (0.2359)	-0.0474 (0.2419)	-0.0211 (0.2453)	-0.0157 (0.2445)	-0.0421 (0.2574)	-0.1269 (0.2174)
Asset structure	-19.1748* (10.2817)	-19.0995* (10.1284)	-19.7164** (9.9077)	-18.5694* (10.2591)	-18.6111* (10.3234)	-19.3694* (10.3738)	-19.7881* (10.4955)	-16.1156 (10.1042)
Liquid assets	1.5353 (8.7406)	1.5629 (8.7787)	-1.8356 (8.0852)	2.0018 (8.7298)	1.7108 (8.6928)	1.3582 (8.7567)	1.6480 (8.6738)	-1.2478 (7.8390)
<i>Banking industry variables (%)</i>								
Bank concentration	0.0297	0.0379	0.0247	0.0344	0.0476	0.0429	-0.0037	0.0362

	(0.0766)	(0.0798)	(0.0685)	(0.0761)	(0.0766)	(0.0718)	(0.0867)	(0.0776)
Bank deposits to GDP	-0.0202 (0.1692)	-0.0274 (0.1733)	-0.1403 (0.1809)	0.0789 (0.1707)	0.0015 (0.1808)	-0.0433 (0.1759)	-0.1233 (0.1809)	0.0507 (0.1666)
Net interest margin	0.8297 (0.6677)	0.7619 (0.6550)	0.0246 (0.7019)	1.1018 (0.6921)	0.8708 (0.6712)	0.7253 (0.6665)	0.8301 (0.6453)	0.1898 (0.5538)
Macroeconomic variables								
GDP growth (annual %)	-0.2889*** (0.1100)	-0.2942** (0.1154)	-0.2561** (0.1112)	-0.2663** (0.1077)	-0.2546** (0.1207)	-0.2875** (0.1125)	-0.3070*** (0.1117)	-0.1808 (0.1156)
Inflation	0.1086 (0.0970)	0.1163 (0.0998)	0.1468 (0.1004)	0.1120 (0.0988)	0.1050 (0.1027)	0.1185 (0.1009)	0.0891 (0.0945)	0.0855 (0.1035)
Constant	83.3438 (51.9591)	82.4810 (51.5406)	92.5612* (50.8946)	80.3041 (51.2513)	77.9386 (51.7140)	83.7573 (52.3982)	91.8266 (55.9896)	92.0609* (46.4992)
R-squared	0.4088	0.4082	0.4228	0.4157	0.4095	0.4084	0.4122	0.4354
N. of cases	693	693	693	693	693	693	693	693

Table 7. Difference-in-difference estimation applied on policy intervention index and different banks structures (Z-score and NPL stability measure)

Dependent variable	Z-score			NPL		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
<i>Alternative Policy interventions</i>	<i>Policy interventions index</i>	<i>Policy interventions index</i>	<i>Policy interventions index</i>	<i>Policy interventions index</i>	<i>Policy interventions index</i>	<i>Policy interventions index</i>
Policy interventions						
Alternative Policy interventions	0.8791 (0.8057)	1.7010* (0.8820)	1.4829* (0.7683)	4.8411 (5.7072)	7.7314 (5.4313)	3.5841 (4.8995)
Alternative Policy interventions* Domestic ownership	2.3364*** (0.8279)			-1.5036 (5.6541)		
Alternative Policy interventions* Large bank		-1.2467 (0.7640)			-6.7054* (3.5664)	
Alternative Policy interventions* Less capitalized			-2.1025** (0.9080)			2.8775 (3.1659)
Bank - specific variables						
Bank size	1.2224*** (0.4081)	1.1541** (0.4531)	1.1682*** (0.4395)	-4.9004 (3.2099)	-5.8926** (2.7415)	-5.0850* (3.0641)
Capital structure	0.0199 (0.0311)	0.0190 (0.0322)	0.0215 (0.0329)	-0.0148 (0.2436)	-0.0469 (0.2454)	0.0019 (0.2620)
Asset structure	3.5258*** (1.1261)	3.5370*** (1.1743)	3.1585*** (1.1985)	-18.2094* (10.5265)	-16.8407* (10.0289)	-17.6853* (10.3456)
Liquid assets/ Total assets	-1.1506 (1.2521)	-0.8472 (1.2643)	-1.0731 (1.2273)	2.0740 (8.8471)	1.9900 (8.7057)	1.9840 (8.7012)
Banking industry variables (%)						
Bank concentration	0.0013 (0.0169)	0.0019 (0.0174)	-0.0016 (0.0171)	0.0574 (0.0868)	0.0544 (0.0792)	0.0567 (0.0816)
Bank deposits to GDP	0.1123*** (0.0258)	0.1049*** (0.0248)	0.0926*** (0.0253)	0.0638 (0.1801)	0.0088 (0.1884)	0.0479 (0.1880)
Net interest margin	0.0053 (0.0986)	-0.0006 (0.1002)	-0.0338 (0.0967)	0.9122 (0.7299)	0.7738 (0.7083)	0.8362 (0.6732)
Macroeconomic variables						
GDP growth (annual %)	0.0762*** (0.0186)	0.0747*** (0.0186)	0.0656*** (0.0190)	-0.2748** (0.1091)	-0.2613** (0.1142)	-0.2749** (0.1115)
Inflation	-0.0078 (0.0207)	-0.0058 (0.0212)	-0.0095 (0.0214)	0.1134 (0.1004)	0.1216 (0.0997)	0.1092 (0.1012)
Constant	-20.1287*** (6.6048)	-19.0355*** (7.1733)	-18.0987** (7.0420)	75.7280 (54.0395)	91.7867** (45.8801)	79.7510 (50.1705)

R-squared	0.2315	0.2225	0.2308	0.4115	0.4159	0.4111
N. of cases	779	779	779	693	693	693

Table 8. Difference-in-difference estimation for each policy measure category on different banks structures (Z -score stability measure)

Z - score	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
<i>Alternative Policy interventions</i>	<i>Banking System Liquidity Policy Measures</i>	<i>Policy Measure s to Protect Bank Solvency</i>	<i>Policy interest rate cuts</i>	<i>Banking System Liquidity Policy Measures</i>	<i>Policy Measure s to Protect Bank Solvency</i>	<i>Policy interest rate cuts</i>	<i>Banking System Liquidity Policy Measures</i>	<i>Policy Measure s to Protect Bank Solvency</i>	<i>Policy interest rate cuts</i>
Policy interventions									
Alternative Policy interventions	0.8532 (0.7862)	- 2.4774** *(0.9123)	0.3859 (0.3055)	1.4106 (0.8852)	-0.5480 (1.1218)	0.7546** (0.3429)	1.2766* (0.7612)	-1.0370 (0.9443)	0.7201** (0.2971)
Alternative Policy interventions* Domestic ownership	1.4693** (0.7141)	4.5560** (1.9800)	1.1559** *(0.4019)						
Alternative Policy interventions* Large bank				-0.9630 (0.6323)	-2.1321 (1.5822)	-0.5406 (0.3798)			
Alternative Policy interventions* Less capitalized							- 1.7778** (0.6890)	-1.4758 (1.7246)	- 0.9339** (0.4510)
Bank - specific variables									
Bank size	1.2834** *(0.4155)	1.2863** *(0.3904)	1.2344** *(0.4117)	1.2131** *(0.4506)	1.2513** *(0.4336)	1.1872** *(0.4534)	1.2194** *(0.4319)	1.2489** *(0.4133)	1.1970** *(0.4381)
Capital structure	0.0234 (0.0304)	0.0346 (0.0297)	0.0207 (0.0314)	0.0215 (0.0314)	0.0263 (0.0313)	0.0217 (0.0323)	0.0245 (0.0326)	0.0302 (0.0334)	0.0259 (0.0331)
Asset structure	3.3486** *(1.1493)	3.1066** *(1.1173)	3.4456** *(1.1165)	3.3691** *(1.1706)	3.1350** *(1.1245)	3.4538** *(1.1588)	3.1050** *(1.2127)	3.0341** *(1.1070)	3.2254** *(1.1845)
Liquid assets	-0.8668 (1.2578)	-0.9397 (1.2702)	-1.2916 (1.2650)	-0.6914 (1.2693)	-0.9763 (1.2847)	-0.9801 (1.2726)	-0.9075 (1.2548)	-1.0616 (1.2531)	-1.1092 (1.2406)
Banking industry variables (%)									
Bank concentration	-0.0010 (0.0166)	0.0043 (0.0155)	0.0051 (0.0168)	-0.0013 (0.0171)	0.0025 (0.0160)	0.0054 (0.0171)	-0.0034 (0.0169)	0.0012 (0.0159)	0.0030 (0.0170)
Bank deposits to GDP	0.1076** *(0.0257)	0.0974** *(0.0245)	0.1114** *(0.0252)	0.1016** *(0.0255)	0.0901** *(0.0242)	0.1056** *(0.0242)	0.0901** *(0.0255)	0.0903** *(0.0247)	0.0970** *(0.0243)
Net interest margin	0.0390 (0.1102)	-0.0061 (0.0986)	-0.0099 (0.0990)	0.0304 (0.1120)	-0.0289 (0.1011)	-0.0176 (0.1009)	0.0053 (0.1085)	-0.0253 (0.0990)	-0.0467 (0.0980)
Macroeconomic variables									
GDP growth (annual %)	0.0717** *(0.0184)	0.0681** *(0.0183)	0.0757** *(0.0184)	0.0716** *(0.0184)	0.0696** *(0.0184)	0.0731** *(0.0183)	0.0641** *(0.0183)	0.0645** *(0.0185)	0.0671** *(0.0187)
Inflation	-0.0109 (0.0207)	-0.0013 (0.0207)	-0.0035 (0.0210)	-0.0082 (0.0209)	-0.0032 (0.0208)	-0.0023 (0.0214)	-0.0114 (0.0214)	-0.0012 (0.0210)	-0.0071 (0.0214)

Constant	-	-	-	-	-	-	-	-	-
	20.7917*	20.5830*	20.4155*	19.6387*	19.4477*	19.5633*	18.8545*	19.2893*	18.9380*
	**	**	**	**	**	**	**	**	**
	(6.6219)	(6.1468)	(6.6230)	(7.0639)	(6.6679)	(7.1228)	(6.8220)	(6.4289)	(6.9727)
R-squared	0.2230	0.2318	0.2319	0.2196	0.2198	0.2224	0.2289	0.2191	0.2288
N. of cases	779	779	779	779	779	779	779	779	779

Table 9. Difference-in-difference estimation for each policy measure category on different banks structures (NPL stability measure)

Dependent variable: NPL	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
<i>Alternative Policy interventions</i>	<i>Banking System Liquidity Measures</i>	<i>Policy Measures to Protect Bank Solvency</i>	<i>Policy interest rate cuts</i>	<i>Banking System Liquidity Measures</i>	<i>Policy Measures to Protect Bank Solvency</i>	<i>Policy interest rate cuts</i>	<i>Banking System Liquidity Measures</i>	<i>Policy Measures to Protect Bank Solvency</i>	<i>Policy interest rate cuts</i>
Policy interventions									
Alternative Policy interventions	-0.9949 (5.6188)	23.9140*** (7.9218)	0.4841 (1.8769)	5.1127 (7.0695)	17.5301** (7.0016)	1.0100 (2.1176)	-0.8350 (6.1020)	18.2142*** (6.5958)	-0.3658 (1.7769)
Alternative Policy interventions* Domestic bank	4.0226 (5.0902)	-18.9334* (10.7086)	-1.6961 (2.7679)						
Alternative Policy interventions* Large bank				8.8816*** (3.0197)	4.7931 (10.4752)	-2.4297 (1.9889)			
Alternative Policy interventions* Less capitalized							1.9546 (2.2354)	1.9809 (7.5582)	1.3061 (1.6737)
Bank - specific variables									
Bank size	-4.9330 (3.2791)	-4.8751 (2.9601)	-4.6617 (3.2346)	-6.0707** (2.7050)	-5.6775** (2.6597)	-5.3873* (2.7393)	-4.9910 (3.1361)	-5.4011* (2.9249)	-4.9507 (3.0863)
Capital structure	-0.0097 (0.2498)	-0.1277 (0.2249)	-0.0013 (0.2467)	-0.0508 (0.2463)	-0.1272 (0.2280)	-0.0248 (0.2476)	0.0199 (0.2694)	-0.1041 (0.2594)	0.0176 (0.2635)
Asset structure	-18.5677* (10.2721)	-15.4007 (10.3547)	-18.7821* (10.4232)	-16.7424* (9.9784)	-16.5097* (9.9473)	-18.1088* (9.9660)	-18.3961* (10.2922)	-16.0026 (10.1394)	-18.3925* (10.2714)
Liquid assets/ Total assets	1.6800 (8.5896)	1.0572 (8.1461)	2.3037 (8.8828)	2.8327 (8.4770)	0.6026 (8.0397)	1.5391 (8.7181)	1.6290 (8.5767)	0.8088 (8.1320)	1.7947 (8.6539)
Banking industry variables (%)									
Bank concentration	0.0295 (0.0795)	-0.0611 (0.0714)	0.0436 (0.0848)	0.0225 (0.0710)	-0.0697 (0.0698)	0.0390 (0.0800)	0.0392 (0.0756)	-0.0614 (0.0704)	0.0373 (0.0814)
Bank deposits to GDP	-0.0377 (0.1652)	-0.0314 (0.1479)	-0.0090 (0.1798)	-0.0768 (0.1661)	-0.0234 (0.1595)	-0.0575 (0.1940)	-0.0343 (0.1671)	-0.0430 (0.1643)	-0.0328 (0.1980)
Net interest margin	0.7916 (0.8096)	0.8675 (0.6761)	0.8721 (0.6897)	0.7209 (0.7327)	0.7218 (0.6708)	0.7719 (0.6742)	0.7672 (0.7180)	0.6885 (0.6490)	0.7986 (0.6468)
Macroeconomic variables									
GDP growth (annual %)	-0.2891*** (0.1069)	-0.2510** (0.1080)	-0.2910*** (0.1096)	-0.2655** (0.1107)	-0.2702** (0.1138)	-0.2862** (0.1148)	-0.2926*** (0.1110)	-0.2624** (0.1106)	-0.2916** (0.1123)
Inflation	0.1108 (0.0984)	0.0299 (0.0993)	0.1169 (0.0981)	0.1217 (0.0981)	0.0357 (0.1017)	0.1226 (0.0976)	0.1104 (0.1012)	0.0348 (0.1017)	0.1116 (0.0983)
Constant	82.6494 (54.0181)	85.9265* (48.5809)	76.1250 (54.3026)	98.6918** (43.6566)	99.8457** (43.8838)	89.0041* (46.4195)	82.9532 (50.3168)	96.0179** (47.7841)	82.2549 (50.8863)
R-squared	0.4110	0.4423	0.4100	0.4219	0.4346	0.4108	0.4092	0.4329	0.4093
N. of cases	693	693	693	693	693	693	693	693	693

Table 10. Difference-in-difference estimation for individual policy measures; domestic banks (Z-score stability measure)

Z - score	Banking System Liquidity Policy Measures					Policy Measures to Protect Bank Solvency		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8

<i>Alternative Policy interventions</i>	<i>Relaxation of reserve requirements</i>	<i>Domestic currency liquidity injections</i>	<i>Foreign exchange liquidity injections</i>	<i>Increase in deposit insurance coverage</i>	<i>Interventions in individual institutions – liquidity injection</i>	<i>Recapitalization on fund</i>	<i>Relaxation of capital/provisioning requirements</i>	<i>Interventions in individual institutions – capital injection</i>
Policy interventions								
Alternative Policy interventions	-0.1900 (0.3150)	0.5171 (0.3520)	0.8592** (0.4140)	-0.8219 (0.5766)	-1.5979*** (0.5863)	-1.0267 (0.7826)	-0.2757 (0.5539)	-0.9224** (0.3586)
Alternative Policy interventions* Domestic ownership	0.8016 (0.5309)	0.3459 (0.5462)	1.3667** (0.5895)	0.7576 (0.4605)	2.1766*** (0.7555)	1.9739* (1.1194)	1.6540 (1.6562)	1.2510* (0.6917)
Bank - specific variables								
Bank size	1.3146*** (0.4133)	1.2798*** (0.4202)	1.3237*** (0.4145)	1.3160*** (0.4103)	1.2790*** (0.4175)	1.2593*** (0.4164)	1.2865*** (0.4176)	1.3418*** (0.3931)
Capital structure	0.0256 (0.0307)	0.0243 (0.0308)	0.0292 (0.0306)	0.0275 (0.0296)	0.0239 (0.0302)	0.0210 (0.0303)	0.0280 (0.0297)	0.0291 (0.0295)
Asset structure	3.3112*** (1.1520)	3.0491*** (1.1415)	3.5214*** (1.1285)	3.2228*** (1.1548)	3.1373*** (1.1219)	3.0708*** (1.1392)	3.1437*** (1.1472)	3.0905*** (1.1221)
Liquid assets	-1.0841 (1.3025)	-0.9604 (1.2622)	-0.4858 (1.2424)	-1.1980 (1.2729)	-0.9802 (1.2654)	-1.1983 (1.2933)	-1.0459 (1.2996)	-0.9445 (1.2815)
Banking industry variables (%)								
Bank concentration	-0.0060 (0.0170)	0.0003 (0.0167)	-0.0012 (0.0172)	-0.0069 (0.0164)	-0.0088 (0.0174)	-0.0013 (0.0167)	-0.0051 (0.0163)	-0.0054 (0.0168)
Bank deposits to GDP	0.0964*** (0.0246)	0.1014*** (0.0256)	0.1036*** (0.0250)	0.0808*** (0.0251)	0.0863*** (0.0261)	0.0907*** (0.0241)	0.0964*** (0.0249)	0.0903*** (0.0254)
Net interest margin	-0.0108 (0.1028)	-0.0037 (0.1026)	0.1011 (0.1108)	-0.0510 (0.1013)	-0.0280 (0.1017)	-0.0285 (0.1003)	-0.0022 (0.1005)	0.0140 (0.1017)
Macroeconomic variables								
GDP growth (annual %)	0.0709*** (0.0183)	0.0662*** (0.0183)	0.0638*** (0.0183)	0.0673*** (0.0187)	0.0606*** (0.0186)	0.0728*** (0.0183)	0.0696*** (0.0185)	0.0622*** (0.0192)
Inflation	-0.0085 (0.0210)	-0.0079 (0.0210)	-0.0108 (0.0204)	-0.0074 (0.0208)	-0.0044 (0.0208)	-0.0065 (0.0209)	-0.0074 (0.0213)	-0.0056 (0.0208)
Constant	-20.2802** (6.5948)	-20.2539** (6.6943)	-21.7167** (6.5303)	-19.4102** (6.5656)	-19.0476** (6.8184)	-19.2995*** (6.6545)	-19.9678*** (6.6485)	-20.4774*** (6.3114)
R-squared	0.2199	0.2207	0.2315	0.2226	0.2231	0.2217	0.2202	0.2222
N. of cases	779	779	779	779	779	779	779	779

Table 11. Difference-in-difference estimation for individual policy measures; domestic banks (NPL stability measure)

NPL	Banking System Liquidity Policy Measures					Policy Measures to Protect Bank Solvency		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
<i>Alternative Policy interventions</i>	<i>Relaxation of reserve requirements</i>	<i>Domestic currency liquidity injections</i>	<i>Foreign exchange liquidity injections</i>	<i>Increase in deposit insurance coverage</i>	<i>Interventions in individual institutions – liquidity injection</i>	<i>Recapitalization on fund</i>	<i>Relaxation of capital/provisioning requirements</i>	<i>Interventions in individual institutions – capital injection</i>
Alternative Policy interventions	0.7918 (2.4030)	-0.0977 (2.3985)	-5.8422** *	5.2882 (3.8251)	2.6651 (3.2380)	-0.4146 (2.6812)	5.4009* (3.0763)	11.5463** (4.9455)

			(1.8637)					
Alternative Policy interventions* Domestic bank	2.8206 (3.3195)	2.3037 (3.6015)	-1.7756 (3.5687)	2.5411 (3.1728)	3.1808 (3.1306)	-3.7043 (4.6618)	-7.4744*** (2.5161)	-7.0032 (6.1577)
Bank - specific variables								
Bank size	-5.0370 (3.2813)	-4.8847 (3.2371)	-4.7424 (3.1447)	-5.2367 (3.3044)	-4.6357 (3.1979)	-4.7741 (3.2571)	-4.8072 (3.3150)	-5.3563* (2.8053)
Capital structure	-0.0232 (0.2570)	-0.0058 (0.2447)	-0.0507 (0.2369)	-0.0457 (0.2463)	-0.0134 (0.2461)	0.0014 (0.2471)	-0.0397 (0.2581)	-0.1387 (0.2057)
Asset structure	-18.5130* (10.2359)	-18.9279* (10.1870)	-19.6414* (9.9735)	-18.2968* (10.2958)	-18.4103* (10.4305)	-19.3520* (10.3867)	-19.5288* (10.5737)	-14.3171 (10.4546)
Liquid assets	1.9460 (8.6587)	1.3469 (8.7562)	-1.6459 (8.0889)	2.2092 (8.6685)	2.2628 (8.7418)	1.5567 (8.7382)	1.1918 (8.6496)	-0.4225 (7.8092)
Banking industry variables (%)								
Bank concentration	0.0223 (0.0794)	0.0363 (0.0830)	0.0285 (0.0692)	0.0284 (0.0791)	0.0492 (0.0771)	0.0466 (0.0727)	-0.0003 (0.0872)	0.0438 (0.0793)
Bank deposits to GDP	-0.0229 (0.1628)	-0.0288 (0.1636)	-0.1317 (0.1743)	0.0706 (0.1706)	0.0136 (0.1697)	-0.0351 (0.1679)	-0.1100 (0.1638)	0.0898 (0.1530)
Net interest margin	0.8632 (0.7243)	0.7980 (0.7008)	0.1181 (0.7101)	1.1138 (0.7663)	0.9628 (0.6892)	0.8108 (0.6818)	0.8794 (0.6733)	0.4078 (0.5826)
Macroeconomic variables								
GDP growth (annual %)	-0.2845*** (0.1077)	-0.2934** (0.1117)	-0.2505** (0.1074)	-0.2654* (0.1059)	-0.2498** (0.1171)	-0.2826** (0.1085)	-0.3051*** (0.1085)	-0.1512 (0.1173)
Inflation	0.0997 (0.0945)	0.1116 (0.0995)	0.1462 (0.1006)	0.1056 (0.0967)	0.1035 (0.1027)	0.1180 (0.1010)	0.0880 (0.0950)	0.0741 (0.1041)
Constant	83.9488 (54.0279)	81.3735 (53.3846)	87.2133* (51.3749)	82.1628 (54.1901)	73.9298 (52.1440)	79.1101 (52.9488)	85.9238 (56.7914)	82.7344* (45.5330)
R-squared	0.4122	0.4103	0.4254	0.4184	0.4109	0.4103	0.4162	0.4454
N. of cases	693	693	693	693	693	693	693	693

Table 12. Difference-in-difference estimation for individual policy measures; large banks (Z-score stability measure)

Z - score	Banking System Liquidity Policy Measures					Policy Measures to Protect Bank Solvency		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Alternative Policy interventions	Relaxation of reserve requirements	Domestic currency liquidity injections	Foreign exchange liquidity injections	Increase in deposit insurance coverage	Interventions in individual institutions – liquidity injection	Recapitalization fund	Relaxation of capital/provisioning requirements	Interventions in individual institutions – capital injection
Alternative Policy interventions	0.1855 (0.4166)	0.5908 (0.4095)	1.7601** (0.4881)	-0.4591 (0.5993)	-0.7298 (0.5556)	2.4811*** (0.3113)	0.1258 (0.6407)	-0.6507 (0.3970)
Alternative Policy interventions* Large bank	-0.4224 (0.3940)	-0.1284 (0.4461)	-1.5477*** (0.5403)	-0.4997 (0.3771)	-1.2478 (0.8208)	-3.8527*** (0.6695)	-0.0394 (0.9745)	0.1738 (0.6511)
Bank - specific variables								
Bank size	1.2242*** (0.4451)	1.2348** (0.4470)	1.2831** (0.4419)	1.2188** (0.4379)	1.2283*** (0.4419)	1.1689*** (0.4360)	1.2574*** (0.4485)	1.3162*** (0.4246)
Capital structure	0.0208	0.0227	0.0321	0.0231	0.0217	0.0157	0.0208	0.0264

	(0.0316)	(0.0313)	(0.0316)	(0.0307)	(0.0306)	(0.0302)	(0.0318)	(0.0298)
Asset structure	3.3194***	3.0786**	3.3105**	3.2922**	3.0506***	3.4523***	3.1543***	3.0212***
	(1.1553)	(1.1418)	(1.1846)	(1.1583)	(1.1437)	(1.1110)	(1.1484)	(1.1413)
Liquid assets	-0.9922	-0.9006	-0.2123	-1.0392	-1.1552	-0.9281	-1.1200	-0.9843
	(1.3007)	(1.2782)	(1.2463)	(1.2834)	(1.2832)	(1.2774)	(1.2992)	(1.2958)
Banking industry variables (%)								
Bank concentration	-0.0072	-0.0001	-0.0014	-0.0064	-0.0084	-0.0021	-0.0065	-0.0061
	(0.0176)	(0.0170)	(0.0172)	(0.0166)	(0.0175)	(0.0168)	(0.0165)	(0.0171)
Bank deposits to GDP	0.0909***	0.0993**	0.0935**	0.0782**	0.0851***	0.0895***	0.0928***	0.0881***
	(0.0249)	(0.0252)	(0.0239)	(0.0249)	(0.0260)	(0.0239)	(0.0245)	(0.0252)
Net interest margin	-0.0228	-0.0190	0.0962	-0.0610	-0.0388	-0.0391	-0.0231	0.0001
	(0.1043)	(0.1025)	(0.1110)	(0.1020)	(0.1022)	(0.0991)	(0.1011)	(0.1049)
Macroeconomic variables								
GDP growth (annual %)	0.0707***	0.0656**	0.0640**	0.0669**	0.0602***	0.0718***	0.0684***	0.0609***
	(0.0184)	(0.0182)	(0.0182)	(0.0187)	(0.0185)	(0.0182)	(0.0185)	(0.0193)
Inflation	-0.0072	-0.0073	-0.0081	-0.0051	-0.0034	-0.0070	-0.0083	-0.0055
	(0.0210)	(0.0212)	(0.0207)	(0.0211)	(0.0211)	(0.0210)	(0.0215)	(0.0210)
Constant	-18.6455***	-19.3096***	-20.7484***	-17.9727***	-17.9895**	-17.9876***	-18.9757***	-19.7103***
	(6.9436)	(6.9554)	(6.8154)	(6.8685)	(7.0126)	(6.8226)	(6.9794)	(6.6768)
R-squared	0.2148	0.2176	0.2407	0.2177	0.2176	0.2324	0.2130	0.2164
N. of cases	779	779	779	779	779	779	779	779

Table 13. Difference-in-difference estimation for individual policy measures; large banks (NPL stability measure)

NPL	Banking System Liquidity Policy Measures					Policy Measures to Protect Bank Solvency		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
<i>Alternative Policy interventions</i>	<i>Relaxation of reserve requirements</i>	<i>Domestic currency liquidity injections</i>	<i>Foreign exchange liquidity injections</i>	<i>Increase in deposit insurance coverage</i>	<i>Interventions in individual institutions – liquidity injection</i>	<i>Recapitalization fund</i>	<i>Relaxation of capital/provisioning requirements</i>	<i>Interventions in individual institutions – capital injection</i>
Policy interventions								
Alternative Policy interventions	4.4386 (3.1848)	2.7087 (2.6872)	-6.0527** (2.9006)	7.4729* (4.1513)	2.9113 (3.3389)	-5.7803*** (1.6396)	3.2679 (2.7328)	7.2622** (3.2352)
Alternative Policy interventions* Large bank	-5.4321*** (1.9510)	-5.3567** (2.2396)	0.0485 (2.9641)	- 5.8216*** (1.6516)	0.9885 (2.6732)	5.4536** (2.3575)	4.5282 (7.1790)	6.0385 (6.7799)
Bank - specific variables								
Bank size	-6.0301** (2.7470)	-5.5994** (2.8008)	-5.3342** (2.5254)	-6.3828** (2.6989)	-4.9153* (2.7366)	-5.0053* (2.7951)	-5.2358* (2.8017)	-6.0191** (2.4960)
Capital structure	-0.0687 (0.2613)	-0.0363 (0.2479)	-0.0650 (0.2267)	-0.0629 (0.2407)	-0.0209 (0.2472)	-0.0084 (0.2465)	-0.0403 (0.2571)	-0.1473 (0.1982)
Asset structure	-16.8646* (9.9867)	-16.7234* (9.9626)	-19.9015** (9.5819)	-16.1848 (9.8434)	-18.6478* (10.1242)	-19.9721* (10.2626)	-19.8104* (10.2638)	-17.0851* (9.2634)
Liquid assets	2.5737 (8.5996)	2.9979 (8.8143)	-1.9453 (7.8880)	3.2995 (8.5594)	1.7383 (8.6925)	1.2012 (8.7811)	1.5946 (8.6624)	-2.1036 (7.4408)
Banking industry variables (%)								
Bank concentration	-0.0090 (0.0781)	0.0363 (0.0728)	0.0233 (0.0670)	0.0301 (0.0696)	0.0467 (0.0769)	0.0420 (0.0711)	-0.0017 (0.0843)	0.0294 (0.0751)
Bank deposits to GDP	-0.0900 (0.1709)	-0.0654 (0.1734)	-0.1386 (0.1814)	0.0018 (0.1706)	0.0039 (0.1787)	-0.0392 (0.1741)	-0.1171 (0.1816)	0.0550 (0.1658)

Net interest margin	0.7960 (0.6831)	0.6136 (0.6910)	0.0187 (0.7028)	1.0100 (0.7056)	0.8727 (0.7000)	0.7272 (0.6853)	0.8414 (0.6619)	0.1266 (0.5333)
Macroeconomic variables								
GDP growth (annual %)	-0.2575** (0.1123)	-0.2936** (0.1161)	-0.2590** (0.1101)	-0.2555** (0.1092)	-0.2561** (0.1219)	-0.2892** (0.1149)	-0.3103*** (0.1141)	-0.1832 (0.1161)
Inflation	0.1026 (0.0943)	0.1202 (0.0999)	0.1462 (0.1010)	0.1276 (0.0958)	0.1033 (0.1033)	0.1185 (0.1017)	0.0904 (0.0968)	0.0785 (0.1056)
Constant	100.7859** (45.7018)	91.6185* (45.8150)	97.6111** (41.6426)	98.3193** (43.8834)	79.7404* (45.5162)	84.4495* (46.1700)	93.0129* (48.9697)	99.3681** (38.0641)
R-squared	0.4216	0.4175	0.4237	0.4320	0.4097	0.4095	0.4137	0.4405
N. of cases	693	693	693	693	693	693	693	693

Table 14. Difference-in-difference estimation for individual policy measures; less capitalized banks (Z - score)

Z - score	Banking System Liquidity Policy Measures					Policy Measures to Protect Bank Solvency		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
<i>Alternative Policy interventions</i>	<i>Relaxation of reserve requirements</i>	<i>Domestic currency liquidity injections</i>	<i>Foreign exchange liquidity injections</i>	<i>Increase in deposit insurance coverage</i>	<i>Interventions in individual institutions – liquidity injection</i>	<i>Recapitalization fund</i>	<i>Relaxation of capital/provisioning requirements</i>	<i>Interventions in individual institutions – capital injection</i>
Policy interventions								
Alternative Policy interventions	0.2641 (0.3366)	0.6641* (0.3474)	1.2662** * (0.3804)	-0.3248 (0.5434)	-0.6795 (0.7326)	-0.0143 (0.6309)	0.0695 (0.6204)	-0.5890 (0.3828)
Alternative Policy interventions* Less capitalized	-0.8206** (0.3800)	-0.5780 (0.4090)	-1.1051** (0.5563)	-0.9944** (0.4654)	-0.7030 (0.8614)	-1.0479 (1.1975)	0.2516 (1.0776)	-0.3236 (0.6391)
Bank - specific variables								
Bank size	1.2475*** (0.4295)	1.1745** * (0.4339)	1.2889** * (0.4140)	1.2952** * (0.4210)	1.2650*** (0.4229)	1.2309*** (0.4204)	1.2685*** (0.4181)	1.2687*** (0.4058)
Capital structure	0.0243 (0.0326)	0.0255 (0.0334)	0.0393 (0.0324)	0.0229 (0.0326)	0.0271 (0.0320)	0.0258 (0.0322)	0.0260 (0.0337)	0.0303 (0.0316)
Asset structure	3.2211*** (1.1923)	3.1301** * (1.1887)	3.2321** * (1.1621)	3.0694** (1.2052)	3.0724*** (1.1245)	3.1634*** (1.1427)	3.2388*** (1.1557)	3.0957*** (1.1106)
Liquid assets	-1.1087 (1.2929)	-0.9134 (1.2737)	-0.4161 (1.2541)	-1.1804 (1.2675)	-1.1741 (1.2613)	-1.1106 (1.2848)	-1.1266 (1.2940)	-0.9611 (1.2685)
Banking industry variables (%)								
Bank concentration	-0.0090 (0.0174)	0.0004 (0.0169)	-0.0003 (0.0173)	-0.0092 (0.0164)	-0.0088 (0.0175)	-0.0040 (0.0170)	-0.0063 (0.0164)	-0.0065 (0.0170)
Bank deposits to GDP	0.0852*** (0.0253)	0.0942** * (0.0254)	0.0969** * (0.0245)	0.0704** * (0.0251)	0.0825*** (0.0259)	0.0897*** (0.0240)	0.0918*** (0.0244)	0.0861*** (0.0253)
Net interest margin	-0.0322 (0.1023)	-0.0237 (0.1027)	0.0820 (0.1097)	-0.0721 (0.1007)	-0.0427 (0.1011)	-0.0399 (0.0980)	-0.0229 (0.1009)	0.0032 (0.1031)
Macroeconomic variables								
GDP growth (annual %)	0.0643***	0.0652** *	0.0618** *	0.0616** *	0.0581***	0.0717***	0.0685***	0.0589***

