# How did depositors react to the recent crisis?

# Evidence from the Central European banking industry[1]

**Iftekhar Hasan**
Fordham University, New York, e-mail: ihasan@fordham.edu

**Krzysztof Jackowicz**[2]
Kozminski University, Warsaw, e-mail kjtrist@kozminski.edu.pl

**Oskar Kowalewski,**
Warsaw School of Economics, Warsaw, e-mail: okowale@sgh.waw.pl

**Łukasz Kozłowski**
BGŻ SA, Warsaw, e-mail: lukaszkoz@gmail.com

This version: May 2012

**Abstract**
The Central European banking industry is dominated by foreign-owned banks. During the recent crisis, for the first time since the transition to a post-Communist era, foreign parent companies were frequently in worse financial conditions than their subsidiaries. This situation created a unique opportunity to study new aspects of depositor discipline. In this article, we investigate whether depositors flexibly accommodated to the changing sources of risk. We also analyse the informational foundations of depositors' decisions. Using a new and comprehensive data set, we find that in Central European countries, the recent crisis did not change the sensitivity of deposit growth rates to accounting risk measures. Additionally, we establish that depositors' actions are much more strongly influenced by press rumours concerning parent companies than by fundamentals and that public aid announcements are interpreted primarily as confirmation of a parent company's financial distress. Our results have policy implications and illustrate the importance of reputational capital during periods of crisis.

**JEL classification**: G21, G28

**Keywords**: depositor behaviour, market discipline, crisis, emerging markets

---

[1] This research project was supported by *Narodowe Centrum Nauki* (project N N113 360040, contract 3600/B/H03/2011/40).
[2] Corresponding author: Kozminski University, Department of Banking and Finance, Jagiellońska 57/59, 03-301 Warsaw, Poland, email: kjtrist@kozminski.edu.pl; phone number +48602510995

## 1. Introduction

Banking systems in Central European (CE) countries are dominated by foreign-owned banks (Allen et al., 2006). As a result, during the recent financial crisis, which originated in developed economies, financial instability was largely imported to the CE banking industry from abroad. This phenomenon, which was unprecedented in the history of Central Europe since the fall of Communism, created a unique opportunity to study new aspects of market discipline in banking. More specifically, we are able to address important research questions in the described context, such as whether depositors flexibly react to changing sources of risk, whether they base decisions on fundamentals or rumours, and whether depositors' decisions are affected by the public aid received by certain foreign parent companies.

Our study uses a large data set on the commercial banks operating in 11 CE countries and their parent companies during the 1994-2009 time period. This data set includes not only financial statements for each firm but also information regarding parent companies, mass-media rumours, capital injections, bad loan removals, and emergency loans. The estimation of dynamic panel models explaining deposit growth rates allows us to reach several interesting conclusions. In particular, we find that the recent crisis did not change the sensitivity of deposit growth rates to accounting risk measures. We also establish that depositors' decisions are much more strongly influenced by press rumours regarding a parent company's condition than by the fundamentals. In addition, we document that public aid is principally interpreted by depositors as a confirmation of the financial distress of the parent company. More generally, our study supports, to an extent, the view that depositors monitor banks' situations and react to changes in the economic environment. However, our results also illustrate a crude character of depositor discipline that is in accordance with the previous research of Oliveira et al. (2011).

The article complements the existing empirical evidence on market discipline in banking in three ways. First, we provide a more comprehensive analysis of depositor discipline in CE countries than exists in previous studies (Mondschean and Opiela, 1999; Jackowicz, 2004; Kraft and Galac, 2007). Second, we extend the traditional test of the existence of market discipline to the direct verification of whether deposit growth rates are affected by factors connected to a parent company. Third, in the context of developing economies, we provide a novel assessment of the significance of variables such as market rumours, parent company fundamentals, and the public aid received by parent companies for depositors' decisions.

The remainder of the article is organised as follows. Section 2 reviews the literature with a specific focus on market discipline in emerging markets. Section 3 presents our hypotheses and econometric model. Section 4 characterises the data set and other sources of information utilised in this study. In Section 5, we describe and discuss the empirical results. Section 6 provides some robustness checks and Section 7 contains concluding remarks.

## 2. Literature review

The vast majority of existing studies on depositor discipline address this topic in the context of mature economies. These studies can be divided into two main categories. The first category includes research that explores the relationship between bank risk and either deposit interest rates or interest costs. Hannan and Hanweck (1988), Cargill (1989), Ellis and Flannery (1992), Kutner (1992), Brewer and Mondschean (1994), Hess and Feng (2007), and Uchida and Satake (2009) all established that deposit interest rates and interest costs were connected, in the expected manner, to measures of bank risk or manifestations of risk in bank activities. In particular, they documented that the deposit interest rates increased as the capital base of a bank worsened, the standard deviation of bank performance augmented, and the assets interest rate risk rose. Additionally, they observed that banks with lower ratings and

higher shares of speculative financial instruments in their assets were forced to pay higher interest rate costs. The second category of depositor discipline studies analyses the disciplinary effect of reduced deposit availability. Billet et al. (1998), Park and Peristiani (1998), Jordan (2000), Jagtiani and Lemieux (2000), Goldberg and Hudgins (2002), Maechler and McDill (2006), and Shimizu (2009) demonstrated that banks that were in danger of bankruptcy did not manage to attract uninsured deposits and that weak banks actively substituted insured deposits for lost uninsured liabilities. Moreover, these studies found evidence that signals generated by uninsured depositors pertaining to the critical financial condition of certain banks could occur as early as two years prior to the actual failure of these banks.

Though the aforementioned research is certainly important, studies using data from emerging markets are more relevant to the current investigation. Hosono (2005) demonstrated that a solid capital base and high profitability lowered deposit interest costs paid by Korean, Indonesian, Malaysian, and Thai banks. Somewhat surprisingly, however, the same independent variables were insignificant in regression models explaining the growth of deposit volumes. Hadad et al. (2011) also found evidence of market discipline in Indonesia, where higher deposit rates were associated with higher default and liquidity risks. The mechanisms of depositor discipline in Latin American countries were studied by several authors. Barajas and Steiner (2000), in contrast to Hosono (2005), established that Columbian banks were disciplined by alterations in real deposit growth rates but not by interest costs. In addition, they noticed that banks recording low inflows of deposits improved their capital base and augmented their loan loss provisions in the next period. This last observation can be interpreted as an indication of the effectiveness of depositor discipline. Peria and Schmukler (2001) demonstrated that deposit volumes were negatively correlated and deposit interest cost was positively correlated with accounting measures of bank risk in Argentina, Chile, and

Mexico. Interestingly, in these countries, disciplining signals were generated by both uninsured and insured depositors. This phenomenon can be explained by the limited credibility of the safety nets in those nations. Calomiris and Powell (2001) confirmed that depositors monitored the risk-taking activities of private banks in Argentina during the last years of the 20th century. Ioannidou and Penas (2010) established that the introduction of the *explicit* deposit insurance system in Bolivia diminished the market discipline exercised by large depositors. Prior to the introduction of this system, banks with a higher share of large deposits took less risk, whereas after the introduction, this effect vanished.

In accordance with the conclusions reached by Ioannidou and Penas (2010), Mondschean and Opiela (1999) observed that the introduction of an *explicit* deposit insurance system weakened depositor discipline in Poland. In addition, Jackowicz (2004) showed that banks in Poland were disciplined mainly by deposit interest costs, a similar conclusion to the findings of Hosono (2005). Kraft and Galac (2007) provided evidence that in Croatia, banks were able to increase deposit growth by raising interest rates in the period immediately preceding the 1998-1999 crisis. Additionally, they showed that Croatian depositors were relatively slow to link high deposit rates to increased portfolio risk. Önder and Özyildirim (2008) found that depositors in Turkey reacted negatively to bank risks even after the introduction of full coverage in 1994. Moreover, they documented that depositor discipline did not discourage Turkish banks from pursuing moral hazard behaviours. The observation that deposit insurance systems in developing countries are frequently seen as not fully credible, made by Önder and Özyildrim (2008) and Peria and Schmukler (2001), is further confirmed by Prean and Stix (2011), who analysed survey data to conclude that Croatian depositors perceived the safety of their deposits to be relatively low during the 2007-2009 time period.

Another distinct group of studies investigate whether crisis and crisis experience influence depositors' behaviours. Opiela (2004) demonstrated that in the 18 month period directly preceding the 1997 crisis in Thailand, depositors monitored banks and finance companies more closely. Levy-Yeyati et al. (2004) established that during crisis periods in Argentina and Uruguay, depositors' sensitivity to macroeconomic risks increased. At the same time, however, depositors' sensitivity to bank-specific factors diminished. Kraft and Galac (2007) demonstrated that during the 1998-1999 crisis in Croatia, the interest-rate elasticity of deposits completely vanished, and the phenomenon of a flight to quality occurred. Oliveira et al. (2011) found that during the recent crisis in Brazil, banks in that nation that were viewed as systemically important components of the financial system recorded a substantial increase in uninsured deposits, whereas the other Brazilian banks lost uninsured deposits. Forssbaeck (2011) found, using a large sample of banks from developed and emerging economies, that there was no proof of augmented market discipline during crisis periods. The majority of reviewed studies concludes thus that during crises depositors exhibited rather low sensitivity to banks fundamentals.

The existing evidence regarding medium- and long-term effects of crisis experience on depositor discipline is inconclusive. Peria and Schmukler (2001) showed that in Latin American countries, the sensitivity of deposit growth rates and deposit interest costs to bank risk measures was augmented in the post-crisis periods. However, Hosono et al. (2005) did not confirm the existence of this change, which is known as the *wake-up-call effect*. Instead, they demonstrated that in Korea, Malaysia, and Thailand, the sensitivity of deposit volumes and interest costs to bank fundamentals actually declined after 1998.

In summary, the existing literature confirms that market participants do monitor the risk-taking activities of banks. In emerging economies, disciplining signals are generated by both insured and uninsured depositors, likely as a result of the limited credibility of safety nets.

However, the existing literature does not answer the fundamental question of whether strengthened market discipline would be sufficient to maintain the stability of the banking system. Furthermore, the functioning of market discipline during periods of crisis is still relatively poorly understood.

## 3. Hypotheses and empirical strategy

We build an empirical strategy based upon the existing evidence and the specific situation in CE countries during the recent crisis. We start our analysis with a traditional test of depositor discipline existence. More specifically, we verify hypothesis H1.

*H1: In the CE countries, bank risk measures are negatively related to the growth of deposit volumes.*

The recent crisis could seriously alter the functioning of depositor discipline. On the one hand, increased risk may result in augmented sensitivity of deposit volume and interest costs to accounting risk measures. On the other hand, however, the response to the crisis in the form of extended or blanket guarantees (FSB 2009; FSB 2010) should considerably diminish the disciplining role of depositors' actions. Based on purely theoretical grounds, it is difficult to forecast which of the two effects identified above is stronger. As a consequence, we test hypothesis H2 in the following form.

*H2: During the recent crisis, the sensitivity of deposit volume to accounting measures of bank risks in the CE countries was different than it was during the other periods studied.*

From 2007 onward, the instability in the CE banking industry was mainly imported from developed countries. Therefore, if market discipline reacts flexibly to changing market conditions (as its proponents claim), the competitive position of foreign-owned banks controlled by financially distressed owners should be negatively affected. This line of reasoning produces the following hypothesis H3 for testing:

*H3: During the recent crisis in the CE countries, foreign-owned banks controlled by distressed owners had difficulties in attracting new deposits*.

The anxiety regarding the financial health of foreign-owned banks might encourage certain depositors to withdraw their funds and search for safer investment opportunities. In the CE countries, one source for such opportunities was the offers of state-owned banks. In the majority of cases, these banks maintained a traditional banking business model. As a result, these institutions were relatively unaffected by the recent crisis. This reasoning leads us to the formulation of hypothesis H4.

*H4: The uncertain financial conditions of foreign banks enabled state-owned banks in the CE countries to record higher deposit growth than other banks during the recent crisis*.

Depositors are usually unsophisticated investors. We can therefore assume that their investment decisions are influenced more by mass-media rumours than by bank fundamentals. Even the small group of sophisticated depositors is forced to take mass-media rumours into account because this group is aware of the simple decision-making processes applied by the majority of bank depositors. In the context of the recent crisis and the CE banking industry, these arguments permit us to formulate hypothesis H5.

*H5: During the recent crisis, depositors' behaviour was more strongly influenced by rumours concerning the financial health of foreign parent companies than by the financial fundamentals of these foreign parent companies*.

Many parent companies of banks operating in the CE countries received state aid during the recent period of crisis. On the one hand, this aid should stabilise the situation of the parent company and its subsidiaries. On the other hand, negative press coverage accompanying capital injections and other forms of public assistance may damage the reputation of a bank and thereby sap the confidence of its depositors. The net impact of public aid on depositors'

decisions is thus an open question. Hypothesis H6 assumes that the two effects offset each other perfectly or near perfectly.

*H6: Public aid received by parent companies does not significantly influence the deposit dynamics recorded by the CE banking subsidiaries.*

To test our hypotheses, we employ dynamic panel models similar to the models used by Maechler and McDill (2006) and Oliveira et al. (2011). We use the real growth rate of deposits from non-financial entities ($DEPOSIT_GR_{t,i}$) as the dependent variable in these models. Unfortunately, we are unable to differentiate in this study between insured and uninsured deposits. However, as we discussed in Section 2, in emerging economies, deposit insurance systems are not fully credible, or at least are seen by depositors as not fully credible. We expect that this shortcoming of our empirical strategy will bias the results against finding proofs of market discipline existence. The estimated models are built according to the general principles expressed by equation (1).

$$\begin{aligned} DEPOSIT_GR_{t,i} = {} & DEPOSIT_GR_{t-1,i} + a_0 + a_1 MD_{t-1,i} + a_2 CV_{t,i} + a_3 OS_{t,i} + \\ & + a_4 PF_{t-1,s} + a_5 RM_{t,s} + a_6 PH_s + a_7 TCD_{t,k} + \\ & + a_8 INTEREST_EXP_{t,i} + v_{t,i} \end{aligned} \tag{1}$$

In equation (1), $DEPOSIT_GR_{t-1,i}$ denotes the lagged dependent variable recorded by bank *i* in period *t*; *MD* is a set of explanatory variables used to test the existence of market discipline in the CE deposit market; *CV* is a set of explanatory variables designed to control for other important bank-specific determinants of the dependent variable; *OS* is a set of binary variables encoding the ownership structures of banks operating in the CE economies; *PF* is a set of variables describing the fundamentals of parent company *s*; *RM* is a set of variables capturing market rumours regarding the financial health of parent company *s* during the recent crisis; *PH* is a set of variables identifying parent companies that received public aid during the recent

crisis; and $INTEREST_EXP_{t,i}$ is a variable reflecting bank interest costs. Model (1) also includes dummies controlling for specific conditions in year *t* in country *k* (*TCD*).

The model parameters are estimated using the Generalised Method of Moments (GMM-SYS) procedure proposed by Blundell and Bond (1998). This method was previously used in the context of market discipline testing, such as that conducted by Hadad et al. (2011) and Oliveira et al. (2011). In contrast to other panel model estimators (such as the fixed effects or random effects estimators), the GMM-SYS enables us to remove the strict exogeneity assumption for regressors and thus to include the lagged dependent variable among these regressors. In our research, we assume that most of the bank fundamentals are correlated with the past shocks to the dependent variable. Because the removal of the strict exogeneity assumption implies that the feedback effect running from the dependent variable to the other variables is allowed, we permit the regressors mentioned above to be only sequentially exogenous. We therefore use suitably lagged values of these regressors as instrumental variables in the equations in first differences and the first differences of these regressors in the equations in levels. Other regressors, including binary variables encoding the ownership structures, variables describing the fundamentals of the parent company, variables capturing market rumours concerning the parent company, variables identifying parent companies that received public aid, and time and country dummy variables, are treated as strictly exogenous.

We base our statistical inferences regarding the significance of parameters on the one-step estimator, as simulations performed by Arellano and Bond (1991) and Blundell and Bond (1998) suggest that the asymptotic standard errors for the two-step estimator can be a poor guide for hypothesis testing, especially in case of heteroscedastic error components. The appropriateness of a set of instruments we use is formally evaluated by the Sargan test of overidentifying restrictions and the Arellano-Bond test for error autocorrelation. We compute the Sargan test using the two-step GMM-SYS estimator, as the Sargan test based on the one-

step estimator is not heteroscedasticity-consistent (Arellano and Bond, 1991; Doornik and Hendry, 2009).

Table 1 presents the construction of the independent variables in detail. Hence, we will concentrate our analysis on two topics: the expected influence of these variables and their connection with the hypotheses. We use three bank-specific variables to test H1. If depositors observe bank risk, high profitability (*OROA*) and solid capital base (*EQUITY*) should increase deposit growth rates. In contrast, an elevated share of risky assets (*LOANS*) should have a negative impact on the dependent variable. To check whether deposit volume sensitivity changed during the recent crisis (i.e., to verify H2), we examine interactions of the *OROA*, *EQUITY*, and *LOANS* variables with the binary variable *CRISIS* that encodes the years from 2007 to 2009.

The quality of our depositor discipline tests depends critically on the composition of the set of variables controlling for other important deposit growth rate determinants. This set is composed of three elements. First, as equation (1) indicates, we introduce the lagged dependent variable (*DEPOSIT_GR*) and the variable reflecting contemporaneous interest costs (*INTEREST_EXP*). We assume that inertia in deposit inflows and moral hazard will result in positive signs of the coefficients estimated for these variables. Second, we control for bank characteristics, such as the quality of management (*CIR*), the dominating retail or wholesale component of activities (*NCI_SHARE* and *RELAT_FIXED_ASSETS*) and the scale of operations (*ASSETS*). We expect positive signs of parameters for *ASSETS* and *RELAT_FIXED_ASSETS*, and a negative sign of the coefficient for *NCI_SHARE* because large and retail banks usually report more rapid deposit growth rates than other banks. The lack of strict control of non-interest costs (i.e., high *CIR* values) is a trait of bad management and thus should be negatively correlated with the dependent variable. Third, the literature on privatisation and on ownership significance in developing economies suggests that foreign-

owned banks follow more aggressive growth strategies and that government-owned banks suffer from corporate governance problems (Shleifer, 1998; Haas and van Lelyveld, 2006; Haselman, 2006). Therefore, we forecast that, *ceteris paribus*, foreign-owned banks (*FGN*) should attract more deposits than private domestic banks, whereas government-controlled banks (*GOV*) should attract fewer deposits than private domestic banks. In addition, the interactions of the ownership dummy variables with the *CRISIS* variable provide us with an opportunity to test H4.

As we mentioned earlier, CE banking systems, which are dominated by foreign-owned entities, constitute an ideal laboratory for the study of the impact of parent companies' financial conditions on subsidiaries' chances to successfully compete in deposit markets. The market discipline theory implies that subsidiaries controlled by parent companies with a solid capital base (*PAR_EQUITY*), high profitability (*PAR_ROA*), and low share of risky assets (*PAR_LOANS*) should enjoy more favourable deposit growth rates. Similarly, growth in profitability (*PAR_ROA_GROTWH*) or in a capital base (*PAR_EQUITY_GROWTH*) should produce higher deposit inflows. Because parent company fundamentals are most likely directly observed only by a very limited number of depositors, we include in our regressions three variables describing mass-media rumours regarding the financial health of parent companies. The first variable is based on the percentage of negative pieces of information out of the total media coverage (*PAR_NEG_COV*). The second (*PAR_NEG_COV_50*) and third (*PAR_NUM_NEG_50*) are binary variables identifying the parent companies that rank among the 50% of parent companies with the highest proportion of negative coverage and among the 50% of parent companies with the highest number of negative pieces of information, respectively. We expect that all the variables based on rumours will affect deposit dynamics negatively. The use of several variables indicating the condition of parent companies allows us to thoroughly test H3 and H5.

As we explained earlier, the influence of the state aid received by certain foreign parent companies on depositors' decisions is theoretically ambiguous in CE countries. H6 claims that the positive and negative effects of state aid will offset. To fully investigate the role of state aid, we define three binary variables. These variables identify the parent companies that received public help, but they differ in the assumed time frames of the public aid effects. For the group of parent companies that received public aid, the first variable (*PAR_HELP1*) equals one for all years of the recent crisis, the second (*PAR_HELP2*) equals one for the year in which the public aid occurred and all subsequent years, and the third (*PAR_HELP3*) equals one only for the year in which the aid occurred.

[Table 1 here]

**4. Data set**

Our study spans the period from 1994 to 2009 and addresses the commercial banks operating in Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, and Slovenia. We use the abbreviation "banks" for these entities. All of the bank-specific financial information was obtained from the *BankScope* database. Based on these data, we constructed a panel of 4125 bank-year observations for 416 banks. With regard to the information on bank ownership structures we updated previous findings by Bonin et al. (2005), Fristch et al. (2007), and Jackowicz et al. (2011) using the annual reports of banks, official publications of regulatory bodies, and articles in various newspapers. In the final data set, we have 2136 bank-year observations for banks controlled by foreign investors, 754 observations for government-owned banks, and 1235 observations for banks owned by private domestic investors. Table 2 presents the descriptive statistics for the dependent variable and selected explanatory variables.

[Table 2 here]

The mean and median values of the real deposit growth rate are equal to 19.27% and 12.11%, respectively. The distribution of the real deposit growth rate is also characterised by a high standard deviation. For a majority of banks, the interest cost ratios expressed in real terms are negative, which means that bank deposits in the CE countries offered only weak protection against inflation. The average share of the loans to non-financial companies amounts to 48%. The median value of the *LOANS* variable is almost identical. The mean and median returns on assets measured on the level of operating income are equal to 6.85% and 5.88%, respectively. The standard deviation calculated for *OROA* is relatively small, in contrast to the standard deviation for real deposit growth rates. The median bank in our sample financed 10.69% of its assets with equity capital.

For the foreign-owned banks, we identified the majority shareholders. We concentrated our analysis on financial parent companies for two reasons. First, financial owners are by far the most important category of foreign owners in CE countries. Second, this group of owners was the most severely impacted by the recent financial crisis. We managed to identify 93 financial parent companies. Because many parent companies exercised control over multiple subsidiaries for prolonged periods, we have at our disposal 1893 parent-subsidiary-year observations. The remainder of the observations for the foreign-owned banks concerns banks possessed by non-financial companies, banks with dispersed shareholders, banks owned by wealthy individuals or banks with missing detailed data on ownership structure. The figure 1 shows the number of parent companies with an average yearly number of controlled subsidiaries comprised within a given range. We find that the number of parent companies controlling more than three subsidiaries in the CE countries each year is quite limited.

[Figure 1 here]

We retrieved the financial statements of parent companies also from the *BankScope* database. Table 3 provides the descriptive statistics for the parent companies. The owners are

characterised by significantly lower equity levels than the banks operating in CE countries. By contrast, the mean and median shares of loans in parent company assets are higher and exceed 53%. The average long-term profitability for the parent companies is low. The mean and median returns on assets, as measured on the level of net income, do not surpass 1%.

[Table 3 here]

To test H3 and H5, we needed information regarding market rumours. We accessed and utilised the *Reuters* news service for this purpose. First, we identified the total number of pieces of information concerning a given parent company during each year of the recent crisis. Next, we determined the number and share of negative pieces of information. We classified a piece of information as negative when it contained at least one of the following key words or phrases: *loss*, *capital injection*, *state aid*, *restructuring* or *emergency*. We acknowledge that our automated procedures may lead to erroneous classifications. However, we manually verified the quality of classifications for a small subsample of parent companies, for which the automated procedures described above worked quite well.

We compiled the information on public aid received by parent companies from several sources. Our main sources were the reports prepared by the *Bank for International Settlements* (2009) and the *Office of the Special Inspector General for the Troubled Asset Relief Program* (2009). These sources were verified and complemented by articles from *The Banker* and information contained in parent companies' annual reports. We considered several different forms of public aid, namely, stock purchases, troubled asset removals, and the granting of emergency loans.

The information on changes in safety net arrangements in CE countries was derived from the *Financial Stability Board* publications (2009; 2010). These sources were verified and complemented by information available on the Internet.

In Sections 5 and 6, the actual number of bank-year observations drops below 3000. There are three reasons for this decrease. First, our econometric approach relies on lagged variables and instruments. As a result, banks with only a short time series are eliminated. Second, certain values of the explanatory variables are missing due to shortcomings of the *BankScope* database. Third, clearly erroneous values of the explanatory variables were eliminated from the sample, such as values of the *ASSETS* variable that were higher than the ratio of banking system assets to GDP in a given country.

## 5. Empirical results

In Table 4, we investigate the question of whether the fundamentals of banks and foreign parent companies affect the growth of deposits. As Table 1 documents, our models possess good econometric properties. In all specifications in the Sargan test, we cannot reject the null hypothesis regarding the validity of the instruments. The critical assumption of no serial correlation in the disturbances ($v_{t,i}$) is fulfilled in this study. As required by this assumption, we find significant negative first order serial correlation in the differenced residuals (the AR(1) test), and no evidence of second order serial correlation in the differenced residuals (the AR(2) test). Independent variables (excluding time and country dummies) are jointly statistically significant at the level lower than 1%. In addition, usually at least five variables are individually significant.

The bank-specific control variables only partially influence the deposit growth in the expected directions. The poorly managed banks with high values of the *CIR* variable record lower deposit dynamics by a statistically significant margin. The large banks attract more deposits but this effect is not statistically significant in all specifications presented in Table 1. Interestingly, the deposit growth is also slower for retail banks, as the estimated coefficient for the *RELAT_FIXED_ASSETS* variable is negative and significant. This outcome can be

explained by the more cautious growth strategies followed by retail banks in comparison with wholesale banks and banks with more balanced structures of activities. The lagged dependent variable and the contemporaneous interest cost ratio, as forecasted, positively impact the deposit growth. However, this influence is not statistically significant. Therefore, contrary to Kraft and Galac (2007), we do not find evidence that banks in CE countries are able to fund rapid expansion by offering high deposit rates.

The results of H1 verification are mixed. Two observations support the hypothesis that depositors discipline banks' decisions in the CE countries. First, the equity levels are positively related to the growth of deposits. Moreover, the coefficients obtained for *EQUITY* variable are stable and significant at the levels lower than 1%. Second, there is some evidence that more profitable banks report higher deposit growth rates. The *OROA* variable is significant at the conventional levels only in two out of nine specifications in Table 1, but in the remaining specifications, the *p-values* are close to the 10% threshold. Contrary to the expectations based on the market discipline theory, the share of loans in assets influences the dependent variable positively and significantly. This relationship can be interpreted as proof of weakness in market discipline. Alternatively, the positive parameter for the *LOANS* variable can be explained by the fact that banks that adhere to more aggressive investment policies also pursue more aggressive growth strategies. Summarizing, we establish that traces of depositor discipline are detectable in emerging markets even when the vast majority of depositors is formally insured. This result is similar to those obtained by Peria and Schmukler (2001), Jackowicz (2004), and Önder and Özyildrim (2008).

The relationships between bank fundamentals and deposit growth rates remain unchanged when we introduce (in specification 2) the following interaction terms: *EQUITY_x_CRISIS*, *OROA_x_CRISIS*, and *LOANS_x_CRISIS*. All the coefficients estimated for the interaction terms are insignificant. This outcome falsifies H2 and suggests that the

recent crisis did not alter the sensitivity of deposit growth ratios to accounting bank risk measures.

The coefficients obtained for the *GOV* variable are negative and for the *FGN* variable positive in all specifications. However, in the entire sample the ownership structure does not influence deposit growth statistically significantly. The results, therefore, do not support the view that foreign-owned banks enjoy a reputational advantage in CE countries (Kraft and Galac, 2007). Our conclusions are the same when we allow the coefficients for the *GOV* and *FGN* variables to take different values during the recent crisis, as the interaction terms *GOV_x_CRISIS* and *FGN_x_CRISIS* are also insignificant (specification 3). This evidence proves that the recent crisis did not indiscriminately worsen the situation of foreign-owned banks and improve the situation of state-owned banks. The empirical results thus contradict H4.

Specifications (4), (5), and (6) in Table 4 demonstrate that in the CE countries, foreign parent company fundamentals generally do not influence depositors' decisions. During the recent crisis, this outcome changes only slightly. In specifications (7), the parent company equity level starts to influence positively and significantly deposit growth recorded by a subsidiary. The remainder of the variables illustrating parent company financial health remain insignificant. The evidence that during the recent crisis foreign-owned banks controlled by distressed owners had difficulties in attracting new deposits (as stated in H3) is therefore very weak when we use fundamentals to identify distressed parent companies.

[Table 4 here]

In Table 5, we turn our attention to the role of rumours concerning the parent company's financial situation. As Table 5 documents, our models again possess good econometric properties, thus implying that the estimates create a good base from which to draw inferences.

In this table, the variables pertaining to banks operating in the CE countries change neither their directions of influence nor their strength of impact on deposit growth ratios. We observe only three minor differences in this table in comparison with Table 4. First, the *OROA* variable more frequently significantly augments the deposit growth ratios. Second, the variable measuring banks' scale of operations is statistically significant in all specifications. Third, in specifications (11) and (12), we find that foreign-owned banks in general are characterised by higher deposit growth rates.

During non-crisis periods, parent companies' fundamentals remain insignificant. By contrast, in the last three years of the studied period, as specifications (16) – (18) document, the capital base and profitability of a parent company are statistically significantly related to subsidiaries' deposits growth when we control for the influence of rumours. Although the *PAR_EQUITY_x_CRISIS* variable influences the dependent variable in the expected direction, the sign of the coefficient for *PAR_ROA_x_CRISIS* variable is at odds with that predicted by the traditional market discipline theory. The latter variable is, however, statistically significant only at the 10% level.

In Table 5, we establish that rumours regarding the conditions of foreign parent companies played an important role during the recent crisis. Regardless of the methods we use to measure rumours, the independent variables based on rumours are significant at the 1% level. The significance of these variables does not diminish when we control for parent companies' fundamentals in the entire sample (specifications (13) - (15)), nor is it affected when we allow parent companies' fundamentals to influence deposit growth rates in a different manner during the recent crisis (specifications (16) - (18)). The impact of rumours on deposit dynamics is also economically significant. *Ceteris paribus*, a ten percentage points rise in the negative coverage results in a deposit growth rate that is almost three percentage points lower. Having a parent company classified among the 50% of parent companies with

the highest negative coverage percentages or the highest number of negative pieces of information translates, again, *ceteris paribus*, into deposit growth rates that are reduced by almost 18 percentage points and 15 percentage points, respectively.

Thus, we conclude that rumours pertaining to the conditions of foreign-parent companies possess a significant autonomous role in explaining depositors' behaviour. Moreover, during the crisis, the negative influence of rumours is stronger and more stable than the impact of parent companies' fundamentals. In summary, our evidence supports H5 and H3 when we utilise a rumour-based definition of distressed parent companies. Our results therefore corroborate previous findings by Levy-Yeyati et al. (2004) and Forssbaeck (2011).

[Table 5 here]

Table 6 presents the empirical results regarding the importance of public aid received by certain parent companies included in our sample. The econometric properties of the estimated models as well as the coefficient signs and significance levels for bank-specific variables remain unchanged.

In general terms, public help is interpreted by depositors as a confirmation that the parent company is encountering financial difficulties. The coefficients estimated for the *PAR_HELP1*, *PAR_HELP2*, and *PAR_HELP3* variables are always negative. However, these coefficients are statistically significant only in five out of nine cases. The results in Table 6, in contrast to the evidence concerning market rumours, therefore display a sensitivity to the method by which we encode public aid and construct models. According to specifications (20) and (21), *ceteris paribus,* public aid received by the parent company lowers the deposit growth rates recorded by a subsidiary by approximately 13 percentage points in the year of public aid announcements and for subsequent years. The inclusion of variables illustrating parent company fundamentals in specification (23) and (24) does not modify this outcome. However, interesting changes to our results occur when we allow parent company

fundamentals to influence the dependent variable differently for the groups of entities that received and did not receive public help (specifications (25)-(27)). Under these conditions, the variable *PAR_HELP1* gains statistical significance, whereas the variables *PAR_HELP2* and *PAR_HELP3* lose their significance. At the same time, we establish that a relatively healthy capital base of parent companies that received public aid has a significant positive influence on the deposit growth rates reported by its subsidiaries operating in the CE countries (specifications (25) and (27)).

The empirical evidence contained in Table 6 therefore contradicts H6. Public aid received by a parent company constitutes a negative piece of information, at least as far as the deposit growth rates recorded by its subsidiaries are concerned. Moreover, our results suggest that when we control for parent companies' fundamentals during the recent crisis, mass-media rumours provide more incremental information than do public aid announcements.

[Table 6 here]

## 6. Robustness checks

We perform three robustness checks. First, we verify whether our results are sensitive to the estimation procedure. For this purpose, we estimate random effects versions of our dynamic panel models. Table 7 shows that our results exhibit moderate sensitivity to the choice of estimation procedure. The results confirm previous findings that deposit growth is strongly negatively affected by mass media rumours about the financial health of parent companies. The same applies to the informational content of public help announcements because the coefficients estimated for the variables *PAR_HELP1*, *PAR_HELP2*, and *PAR_HELP3* are negative and statistically significant, as in Section 5. Parent companies' fundamentals remain unimportant for depositors' decisions in CE countries. The most noticeable changes concern bank-specific variables. The outcome of the traditional market

discipline test is less ambiguous. According to the results in Table 7, banks with a stronger capital base and higher profitability have statistically significantly easier access to the deposit market. When we substitute static panel models for dynamic models, the variables describing deposit interest costs and lagged deposit growth gain statistical significance. Moreover, these variables impact the dependent variable in the expected directions.

[Table 7 here]

Second, in Table 8, we replace the lagged variables describing the risk of parent companies and banks with contemporaneous variables. This exercise does not change our conclusion concerning the role of mass media rumours and public aid announcements. Parent companies' fundamentals still do not play an important role in depositors' decision-making processes. However, in Table 8, there is an indication (specification 36) that during the recent crisis, a strong capital base of a parent company, as in specification (7), was positively correlated with the deposit growth ratios recorded by its subsidiaries. Similar to the first robustness check, the most interesting changes occur with regard to bank-specific variables. As predicted by the market discipline theory, banks with riskier assets and lower profitability attract fewer deposits. The change in the coefficients estimated for the variable *EQUITY* can be easily explained by the mechanical balance sheet relationship between the deposit growth rates and the equity share at the end of a fiscal year. Altogether, the empirical evidence in Table 8 is more supportive of H1 than is the evidence in Section 5. In contrast to the cases when we use the lagged variables, the coefficient estimated for the variable *INTEREST_EXP* is now positive and statistically significant. This suggests that depositors' actions in CE countries are affected by moral hazard.

[Table 8 here]

Third, public authorities in CE countries reacted to the first stage of the recent crisis in a partially uncoordinated manner. Hence, there is a possibility that differences in safety net

changes distort our empirical findings. To account for this factor, we introduce two additional variables. The variable *NONFULLGUAR* equals one for countries that did not provide blanket guarantees for bank liabilities after 2007 and zero otherwise. The binary variable *LOWCOVMULTP* identifies countries that were characterised after 2007 by a below-median increase in deposit insurance limits. We measure the mentioned increase using a coverage multiplier calculated as a quotient of the coverage limit in a given year to the coverage limit binding in 2007. To retest the hypotheses, we interact the variables *NONFULLGUAR* and *LOWCOVMULTP* with the variables describing the risk of banks and their ownership structures. For the sake of brevity, Table 9 presents only selected models controlling for differences in safety net modifications. The results of the H1, H3, H5, and H6 verifications remain unchanged. In contrast, the tests of H2 and H4 are fine-tuned by the new empirical evidence. As specification (43) demonstrates, in the entire sample, the recent crisis did not increase depositors' sensitivity to the fundamentals of banks. However, in the sub-group of countries with low increases in deposit coverage limits, a solid capital base of a bank begins to play a more important role. As specification (44) indicates, government-owned banks did not benefit from the uncertainty pertaining to the financial conditions of foreign-owned banks, with one exception. In countries with low increases in coverage limits, government-controlled banks reported statistically and economically significant higher deposit growth rates during the recent crisis.

[Table 9 here]

## 7. Concluding remarks

In CE countries, depositor discipline is the only potentially viable and universal source of market discipline in banking, for two reasons. First, the market for banks' subordinated debt is virtually nonexistent. Second, only selected banks are listed on regional stock

exchanges. In addition, shareholders' goals do not have to coincide with the interests of either the public as a whole or depositors in particular (Bliss and Flannery, 2001; Park and Peristiani, 2001; Gropp and Vesala, 2001). Unfortunately, at least from the perspective of supplementing regulatory discipline with market discipline, our study shows more weaknesses than strengths of depositor discipline in CE countries. The evidence that bank accounting risk measures influence deposit growth rates in socially desired ways is weak. Moreover, the sensitivity of deposit growth rates to the fundamentals of banks did not augment during the recent crisis, and the sensitivity to parent companies' fundamentals increased only marginally. By contrast, depositors' decisions during the recent crisis were strongly affected by rumours spread by the press. Government-owned banks benefited from the uncertainty concerning foreign-owned banks and their parent companies only in countries with relatively low increases in deposit insurance limits. Our research results have implications not only for policymakers, but also for bank managers. These results provide an important reminder that rumours related to a parent company's financial situation or the public aid received by a parent company can seriously reduce deposit growth rates, even for financially healthy subsidiaries.

**References**


Allen, F., Bartiloro L., Kowalewski, O. (2006), *The financial system of the EU 25*, in: Liebscher, K., Christl, J., Mooslechner, P. (Eds.), *Financial development, integration and stability in Central, Eastern and South-Eastern Europe*. Edward Elgar, Cheltenham, p. 80-104.

Arellano M.., Bond S. R. (1991), *Some tests of specifications for panel data: Monte Carlo evidence and an application to employment equations*, "Review of Economic Studies", Vol. 58, p. 277-297.

Bank for International Settlements (2009), *An Assessment of financial sector rescue programmes*, BIS Papers, No. 48.

Barajas A., Steiner R. (2000), *Depositor behavior and market discipline in Colombia*, IMF Working Paper, No. WP/00/214.

Billett M.T., Garfinkel J.A., O'Neal E.S. (1998): *The cost of market versus regulatory discipline in banking*, "Journal of Financial Economics", Vol. 48, No. 3, p. 333-358.

Bliss R.R., Flannery M.J. (2001), *Market discipline in the governance of U.S. bank holding companies: Monitorig vs. influencing*, p. 107-143 in: F. S. Mishkin, (ed), *Prudential supervision. What works and what doesn't*, The University of Chicago Press, Chicago, London.

Blundell R.W., Bond S.R. (1998), *Initial conditions and moment restrictions in dynamic panel data models*, "Journal of Econometrics", Vol. 87, p. 115-143.

Bonin, J.P., Hasan, I., Wachtel P. (2005), *Bank performance, efficiency and ownership in transition countries*, "Journal of Banking and Finance", Vol. 29, p. 31–53.

Brewer III E., Mondschean T.H. (1994), *An empirical test of the incentive effects of deposit insurance. The case of junk bonds at savings and loan associations*, "Journal of Money, Credit, and Banking", Vol. 26, p. 146-164.

Calomiris C.W., Powell A. (2001), *Can emerging market bank regulators establish credible discipline? The case of Argentina, 1992-1999*, s. 147-191, in: F. S. Mishkin (ed.), *Prudential supervision. What works and what doesn't*, National Bureau of Economic Research, The University of Chicago Press, Chicago and London.

Cargill T.F. (1989), *CAMEL ratings and the CD market*, "Journal of Financial Services Research", Vol. 3, p. 347-358.

Doornik J.A., Hendry D. F. (2009), *Econometric modelling. PcGive 13*, Timberlake Consultants Ltd.

Ellis D.M., Flannery M.J. (1992), *Does the debt market assess large banks' risk? Time series evidence from money center CDs*, "Journal of Monetary Economics", Vol. 30, p. 481-502.

Financial Stability Board – FSB (2009), *Exit form extraordinary financial sector support measures*. Note for G20 Ministers and Governors meeting 6-7 November 2009.

Financial Stability Board – FSB (2010), *Update on unwinding temporary deposit insurance arrangements*. Note by the Staffs of the International Association of Deposit Insurers and the International Monetary Fund.

Forssbaeck J. (2011), *Ownership structure, market discipline, and banks' risk-taking incentives under deposit insurance*, Journal of Banking and Finance, Vol. 35, p. 266-2678.

Fritsch, M., Gleisner, F., Holzhäuser, M. (2007), *Bank M&A in Central and Eastern Europe*, Working Paper. Available at SSRN: http://ssrn.com/abstract=966294.

Goldberg L.G., Hudgins S.C. (2002), *Depositor discipline and changing strategies for regulating thrift institutions,* "Journal of Financial Economics", Vol. 63, Is. 1, p. 263-274.

Gropp R., Vesala J. (2001), *Deposit Insurance and moral hazard: Does the counterfactual matter* ?, European Central Bank, Working Paper Series, No. 47.

Haas de R., van Lelyveld, I. (2006), *Foreign banks and credit stability in Central and Eastern Europe. A panel data analysis*, "Journal of Banking and Finance", Vol. 30, p. 1927-1952.

Hadad M.D., Agusman A., Monroe G. S, Gasbarro D. (2011), *Market discipline, financial crisis and regulatory changes: Evidence from Indonesian banks*, "Journal of Banking and Finance", Vol. 35, p. 1552-1562.

Hannan T.H., Hanweck G.A. (1988), *Bank insolvency risk and the market for large certificates of deposit*, "Journal of Money, Credit and Banking", Vol. 20, p. 203-211.

Haselmann, R. (2006), *Strategies of foreign banks in transition economies*, "Emerging Markets Review", Vol. 7, p. 283-299.

Hess K., Feng G. (2007), *Is there market discipline for New Zealand non-bank financial institutions*, "Journal of International Financial Markets, Institutions & Money", Vol. 17, p. 326-340.

Hosono K. (2005), *Market discipline to banks in Indonesia, the Republic of Korea, Malaysia and Thailand*, Asian Development Bank Institute Conference, Corporate Governance of Banks in Asia, January 20-21.

Ioannidou V.P., Penas M. F. (2010), *Deposit insurance and bank risk-taking: Evidence from internal loan rating*, "Journal of Financial Intermediation", Vol. 19, p. 95-115.

Jackowicz K. (2004), *Dyscyplina rynkowa w bankowości. Rodzaje i możliwości zastosowania* [Market discipline in banking. Types and applications], Wydawnictwo Wyższej Szkoły Przedsiębiorczości i Zarządzania im. L. Koźmińskiego, Warszawa.

Jackowicz K, Kowalewski O., Kozłowski Ł. (2011), *The impact of electoral factors on commercial banks in CEE countries*, Wharton Financial Institutions Center Working

Paper No. 11-02. Available at SSRN: http://ssrn.com/abstract=1736289 or http://dx.doi.org/10.2139/ssrn.1736289

Jagtiani J., Lemieux C. (2000), *Stumbling blocks to increasing market discipline in the banking sector: a note on bond pricing and funding strategy prior to failure*, "Emerging Issues Series", Supervision and Regulation Department, Federal Reserve Bank of Chicago, S&R-99-8R.

Jordan J.S. (2000), *Depositor discipline at failing banks*, "New England Economic Review", Federal Reserve Bank of Boston, p. 15-28.

Kraft E., Galac T. (2007), *Deposit interest rates, asset risk and bank failure in Croatia*, "Journal of Financial Stability, Vol. 2, p. 312-336.

Kutner G.W. (1992), *CD Market response to continental Illinois' liquidity crisis and its subsequent bailout*, "The Mid-Atlantic Journal of Business", p. 133-146.

Levy-Yeyati E., Peria M.S.M., Schmukler S. L.. (2004), *Market discipline under systemic risk: Evidence from bank runs in emerging economies*, The World Bank Group, Working Paper No. 3440, October.

Maechler A.M., McDill, K.M. (2006), *Dynamic depositor discipline in US banks*, "Journal of Banking & Finance", Vol. 30, p. 1871-1898.

Mondschean T.S., Opiela T.P. (1999), *Bank time deposit rates and market discipline in Poland: The impact of state ownership and deposit insurance reform*, "Journal of Financial Services Research", Vol. 15, p. 179-196.

Office of the Special Inspector General for the Troubled Asset Relief Program (2009), *Emergency capital injections provided to support the viability of Bank of America, other major banks, and the U.S. Financial System*, SIGTARP-10-001.

Oliveira R.F., Schiozer R.F., Barros L.A.B. (2011), *Financial crisis and cross-border too big to fail perception*, Midwest Finance Association 2012 Annual Meetings Paper. Available at SSRN: http://ssrn.com/abstract=1787661 or http://dx.doi.org/10.2139/ssrn.1787661.

Önder Z., Özyildirim S. (2008), *Market Reaction to risky banks: Did generous deposit guarantee change it ?*, "World Developments", Vol. 36, p. 1415-1435.

Opiela T. (2004), *Was there an implicit full guarantee at financial institutions in Thailand ? Evidence of risk pricing by depositors*, "Journal of Comparative Economics", Vol. 32, p. 519-541.

Park S., Peristiani S. (1998), *Market discipline by thrift depositors*, "Journal of Money, Credit, and Banking", Vol. 30, Is. 3, p. 347-364.

Park S., Peristiani S. (2001) , *Are bank shareholders enemies of regulators or a potential source of market discipline* ?, Federal Reserve Bank of New York, Staff Reports, No. 138.

Peria M.S.M., Schmukler S.L. (2001), *Do depositors punish banks for bad behavior? Market discipline, Deposit insurance, and banking crisis*, "The Journal of Finance", Vol. 56, p. 1029-1051.

Prean N., Stix H. (2011), The effect of raising deposit insurance coverage in times of financial crisis – Evidence from Croatia microdata, "Economic Systems", doi: 10.1016/j.ecosys.2011.01.004.

Shimizu K. (2009), *Is the information produced in the stock market useful for depositors?, "*Finance Research Letters", Vol. 6, p. 34-39.

Shleifer, A. (1998), *State versus private ownership,* "Journal of Economic Perspectives", Vol. 12, p. 133-150.

Uchida H, Satake M. (2009), *Market discipline and bank efficiency*, "Journal of International Financial Markets, Institutions & Money", Vol. 19, p. 792-802.

Table 1. Explanatory variables and their definitions

| Explanatory variable | Definition | Type | Lag |
|---|---|---|---|
| DEPOSIT_GR | The real growth rate of deposits from non-financial entities | SE | L |
| INTEREST_EXP | A ratio of interest costs and liabilities | SE | C |
| OROA | The return on assets, measured on the level of operating income | SE | L |
| EQUITY | A ratio of equity capital and assets | SE | L |
| LOANS | A share of loans in total assets | SE | L |
| CIR | Cost to income ratio | SE | C |
| NCI_SHARE | A share of net commission and fee incomes in operating income | SE | C |
| ASSETS | A ratio of a given bank's assets and the GDP of the country in which the bank is licensed | SE | C |
| RELAT_FIXED_ASSETS | A variable equal to one for the bank with the biggest fixed assets in a given year and country. For the other banks, the variable shows the relative scale of fixed assets. | E | C |
| GOV | A binary variable identifying banks that were directly or indirectly controlled by the government in a given year | E | C |
| FGN | A binary variable identifying banks that were owned by foreign investors in a given year | E | C |
| CRISIS | A binary variable equal to one for the years from 2007 to 2009 and equal to zero for the other years | E | C |
| PAR_EQUITY | A ratio of equity capital and assets calculated for parent companies | E | L |
| PAR_ROA | The return on assets calculated for parent companies | E | L |
| PAR_LOANS | A share of loans in total assets calculated for parent companies | E | L |
| PAR_ROA_GROTWH | A growth ratio for the PAR_ROA variable | E | |
| PAR_EQUITY_GROWTH | A growth ratio for the PAR_EQUITY variable | E | |
| PAR_NEG_COV | A percentage of negative pieces of information out of total number of press coverage for a given parent company in a given year | E | C |
| PAR_NEG_COV_50 | A binary variable identifying the 50% of parent companies with the highest values of PAR_NEG_COV variable values in a given year | E | C |
| PAR_NUM_NEG_50 | A binary variable identifying the 50% of parent companies in a given year with the highest number of negative pieces of information | E | C |
| PAR_HELP1 | For the group of parent companies that received public aid, this binary variable is equal to one in all years of the recent crisis | E | C |

| | | | |
|---|---|---|---|
| PAR_HELP2 | For the group of parent companies that received public aid, this binary variable is equal to one for the year in which the public aid occurred and subsequent years | E | C |
| PAR_HELP3 | For the group of parent companies that received public aid this binary variable is equal to one only in the year in which the public aid occurred | E | C |

Note: The symbol SE denotes sequentially exogenous variables, whereas E denotes strictly exogenous variables, L denotes lagged variables, and C denotes contemporaneous variables.

Table 2. The descriptive statistics for the dependent variable and the selected explanatory variables

| | DEPOSIT_ GR | INTEREST_ EXP | OROA | LOANS | EQUITY |
|---|---|---|---|---|---|
| Mean | 19.72% | -1.98% | 6.85% | 47.74% | 14.75% |
| Median | 12.11% | -0.85% | 5.88% | 48.28% | 10.69% |
| Standard deviation | 41.62% | 4.82% | 4.39% | 20.75% | 13.64% |
| $10^{th}$ percentile | -18.80% | -7.94% | 2.76% | 20.17% | 5.12% |
| $90^{th}$ percentile | 70.12% | 2.58% | 12.40% | 74.32% | 28.00% |

Figure 1. The number of financial parent companies with a given average yearly number of subsidiaries

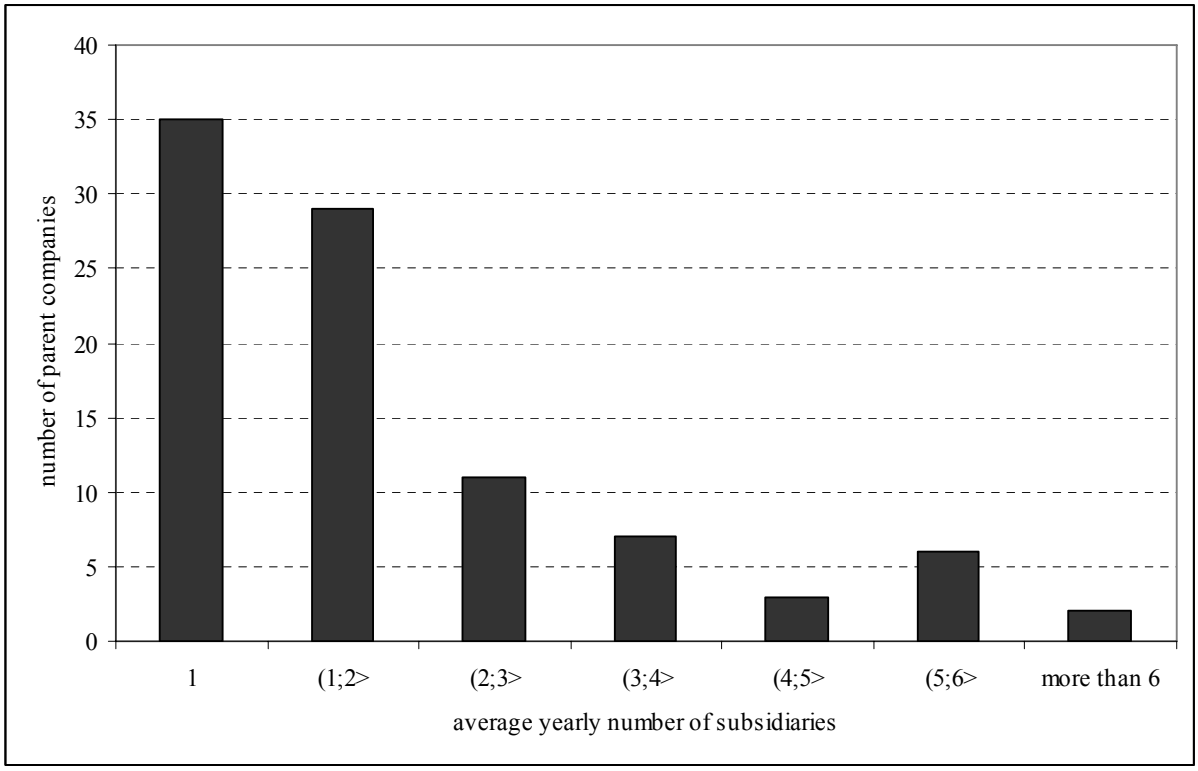

Table 3. The descriptive statistics for parent companies

| | PAR_EQUITY | PAR_LOANS | PAR_ROA |
|---|---|---|---|
| Mean | 6.35% | 53.04% | 0.62% |
| Median | 4.81% | 53.01% | 0.49% |
| Standard deviation | 5.51% | 17.22% | 1.60% |
| $10^{th}$ percentile | 2.68% | 33.32% | 0.00% |
| $90^{th}$ percentile | 11.24% | 75.66% | 1.59% |

Table 4. The impact of bank and parent company fundamentals on deposit growth rates

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Ddeposit_gr | 0.019 | 0.018 | 0.019 | 0.015 | 0.027 | 0.025 | 0.014 | 0.027 | 0.023 |
| | 0.025 | 0.025 | 0.025 | 0.024 | 0.025 | 0.026 | 0.025 | 0.026 | 0.025 |
| Dinterest_exp | 1.432 | 1.367 | 1.442 | 1.477 | 0.941 | 1.213 | 1.366 | 0.941 | 1.154 |
| | 1.176 | 1.190 | 1.178 | 1.178 | 1.131 | 1.153 | 1.183 | 1.131 | 1.139 |
| Doroa | 1.043 | 1.064 | 1.041 | 1.170 * | 1.123 | 1.025 | 1.174 * | 1.120 | 1.067 |
| | 0.671 | 0.752 | 0.670 | 0.688 | 0.688 | 0.673 | 0.692 | 0.687 | 0.675 |
| Dloans | 0.327 ** | 0.238 * | 0.330 *** | 0.311 ** | 0.307 ** | 0.314 ** | 0.318 ** | 0.306 ** | 0.319 ** |
| | 0.129 | 0.128 | 0.128 | 0.128 | 0.133 | 0.131 | 0.125 | 0.132 | 0.130 |
| Dequity | 0.943 *** | 0.883 *** | 0.941 *** | 0.940 *** | 1.001 *** | 1.015 *** | 0.930 *** | 1.001 *** | 1.012 *** |
| | 0.249 | 0.259 | 0.248 | 0.247 | 0.257 | 0.256 | 0.248 | 0.257 | 0.254 |
| Dloans _x_crisis | | 0.213 | | | | | | | |
| | | 0.177 | | | | | | | |
| Dequity_x_crisis | | 0.133 | | | | | | | |
| | | 0.378 | | | | | | | |
| Doroa_x_crisis | | 0.089 | | | | | | | |
| | | 1.509 | | | | | | | |
| Dcir | -0.182 ** | -0.186 *** | -0.181 ** | -0.169 ** | -0.192 *** | -0.188 ** | -0.178 ** | -0.192 *** | -0.184 ** |
| | 0.073 | 0.069 | 0.073 | 0.074 | 0.075 | 0.075 | 0.073 | 0.075 | 0.076 |
| Dnci_share | 0.228 | 0.240 | 0.227 | 0.192 | 0.214 | 0.252 | 0.214 | 0.216 | 0.251 |
| | 0.188 | 0.178 | 0.189 | 0.189 | 0.180 | 0.189 | 0.188 | 0.180 | 0.189 |
| Drelat_fixed_assets | -0.168 *** | -0.167 *** | -0.169 *** | -0.181 *** | -0.101 * | -0.169 *** | -0.187 *** | -0.102 * | -0.171 *** |
| | 0.061 | 0.059 | 0.061 | 0.061 | 0.059 | 0.062 | 0.061 | 0.059 | 0.062 |
| Dassets | 0.636 * | 0.589 | 0.643 * | 0.737 ** | 0.241 | 0.612 * | 0.768 ** | 0.244 | 0.626 * |
| | 0.366 | 0.361 | 0.365 | 0.365 | 0.348 | 0.363 | 0.367 | 0.348 | 0.367 |
| Dgov | -0.029 | -0.029 | -0.032 | -0.030 | -0.021 | -0.024 | -0.032 | -0.021 | -0.023 |
| | 0.033 | 0.032 | 0.034 | 0.033 | 0.033 | 0.034 | 0.033 | 0.033 | 0.034 |
| Dfgn | 0.031 | 0.031 | 0.030 | 0.006 | 0.027 | 0.033 | 0.005 | 0.027 | 0.035 |
| | 0.024 | 0.024 | 0.028 | 0.034 | 0.024 | 0.025 | 0.033 | 0.024 | 0.025 |
| Dgov_x_crisis | | | 0.020 | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 0.069 | | | | | | |
| Dfgn_x_crisis | | | 0.004 | | | | | | |
| | | | 0.045 | | | | | | |
| Dpar_equity | | | | 1.237 | | | 0.015 | | |
| | | | | 0.935 | | | 1.054 | | |
| Dpar_loans | | | | -0.057 | | | 0.012 | | |
| | | | | 0.092 | | | 0.096 | | |
| Dpar_roa | | | | -0.618 | | | 2.557 | | |
| | | | | 3.142 | | | 3.802 | | |
| Dpar_equity_growth | | | | | 0.068 | | | 0.065 | |
| | | | | | 0.057 | | | 0.067 | |
| Dpar_roa_growth | | | | | | 1.060 | | | -1.209 |
| | | | | | | 2.292 | | | 3.612 |
| Dpar_roa_growth_x_crisis | | | | | | | | | 4.437 |
| | | | | | | | | | 4.882 |
| Dpar_equity_growth_x_crisis | | | | | | | | 0.012 | |
| | | | | | | | | 0.137 | |
| Dpar_equity_x_crisis | | | | | | | 3.141 ** | | |
| | | | | | | | 1.524 | | |
| Dpar_loans_x_crisis | | | | | | | -0.208 | | |
| | | | | | | | 0.134 | | |
| Dpar_roa_x_crisis | | | | | | | -7.647 | | |
| | | | | | | | 4.859 | | |
| Constant | -0.144 | -0.109 | -0.143 | -0.157 | -0.190 | -0.159 | -0.144 | -0.190 | -0.164 |
| | 0.120 | 0.120 | 0.121 | 0.121 | 0.128 | 0.124 | 0.123 | 0.127 | 0.125 |
| no. of observations | 2353 | 2353 | 2353 | 2351 | 2305 | 2333 | 2351 | 2305 | 2333 |
| Wald (joint) | 83.87 *** | 94.28 *** | 85.5 *** | 88.89 *** | 75.08 *** | 81.57 *** | 92.86 *** | 74.94 *** | 81.62 *** |
| Sargan test (two-step) | 136.9 | 132.4 | 131.8 | 135.7 | 155.7 | 140.1 | 130.7 | 150.8 | 140.6 |
| AR(1) test | -8.816 *** | -8.825 *** | -8.811 *** | -8.785 *** | -8.561 *** | -8.729 *** | -8.785 *** | -8.562 *** | -8.738 *** |
| AR(2) test | 0.4979 | 0.5016 | 0.4935 | 0.5742 | 0.3444 | 0.2368 | 0.5647 | 0.3424 | 0.2775 |

This table presents the one-step GMM-SYS estimates. The robust standard errors are given under the coefficients.
***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 5. The impact of rumours concerning parent companies on deposit growth rates

| | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
|---|---|---|---|---|---|---|---|---|---|
| Ddeposit_gr | 0.017 | 0.015 | 0.016 | 0.013 | 0.011 | 0.013 | 0.011 | 0.010 | 0.011 |
| | 0.025 | 0.025 | 0.025 | 0.024 | 0.024 | 0.025 | 0.025 | 0.025 | 0.025 |
| Dinterest_exp | 1.431 | 1.429 | 1.439 | 1.488 | 1.478 | 1.490 | 1.318 | 1.247 | 1.287 |
| | 1.172 | 1.173 | 1.177 | 1.177 | 1.177 | 1.181 | 1.179 | 1.174 | 1.186 |
| Doroa | 1.051 | 1.077 | 1.082 | 1.183 * | 1.191 * | 1.199 * | 1.190 * | 1.192 * | 1.205 * |
| | 0.669 | 0.669 | 0.667 | 0.685 | 0.686 | 0.684 | 0.689 | 0.688 | 0.686 |
| Dloans | 0.325 ** | 0.321 ** | 0.321 ** | 0.306 ** | 0.307 ** | 0.306 ** | 0.314 ** | 0.317 ** | 0.316 ** |
| | 0.129 | 0.129 | 0.129 | 0.129 | 0.129 | 0.128 | 0.127 | 0.127 | 0.127 |
| Dequity | 0.952 *** | 0.966 *** | 0.962 *** | 0.952 *** | 0.963 *** | 0.959 *** | 0.940 *** | 0.948 *** | 0.945 *** |
| | 0.248 | 0.248 | 0.248 | 0.246 | 0.246 | 0.246 | 0.248 | 0.248 | 0.247 |
| Dcir | -0.183 ** | -0.186 *** | -0.184 ** | -0.169 ** | -0.172 ** | -0.171 ** | -0.177 ** | -0.181 ** | -0.179 ** |
| | 0.074 | 0.072 | 0.072 | 0.075 | 0.073 | 0.073 | 0.073 | 0.071 | 0.071 |
| Dnci_share | 0.218 | 0.233 | 0.233 | 0.184 | 0.195 | 0.196 | 0.210 | 0.229 | 0.228 |
| | 0.188 | 0.188 | 0.188 | 0.189 | 0.189 | 0.189 | 0.188 | 0.189 | 0.188 |
| Drelat_fixed_assets | -0.174 *** | -0.171 *** | -0.171 *** | -0.188 *** | -0.186 *** | -0.185 *** | -0.190 *** | -0.183 *** | -0.185 *** |
| | 0.062 | 0.062 | 0.062 | 0.062 | 0.062 | 0.062 | 0.062 | 0.063 | 0.062 |
| Dassets | 0.673 * | 0.715 * | 0.701 * | 0.778 ** | 0.830 ** | 0.814 ** | 0.773 ** | 0.809 ** | 0.806 ** |
| | 0.369 | 0.374 | 0.372 | 0.369 | 0.375 | 0.373 | 0.371 | 0.380 | 0.378 |
| Dgov | -0.028 | -0.029 | -0.029 | -0.029 | -0.030 | -0.030 | -0.031 | -0.034 | -0.033 |
| | 0.033 | 0.033 | 0.033 | 0.033 | 0.033 | 0.033 | 0.033 | 0.033 | 0.033 |
| Dfgn | 0.040 | 0.048 * | 0.045 * | 0.011 | 0.016 | 0.015 | 0.012 | 0.021 | 0.019 |
| | 0.025 | 0.026 | 0.026 | 0.034 | 0.034 | 0.034 | 0.033 | 0.033 | 0.033 |
| Dpar_equity | | | | 1.295 | 1.349 | 1.324 | -0.043 | 0.000 | 0.001 |
| | | | | 0.938 | 0.949 | 0.945 | 1.058 | 1.053 | 1.052 |
| Dpar_loans | | | | -0.047 | -0.050 | -0.052 | 0.007 | -0.016 | -0.011 |
| | | | | 0.091 | 0.091 | 0.091 | 0.096 | 0.095 | 0.095 |
| Dpar_roa | | | | -0.934 | -0.868 | -0.817 | 2.667 | 2.753 | 2.713 |
| | | | | 3.193 | 3.185 | 3.172 | 3.785 | 3.770 | 3.773 |

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dpar_equity_x_crisis | | | | | | | | | | | | | 3.070 | ** | 2.835 | * | 2.897 | ** |
| | | | | | | | | | | | | | 1.560 | | 1.449 | | 1.458 | |
| Dpar_loans_x_crisis | | | | | | | | | | | | | -0.097 | | -0.001 | | -0.043 | |
| | | | | | | | | | | | | | 0.135 | | 0.128 | | 0.135 | |
| Dpar_roa_x_crisis | | | | | | | | | | | | | -9.107 | * | -9.013 | * | -8.728 | * |
| | | | | | | | | | | | | | 5.028 | | 4.725 | | 4.752 | |
| Dpar_neg_cov | -0.209 | *** | | | | | -0.221 | *** | | | | | -0.279 | *** | | | | |
| | 0.076 | | | | | | 0.080 | | | | | | 0.084 | | | | | |
| Dpar_neg_cov_50 | | | -0.133 | *** | | | | | -0.135 | *** | | | | | -0.178 | *** | | |
| | | | 0.042 | | | | | | 0.043 | | | | | | 0.045 | | | |
| Dpar_num_neg_50 | | | | | -0.110 | *** | | | | | -0.112 | *** | | | | | -0.146 | *** |
| | | | | | 0.039 | | | | | | 0.040 | | | | | | 0.045 | |
| Constant | -0.146 | | -0.153 | | -0.153 | | -0.160 | | -0.166 | | -0.166 | | -0.147 | | -0.153 | | -0.154 | |
| | 0.119 | | 0.118 | | 0.119 | | 0.121 | | 0.120 | | 0.120 | | 0.122 | | 0.121 | | 0.122 | |
| no. of observations | 2353 | | 2353 | | 2353 | | 2351 | | 2351 | | 2351 | | 2351 | | 2351 | | 2351 | |
| Wald (joint) | 89.77 | *** | 94.13 | *** | 90.67 | *** | 96.63 | *** | 99.77 | *** | 95.64 | *** | 99.22 | *** | 107.5 | *** | 100.5 | *** |
| Sargan test (two-step) | 137.6 | | 136.2 | | 135.4 | | 135.4 | | 135.2 | | 134.1 | | 129.3 | | 125.8 | | 125.7 | |
| AR(1) test | -8.79 | *** | -8.777 | *** | -8.768 | *** | -8.759 | *** | -8.742 | *** | -8.734 | *** | -8.769 | *** | -8.752 | *** | -8.739 | *** |
| AR(2) test | 0.5409 | | 0.4987 | | 0.4924 | | 0.6092 | | 0.5867 | | 0.5785 | | 0.617 | | 0.5921 | | 0.578 | |

This table presents the one-step GMM-SYS estimates. The robust standard errors are given under the coefficients.
***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 6. The public aid received by parent companies and deposit growth rates

| | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|---|---|
| Ddeposit_gr | 0.018 | 0.019 | 0.020 | 0.014 | 0.016 | 0.016 | 0.009 | 0.015 | 0.014 |
| | 0.025 | 0.024 | 0.025 | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 | 0.024 |
| Dinterest_exp | 1.468 | 1.441 | 1.453 | 1.507 | 1.517 | 1.525 | 1.360 | 1.516 | 1.532 |
| | 1.178 | 1.172 | 1.175 | 1.183 | 1.178 | 1.180 | 1.169 | 1.175 | 1.179 |
| Doroa | 1.054 | 1.088 | 1.082 | 1.181 * | 1.206 * | 1.207 * | 1.211 * | 1.222 * | 1.219 * |
| | 0.669 | 0.668 | 0.670 | 0.685 | 0.684 | 0.686 | 0.683 | 0.690 | 0.691 |
| Dloans | 0.321 ** | 0.313 ** | 0.316 ** | 0.306 ** | 0.294 ** | 0.296 ** | 0.310 ** | 0.297 ** | 0.290 ** |
| | 0.128 | 0.128 | 0.129 | 0.128 | 0.128 | 0.128 | 0.126 | 0.127 | 0.129 |
| Dequity | 0.953 *** | 0.959 *** | 0.954 *** | 0.949 *** | 0.960 *** | 0.953 *** | 0.946 *** | 0.966 *** | 0.958 *** |
| | 0.249 | 0.248 | 0.249 | 0.247 | 0.246 | 0.247 | 0.243 | 0.246 | 0.246 |
| Dcir | -0.182 ** | -0.176 ** | -0.179 ** | -0.168 ** | -0.164 ** | -0.165 ** | -0.174 ** | -0.166 ** | -0.172 ** |
| | 0.074 | 0.073 | 0.073 | 0.075 | 0.074 | 0.074 | 0.071 | 0.074 | 0.073 |
| Dnci_share | 0.224 | 0.215 | 0.218 | 0.189 | 0.185 | 0.188 | 0.216 | 0.190 | 0.198 |
| | 0.187 | 0.187 | 0.188 | 0.188 | 0.188 | 0.188 | 0.188 | 0.189 | 0.189 |
| Drelat_fixed_assets | -0.168 *** | -0.169 *** | -0.170 *** | -0.181 *** | -0.181 *** | -0.183 *** | -0.186 *** | -0.181 *** | -0.186 *** |
| | 0.062 | 0.062 | 0.063 | 0.062 | 0.063 | 0.063 | 0.061 | 0.062 | 0.063 |
| Dassets | 0.644 * | 0.645 * | 0.652 * | 0.745 ** | 0.748 ** | 0.754 ** | 0.738 ** | 0.740 ** | 0.759 ** |
| | 0.368 | 0.375 | 0.376 | 0.367 | 0.373 | 0.374 | 0.365 | 0.374 | 0.375 |
| Dgov | -0.028 | -0.028 | -0.028 | -0.029 | -0.029 | -0.029 | -0.029 | -0.028 | -0.029 |
| | 0.033 | 0.033 | 0.033 | 0.033 | 0.033 | 0.033 | 0.033 | 0.033 | 0.033 |
| Dfgn | 0.036 | 0.039 | 0.038 | 0.008 | 0.014 | 0.011 | 0.024 | 0.014 | 0.012 |
| | 0.025 | 0.025 | 0.025 | 0.034 | 0.034 | 0.034 | 0.033 | 0.034 | 0.034 |
| Dpar_equity | | | | 1.243 | 1.238 | 1.223 | 0.720 | 0.995 | 1.012 |
| | | | | 0.937 | 0.935 | 0.935 | 1.019 | 1.040 | 0.977 |
| Dpar_loans | | | | -0.052 | -0.047 | -0.045 | -0.058 | -0.033 | -0.033 |
| | | | | 0.091 | 0.090 | 0.090 | 0.094 | 0.094 | 0.093 |
| Dpar_roa | | | | -0.731 | -1.298 | -1.163 | 0.626 | -0.503 | -0.517 |
| | | | | 3.188 | 3.405 | 3.334 | 3.766 | 3.885 | 3.584 |
| Dpar_help1 | -0.038 | | | -0.035 | | | -0.337 *** | | |
| | 0.036 | | | 0.037 | | | 0.091 | | |
| Dpar_help2 | | -0.137 *** | | | -0.132 *** | | | -0.152 | |
| | | 0.039 | | | 0.043 | | | 0.129 | |
| Dpar_help3 | | | -0.133 *** | | | -0.128 *** | | | -0.184 |

| | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 0.035 | | | | | | 0.039 | | | | | | 0.139 | |
| Dpar_loans_x_par_help1 | | | | | | | | | | | | | 0.295 | | | | | |
| | | | | | | | | | | | | | 0.211 | | | | | |
| Dpar_equity_x_par_help1 | | | | | | | | | | | | | 4.001 | * | | | | |
| | | | | | | | | | | | | | 2.293 | | | | | |
| Dpar_roa_x_par_help1 | | | | | | | | | | | | | -6.215 | | | | | |
| | | | | | | | | | | | | | 5.102 | | | | | |
| Dpar_loans_x_par_help2 | | | | | | | | | | | | | | | -0.127 | | | |
| | | | | | | | | | | | | | | | 0.331 | | | |
| Dpar_equity_x_par_help2 | | | | | | | | | | | | | | | 2.005 | | | |
| | | | | | | | | | | | | | | | 2.416 | | | |
| Dpar_roa_x_par_help2 | | | | | | | | | | | | | | | -3.756 | | | |
| | | | | | | | | | | | | | | | 5.548 | | | |
| Dpar_loans_x_par_help3 | | | | | | | | | | | | | | | | | -0.398 | |
| | | | | | | | | | | | | | | | | | 0.458 | |
| Dpar_equity_x_par_help3 | | | | | | | | | | | | | | | | | 5.945 | * |
| | | | | | | | | | | | | | | | | | 3.474 | |
| Dpar_roa_x_par_help3 | | | | | | | | | | | | | | | | | -6.331 | |
| | | | | | | | | | | | | | | | | | 6.212 | |
| Constant | -0.146 | | -0.152 | | -0.149 | | -0.159 | | -0.164 | | -0.162 | | -0.159 | | -0.165 | | -0.157 | |
| | 0.120 | | 0.119 | | 0.119 | | 0.121 | | 0.120 | | 0.120 | | 0.121 | | 0.121 | | 0.121 | |
| no. of observations | 2353 | | 2353 | | 2353 | | 2351 | | 2351 | | 2351 | | 2351 | | 2351 | | 2351 | |
| Wald (joint) | 85.56 | *** | 104.6 | *** | 103.5 | *** | 90.47 | *** | 106.1 | *** | 106.6 | *** | 103.6 | *** | 108.3 | *** | 107.8 | *** |
| Sargan test (two-step) | 137 | | 140.9 | | 139.3 | | 135.8 | | 138 | | 135.7 | | 135.2 | | 131 | | 124.3 | |
| AR(1) test | -8.803 | *** | -8.819 | *** | -8.825 | *** | -8.774 | *** | -8.788 | *** | -8.793 | *** | -8.765 | *** | -8.794 | *** | -8.791 | *** |
| AR(2) test | 0.5011 | | 0.5278 | | 0.5134 | | 0.5768 | | 0.5866 | | 0.5712 | | 0.5378 | | 0.5823 | | 0.5277 | |

This table presents the one-step GMM-SYS estimates. The robust standard errors are given under the coefficients.
***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 7. Research results when the random effects estimator is used

| | 28 | | 29 | | 30 | | 31 | | 32 | | 33 | | 34 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| deposit_gr | 0.104 | *** | 0.103 | *** | 0.104 | *** | 0.103 | *** | 0.101 | *** | 0.099 | *** | 0.100 | *** |
| | 0.019 | | 0.019 | | 0.019 | | 0.019 | | 0.019 | | 0.019 | | 0.019 | |
| interest_exp | 1.565 | *** | 1.607 | *** | 1.594 | *** | 1.612 | *** | 1.592 | *** | 1.582 | *** | 1.583 | *** |
| | 0.455 | | 0.456 | | 0.455 | | 0.456 | | 0.456 | | 0.455 | | 0.455 | |
| oroa | 0.614 | ** | 0.619 | ** | 0.614 | ** | 0.624 | ** | 0.606 | ** | 0.591 | ** | 0.608 | ** |
| | 0.275 | | 0.275 | | 0.275 | | 0.275 | | 0.275 | | 0.275 | | 0.275 | |
| loans | 0.058 | | 0.060 | | 0.060 | | 0.056 | | 0.061 | | 0.071 | | 0.068 | |
| | 0.047 | | 0.047 | | 0.047 | | 0.047 | | 0.047 | | 0.047 | | 0.047 | |
| equity | 0.465 | *** | 0.462 | *** | 0.454 | *** | 0.459 | *** | 0.454 | *** | 0.458 | *** | 0.458 | *** |
| | 0.085 | | 0.085 | | 0.085 | | 0.085 | | 0.085 | | 0.085 | | 0.085 | |
| cir | -0.053 | * | -0.049 | | -0.050 | | -0.049 | | -0.050 | | -0.055 | * | -0.054 | * |
| | 0.032 | | 0.032 | | 0.032 | | 0.032 | | 0.032 | | 0.032 | | 0.032 | |
| nci_share | -0.040 | | -0.043 | | -0.039 | | -0.044 | | -0.047 | | -0.033 | | -0.037 | |
| | 0.065 | | 0.065 | | 0.065 | | 0.065 | | 0.065 | | 0.065 | | 0.065 | |
| relat_fixed_assets | -0.075 | | -0.075 | | -0.075 | | -0.076 | | -0.081 | * | -0.080 | * | -0.079 | |
| | 0.048 | | 0.048 | | 0.048 | | 0.048 | | 0.048 | | 0.048 | | 0.048 | |
| assets | -0.153 | | -0.149 | | -0.154 | | -0.144 | | -0.129 | | -0.089 | | -0.101 | |
| | 0.222 | | 0.222 | | 0.222 | | 0.222 | | 0.222 | | 0.222 | | 0.223 | |
| gov | -0.007 | | -0.006 | | -0.006 | | -0.006 | | -0.006 | | -0.008 | | -0.007 | |
| | 0.023 | | 0.023 | | 0.023 | | 0.023 | | 0.023 | | 0.023 | | 0.023 | |
| fgn | 0.006 | | 0.011 | | 0.017 | | 0.012 | | 0.012 | | 0.015 | | 0.014 | |
| | 0.025 | | 0.025 | | 0.025 | | 0.025 | | 0.025 | | 0.025 | | 0.025 | |
| par_equity | 0.838 | | 0.865 | | 0.900 | | 0.845 | | 0.969 | | 0.935 | | 0.913 | |
| | 0.626 | | 0.627 | | 0.626 | | 0.626 | | 0.629 | | 0.626 | | 0.627 | |
| par_loans | 0.016 | | 0.022 | | 0.017 | | 0.025 | | 0.020 | | 0.018 | | 0.017 | |
| | 0.063 | | 0.063 | | 0.062 | | 0.063 | | 0.063 | | 0.062 | | 0.063 | |
| par_roa | -0.568 | | -0.818 | | -1.399 | | -1.122 | | -1.052 | | -0.843 | | -0.780 | |
| | 1.779 | | 1.785 | | 1.791 | | 1.786 | | 1.790 | | 1.778 | | 1.779 | |
| par_neg_cov | | | | | | | | | -0.198 | ** | | | | |
| | | | | | | | | | 0.084 | | | | | |
| par_neg_cov_50 | | | | | | | | | | | -0.110 | *** | | |
| | | | | | | | | | | | 0.032 | | | |
| par_num_neg_50 | | | | | | | | | | | | | -0.089 | *** |
| | | | | | | | | | | | | | 0.032 | |
| par_help1 | | | -0.056 | * | | | | | | | | | | |
| | | | 0.031 | | | | | | | | | | | |
| par_help2 | | | | | -0.157 | *** | | | | | | | | |
| | | | | | 0.044 | | | | | | | | | |
| par_help3 | | | | | | | -0.142 | *** | | | | | | |
| | | | | | | | 0.045 | | | | | | | |
| Constant | -0.059 | | -0.064 | | -0.063 | | -0.062 | | -0.061 | | -0.064 | | -0.064 | |
| | 0.109 | | 0.109 | | 0.108 | | 0.108 | | 0.109 | | 0.108 | | 0.109 | |
| no. of observations | 2351 | | 2351 | | 2351 | | 2351 | | 2351 | | 2351 | | 2351 | |
| Wald (joint) | 171.5 | *** | 173.9 | *** | 184.3 | *** | 180.7 | *** | 176.4 | *** | 183 | *** | 178.6 | *** |
| $R^2$ | 0.285 | | 0.286 | | 0.289 | | 0.288 | | 0.286 | | 0.288 | | 0.287 | |

This table presents the random effects estimates. The robust standard errors are given under the coefficients. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 8. Research results when the risk of parent companies and banks is described by contemporaneous variables

| | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 |
|---|---|---|---|---|---|---|---|---|
| Ddeposit_gr | 0.025 | 0.024 | 0.024 | 0.023 | 0.024 | 0.025 | 0.026 | 0.027 |
| | 0.025 | 0.026 | 0.026 | 0.026 | 0.026 | 0.026 | 0.025 | 0.025 |
| Dinterest_exp | 2.471 ** | 2.277 * | 2.281 ** | 2.271 ** | 2.282 ** | 2.288 ** | 2.299 ** | 2.320 ** |
| | 1.169 | 1.168 | 1.159 | 1.159 | 1.163 | 1.163 | 1.155 | 1.158 |
| Doroa[c] | 1.551 | 2.330 ** | 2.455 ** | 2.500 ** | 2.501 ** | 2.444 ** | 2.450 ** | 2.444 ** |
| | 1.080 | 1.190 | 1.192 | 1.195 | 1.199 | 1.200 | 1.192 | 1.194 |
| Dloans[c] | -0.291 ** | -0.272 * | -0.291 ** | -0.288 ** | -0.291 ** | -0.292 ** | -0.300 ** | -0.299 ** |
| | 0.142 | 0.144 | 0.143 | 0.144 | 0.145 | 0.144 | 0.143 | 0.143 |
| Dequity[c] | -0.596 * | -0.711 ** | -0.734 ** | -0.725 ** | -0.726 ** | -0.730 ** | -0.720 ** | -0.729 ** |
| | 0.327 | 0.323 | 0.323 | 0.323 | 0.323 | 0.323 | 0.320 | 0.323 |
| Doroa_x_crisis[c] | 1.387 | | | | | | | |
| | 1.374 | | | | | | | |
| Dloans_x_crisis[c] | 0.182 | | | | | | | |
| | 0.164 | | | | | | | |
| Dequity_x_crisis[c] | -0.018 | | | | | | | |
| | 0.499 | | | | | | | |
| Dcir | -0.070 | -0.052 | -0.048 | -0.048 | -0.047 | -0.046 | -0.041 | -0.044 |
| | 0.089 | 0.095 | 0.096 | 0.094 | 0.094 | 0.097 | 0.095 | 0.095 |
| Dnci_share | 0.002 | 0.050 | 0.049 | 0.063 | 0.062 | 0.052 | 0.056 | 0.057 |
| | 0.169 | 0.182 | 0.181 | 0.180 | 0.179 | 0.181 | 0.179 | 0.180 |
| Drelat_fixed_assets | -0.253 *** | -0.292 *** | -0.289 *** | -0.287 *** | -0.286 *** | -0.281 *** | -0.283 *** | -0.285 *** |
| | 0.058 | 0.060 | 0.060 | 0.061 | 0.061 | 0.060 | 0.062 | 0.062 |
| Dassets | 0.738 ** | 0.936 *** | 0.899 *** | 0.941 *** | 0.926 *** | 0.857 *** | 0.882 *** | 0.893 *** |
| | 0.321 | 0.330 | 0.329 | 0.334 | 0.333 | 0.329 | 0.338 | 0.340 |
| Dgov | -0.028 | -0.026 | -0.021 | -0.022 | -0.022 | -0.022 | -0.021 | -0.021 |
| | 0.031 | 0.033 | 0.033 | 0.033 | 0.033 | 0.033 | 0.033 | 0.033 |
| Dfgn | 0.046 * | 0.014 | 0.015 | 0.019 | 0.018 | 0.010 | 0.019 | 0.015 |
| | 0.026 | 0.039 | 0.039 | 0.039 | 0.038 | 0.039 | 0.039 | 0.039 |
| Dpar_equity[c] | | -0.755 | 0.376 | 0.378 | 0.327 | 0.187 | 0.532 | 0.567 |
| | | 0.945 | 0.694 | 0.693 | 0.697 | 0.687 | 0.702 | 0.699 |
| Dpar_loans[c] | | 0.103 | 0.061 | 0.060 | 0.061 | 0.069 | 0.048 | 0.053 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 0.105 | | 0.099 | | 0.098 | | 0.099 | | 0.099 | | 0.098 | | 0.098 |
| Dpar_roa[c] | | | 2.147 | | 0.206 | | 0.176 | | 0.333 | | 0.721 | | -0.906 | | -1.056 |
| | | | 2.107 | | 1.606 | | 1.637 | | 1.639 | | 1.603 | | 1.765 | | 1.764 |
| Dpar_equity_x_crisis[c] | | | 2.283 | * | | | | | | | | | | | |
| | | | 1.281 | | | | | | | | | | | | |
| Dpar_loans_x_crisis[c] | | | -0.151 | | | | | | | | | | | | |
| | | | 0.132 | | | | | | | | | | | | |
| Dpar_roa_x_crisis[c] | | | -0.603 | | | | | | | | | | | | |
| | | | 3.576 | | | | | | | | | | | | |
| Dpar_neg_cov | | | | | -0.204 | *** | | | | | | | | | |
| | | | | | 0.077 | | | | | | | | | | |
| Dpar_neg_cov_50 | | | | | | | -0.106 | ** | | | | | | | |
| | | | | | | | 0.042 | | | | | | | | |
| Dpar_num_neg_50 | | | | | | | | | -0.083 | ** | | | | | |
| | | | | | | | | | 0.041 | | | | | | |
| Dpar_help1 | | | | | | | | | | | -0.012 | | | | |
| | | | | | | | | | | | 0.037 | | | | |
| Dpar_help2 | | | | | | | | | | | | | -0.151 | *** | |
| | | | | | | | | | | | | | 0.045 | | |
| Dpar_help3 | | | | | | | | | | | | | | | -0.155 | *** |
| | | | | | | | | | | | | | | | 0.042 |
| Constant | 0.258 | | 0.192 | | 0.175 | | 0.163 | | 0.164 | | 0.175 | | 0.168 | | 0.173 |
| | 0.166 | | 0.175 | | 0.174 | | 0.175 | | 0.175 | | 0.177 | | 0.174 | | 0.174 |
| no. of observations | 2351 | | 2349 | | 2349 | | 2349 | | 2349 | | 2349 | | 2349 | | 2349 |
| Wald (joint) | 59.98 | *** | 74.18 | *** | 64.18 | *** | 67.98 | *** | 67.41 | *** | 58.23 | *** | 65.76 | *** | 66.51 | *** |
| Sargan test (two-step) | 140.7 | | 132.8 | | 132.2 | | 135.2 | | 135.1 | | 137.4 | | 138.8 | | 138.4 |
| AR(1) test | -9.01 | *** | -8.93 | *** | -8.888 | *** | -8.881 | *** | -8.876 | *** | -8.903 | *** | -8.907 | *** | -8.915 | *** |
| AR(2) test | 0.4805 | | 0.4082 | | 0.4382 | | 0.3988 | | 0.3963 | | 0.4051 | | 0.4446 | | 0.429 |

[c] identifies the contemporaneous variables used instead of the lagged variables.
This table presents the one-step GMM-SYS estimates. The robust standard errors are given under the coefficients.
***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 9. Research results and modifications in safety net arrangements

| | 43 | | 44 | | 45 | | 46 | | 47 | | 48 | | 49 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ddeposit_gr | 0,018 | | 0,018 | | 0,018 | | 0,012 | | 0,016 | | 0,012 | | 0,016 | |
| | 0,024 | | 0,025 | | 0,025 | | 0,023 | | 0,023 | | 0,025 | | 0,024 | |
| Dinterest_exp | 1,202 | | 1,493 | | 1,423 | | 1,348 | | 1,389 | | 1,512 | | 1,565 | |
| | 1,167 | | 1,177 | | 1,177 | | 1,154 | | 1,155 | | 1,191 | | 1,193 | |
| Doroa | 0,965 | | 1,059 | | 1,054 | | 1,059 | | 1,060 | | 0,980 | | 0,948 | |
| | 0,724 | | 0,672 | | 0,670 | | 0,690 | | 0,691 | | 0,775 | | 0,773 | |
| Dloans | 0,232 | * | 0,322 | ** | 0,324 | ** | 0,271 | ** | 0,262 | ** | 0,263 | ** | 0,256 | ** |
| | 0,124 | | 0,127 | | 0,128 | | 0,127 | | 0,127 | | 0,126 | | 0,125 | |
| Dequity | 0,935 | *** | 0,958 | *** | 0,948 | *** | 0,967 | *** | 0,955 | *** | 0,897 | *** | 0,889 | *** |
| | 0,242 | | 0,245 | | 0,248 | | 0,243 | | 0,243 | | 0,247 | | 0,249 | |
| Doroa_x_crisis | -0,295 | | | | | | | | | | | | | |
| | 1,302 | | | | | | | | | | | | | |
| Dloans _x_crisis | 0,069 | | | | | | | | | | | | | |
| | 0,201 | | | | | | | | | | | | | |
| Dequity_x_crisis | -0,149 | | | | | | | | | | | | | |
| | 0,390 | | | | | | | | | | | | | |
| Dcir | -0,213 | *** | -0,185 | ** | -0,184 | ** | -0,209 | *** | -0,204 | *** | -0,156 | ** | -0,150 | ** |
| | 0,065 | | 0,073 | | 0,073 | | 0,067 | | 0,067 | | 0,069 | | 0,070 | |
| Dnci_share | 0,230 | | 0,234 | | 0,234 | | 0,183 | | 0,175 | | 0,133 | | 0,124 | |
| | 0,177 | | 0,188 | | 0,187 | | 0,179 | | 0,179 | | 0,198 | | 0,198 | |
| Drelat_fixed_assets | -0,179 | *** | -0,175 | *** | -0,172 | *** | -0,196 | *** | -0,193 | *** | -0,183 | *** | -0,179 | *** |
| | 0,060 | | 0,061 | | 0,062 | | 0,063 | | 0,063 | | 0,060 | | 0,060 | |
| Dassets | 0,651 | * | 0,682 | * | 0,662 | * | 0,876 | ** | 0,804 | ** | 0,807 | ** | 0,727 | ** |
| | 0,376 | | 0,368 | | 0,373 | | 0,395 | | 0,391 | | 0,377 | | 0,371 | |
| Dgov | -0,032 | | -0,032 | | -0,031 | | -0,035 | | -0,033 | | -0,034 | | -0,032 | |
| | 0,032 | | 0,034 | | 0,034 | | 0,033 | | 0,033 | | 0,032 | | 0,032 | |
| Dfgn | 0,030 | | 0,031 | | 0,032 | | 0,022 | | 0,016 | | 0,014 | | 0,011 | |
| | 0,024 | | 0,028 | | 0,028 | | 0,032 | | 0,032 | | 0,034 | | 0,034 | |
| Dgov_x_crisis | | | -0,057 | | 0,039 | | | | | | | | | |
| | | | 0,085 | | 0,069 | | | | | | | | | |
| Dfgn_x_crisis | | | -0,023 | | 0,046 | | | | | | | | | |
| | | | 0,049 | | 0,169 | | | | | | | | | |
| Dpar_equity | | | | | | | 1,220 | | 1,100 | | 1,400 | | 1,254 | |
| | | | | | | | 0,935 | | 0,923 | | 0,934 | | 0,922 | |
| Dpar_loans | | | | | | | -0,063 | | -0,058 | | -0,055 | | -0,050 | |
| | | | | | | | 0,090 | | 0,089 | | 0,090 | | 0,089 | |
| Dpar_roa | | | | | | | -0,613 | | -0,878 | | -1,020 | | -1,362 | |
| | | | | | | | 3,143 | | 3,283 | | 3,108 | | 3,322 | |
| Dloans_x_lowcovmultp | 0,406 | | | | | | 0,456 | * | 0,453 | * | | | | |
| | 0,303 | | | | | | 0,263 | | 0,269 | | | | | |
| Dequity_x_lowcovmultp | 1,922 | ** | | | | | 1,488 | * | 1,530 | * | | | | |
| | 0,945 | | | | | | 0,862 | | 0,925 | | | | | |
| Doroa_x_lovcowmultp | 0,093 | | | | | | -0,204 | | 0,074 | | | | | |
| | 3,792 | | | | | | 3,700 | | 3,715 | | | | | |
| Dloans_x_nonfullguar | | | | | | | | | | | 0,196 | | 0,136 | |
| | | | | | | | | | | | 0,186 | | 0,185 | |
| Dequity_x_nonfullguar | | | | | | | | | | | -0,009 | | 0,027 | |
| | | | | | | | | | | | 0,394 | | 0,384 | |
| Doroa_x_nonfullguar | | | | | | | | | | | -0,019 | | 0,405 | |
| | | | | | | | | | | | 1,428 | | 1,480 | |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dgov_x_lowcovmultp | | | 0,295 | ** | | | | | | | | | | |
| | | | 0,130 | | | | | | | | | | | |
| Dfgn_x_lowcovmultp | | | 0,136 | | | | | | | | | | | |
| | | | 0,110 | | | | | | | | | | | |
| Dgov_x_nonfullguar | | | | | -0,027 | | | | | | | | | |
| | | | | | 0,076 | | | | | | | | | |
| Dfgn_x_nonfullguar | | | | | -0,052 | | | | | | | | | |
| | | | | | 0,174 | | | | | | | | | |
| Dpar_neg_cov_50 | | | | | | | -0,128 | *** | | | -0,143 | *** | | |
| | | | | | | | 0,042 | | | | 0,038 | | | |
| Dpar_num_neg_50 | | | | | | | | | | | | | | |
| Dpar_help2 | | | | | | | | | | | | | -0,133 | *** |
| | | | | | | | | | | | | | 0,042 | |
| Dpar_help3 | | | | | | | | | -0,115 | *** | | | | |
| | | | | | | | | | 0,043 | | | | | |
| Constant | -0,081 | | -0,143 | | -0,143 | | -0,109 | | -0,102 | | -0,120 | | -0,113 | |
| | 0,119 | | 0,121 | | 0,121 | | 0,117 | | 0,117 | | 0,123 | | 0,122 | |
| no. of observations | 2353 | | 2353 | | 2353 | | 2351 | | 2351 | | 2351 | | 2351 | |
| Wald (joint) | 101,6 | *** | 88 | *** | 85,08 | *** | 107,5 | *** | 111,3 | *** | 107 | *** | 110,7 | *** |
| Sargan test (two-step) | 138,1 | | 131,4 | | 129,9 | | 133,5 | | 133,3 | | 132,5 | | 134,7 | |
| AR(1) test | -8,893 | *** | -8,782 | *** | -8,808 | *** | -8,795 | *** | -8,857 | *** | -8,778 | *** | -8,828 | *** |
| AR(2) test | 0,4687 | | 0,507 | | 0,5072 | | 0,5729 | | 0,5515 | | 0,6257 | | 0,6068 | |

This table presents the one-step GMM-SYS estimates. The robust standard errors are given under the coefficients. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.