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Abstract

The Central European banking industry is dominated by foreign-owned banks. During the recent crisis, for the first time since the transition, foreign parent companies were frequently in a worse financial condition than their subsidiaries. This situation created a unique opportunity to study new aspects of market discipline exercised by non-financial depositors. Using a comprehensive data set, we find that the recent crisis did not change the sensitivity of deposit growth rates to accounting risk measures. We establish that depositors' actions were more strongly influenced by negative press rumors concerning parent companies than by fundamentals. The impact of rumors was especially perceptible when rumors turned out *ex post* to be founded. Additionally, we document that public aid announcements were primarily interpreted by depositors as confirmation of a parent company's financial distress. Our results, indicating that depositors react rationally to sources of information other than financial statements, have policy implications, as depositor discipline is usually the only viable and universal source of market discipline for banks in emerging economies.

JEL classification: G21; G28.

Keywords: depositor behavior; market discipline; crisis; emerging markets; market rumors.

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1 Introduction

Banking systems in Central European (CE) countries are dominated by foreign-owned entities. As a result, during the recent financial crisis, which originated in developed economies, financial instability was largely imported into the CE banking industry from abroad. This phenomenon, unprecedented in the history of Central Europe since the fall of Communism, created a unique opportunity to study new aspects of market discipline exercised by non-financial depositors. More specifically, we were able to address important research questions in the described context: whether depositors react flexibly to changing sources of risk; whether depositors base decisions on fundamentals or on rumors; whether depositors can assess the informational content of rumors; and whether depositors' decisions are affected by public aid received by foreign parent companies.

Our study uses a large data set comprising commercial banks operating in 11 CE countries and their parent companies during the 1994−2011 period. This data set includes not only financial statements for each bank but also information about parent companies, mass-media rumors, capital injections, bad-loan removals, and emergency loans. Estimation of dynamic panel models of deposit growth rates leads us to several interesting conclusions. In particular, we find that the recent crisis did not alter the sensitivity of deposit growth rates to accounting risk measures. We observe that depositors' decisions were more strongly influenced by press rumors regarding a parent company's condition than by fundamentals and that the effects of rumors on deposit growth rates were economically significant. We demonstrate that depositors' reactions to negative rumors were surprisingly rational, as the outflow of deposits was concentrated in banks for which negative rumors turned out *ex post* to be founded, and we also show that depositors were not misled by the fact that subsidiaries and their parent companies may have different names. The depositors' reaction to rumors was, however, asymmetric, with the influence of positive rumors weaker than that of negative rumors. Significant inflows of deposits during the recent crisis were recorded only by subsidiaries controlled only by the most highly praised parent companies. In addition, we document that public aid to banks was principally interpreted by depositors as confirmation of the financial distress of parent companies. More generally, our study provides some support for the view that depositors monitor the conditions of banks and respond to changes in the economic environment, and we also show that media rumors may convey relevant information during crises.

This article complements the existing empirical research on market discipline in banking in four ways. First, it provides one of the most comprehensive analyses of depositor discipline in emerging economies to appear in the literature. Second, the article extends the traditional test of the existence of market discipline to direct verification of whether deposit growth rates are affected by factors associated with parent companies. Third, it provides a novel assessment, in the context of developing economies, of the effects of certain variables, such as negative and positive market rumors, parent company fundamentals, brand similarities, and public aid received by parent companies, on depositors' decisions. Fourth, it reflects on the role of market discipline in maintaining the stability of the banking system, as it suggests that even during crisis periods, depositors' reactions are rational. Although the evidence presented here is derived from CE experience, we conjecture that our results are relevant to other emerging economies with similar ownership and competitive banking structures.

The remainder of the paper is organized as follows. Section 2 reviews the literature, with a specific focus on market discipline in emerging markets. Section 3 presents our hypotheses and econometric models. Section 4 describes the data set and other sources of information utilized in this study. Section 5 describes and discusses the empirical results. Section 6 provides some robustness checks. Finally, Section 7 presents concluding remarks.

2 Literature review

The vast majority of studies on depositor discipline address this topic in the context of mature economies. These studies can be divided into two main categories. The first includes research that explores the relationships between bank risk and either deposit interest rates or interest costs. Hannan and Hanweck (1988), Cargill (1989), Ellis and Flannery (1992), Kutner (1992), Brewer III and Mondschean (1994), Hess and Feng (2007), and Uchida and Satake (2009) all establish that deposit interest rates and interest costs are associated in the expected manner with measures of bank risk or manifestations of risk in banking activities. In particular, they document that deposit interest rates increase as the capital base of banks worsens, the standard deviation of bank performance increases, and the interest rate risk of assets rises. Additionally, they observe that banks with lower credit ratings and higher shares of speculative financial instruments among their assets incur higher interest rate

costs. The second category of depositor discipline studies analyzes 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) demonstrate that banks in danger of bankruptcy do not attract uninsured deposits and that weak banks actively substitute insured deposits for lost uninsured liabilities. Moreover, these studies find 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.

Although the aforementioned research is certainly important, studies that use data from emerging markets are more relevant to the current investigation. Hosono (2005) demonstrates that a solid capital base and high profitability lowers deposit interest costs paid by South Korean, Indonesian, Malaysian, and Thai banks. Somewhat surprising, however, is the fact that the same independent variables were found to be insignificant in regression models of the growth of deposit volumes. Hadad et al. (2011) also find evidence of market discipline in Indonesia, where higher deposit rates have been associated with higher default and liquidity risk. The mechanism of depositor discipline in Latin American countries has been studied by several authors. Barajas and Steiner (2000), in contrast to Hosono (2005), establish that Columbian banks have been disciplined by alterations in real deposit growth rates but not by interest costs. In addition, they observe that banks recording low deposit inflows have 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. In a study of Argentina, Chile, and Mexico, Peria and Schmukler (2001) demonstrate that deposit volumes are negatively correlated and deposit interest costs are positively correlated with accounting measures of bank risk. Interestingly, in these countries, disciplining signals have been generated by both uninsured and insured depositors. This phenomenon can be explained by the limited credibility of the safety nets in these nations. Calomiris and Powell (2001) confirm that depositors have monitored the risk-taking activities of private banks in Argentina during the last years of the 20th century.

The evidence with regard to the effects of the implementation of deposit insurance systems in emerging economies is ambiguous. Ioannidou and Penas (2010) establish that the introduction of *explicit* deposit insurance in Bolivia has diminished the market discipline exercised by large depositors. Prior to the introduction of this system, banks with

higher shares of large deposits took on less risk, whereas after the introduction, this effect had vanished. In agreement with the conclusions of Ioannidou and Penas (2010), Mondschean and Opiela (1999) observe that the introduction of an *explicit* deposit insurance system weakened depositor discipline in Poland. In contrast, Kouassi et al. (2011) find that market discipline is effective only in the presence of *explicit* deposit insurance.

Jackowicz (2004) shows that banks in Poland have been disciplined mainly by deposit interest costs, a conclusion similar to findings in Hosono (2005). Kraft and Galac (2007) provide evidence that banks in Croatia were able to increase deposit growth by raising interest rates in the period immediately preceding the 1998−1999 crisis. Additionally, they show 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 risk, even after the introduction of full coverage in 1994. Moreover, they document that depositor discipline did not discourage Turkish banks from engaging in activities fraught with moral hazard. The observation of Önder and Özyildrim (2008) and Peria and Schmukler (2001) that deposit insurance systems in developing countries are frequently seen as not fully credible is further confirmed by Prean and Stix (2011), who, in an analysis of survey data, conclude that Croatian depositors perceived the safety of their deposits to be relatively weak during the 2007−2009 period.

Another distinct group of studies investigates whether crisis and crisis experience influence depositor behavior. Opiela (2004) demonstrates 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) establishes that during crisis periods in Argentina and Uruguay, depositors' sensitivities to macroeconomic risks increased. At the same time, however, depositors' sensitivities to bank-specific factors diminished. Kraft and Galac (2007) demonstrate that during the 1998−1999 crisis in Croatia, the interest-rate elasticity of deposits completely vanished, and a flight to quality occurred. Oliveira et al. (2011) find that during the recent crisis, banks in Brazil were viewed as systemically important components of the financial system and recorded a substantial increase in uninsured deposits, whereas other Brazilian banks lost uninsured deposits. Using a large sample of banks from developed and emerging economies, Forssbæck (2011) finds no evidence for augmented market discipline during crisis periods. The majority of the reviewed studies thus conclude that, during crises, depositors exhibit rather low sensitivity to bank fundamentals.

Existing evidence on the medium- and long-term effects of crisis experience on depositor discipline is inconclusive. Peria and Schmukler (2001) show that in Latin American countries, the sensitivities of deposit growth rates and deposit interest costs to measures of bank risk have been augmented in post-crisis periods. However, Hosono (2005) does not confirm this change, which is known as the *wake-up-call effect*. Hosono's work demonstrates that, in South 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 owing to the limited credibility of safety nets. However, the current literature does not answer the basic question of whether strengthened market discipline is sufficient to maintain the stability of the banking system. Furthermore, the functioning of market discipline during periods of crisis remains relatively poorly understood, especially when the informational content of financial statements is reduced.

3 Hypotheses and empirical strategy

We build an empirical strategy based on the existing evidence and the specific context of CE countries during the recent crisis. We focus on market discipline exercised through deposit volumes because the available data do not allow for a precise ascription of interest costs to deposits of non-financial entities. We begin with a traditional test for the existence of depositor discipline, by seeking verification of hypothesis H1:

> **H1:** *In CE countries, measures of bank risk 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 augment sensitivity of deposit volume and interest costs to accounting risk measures. On the other hand, the response to the crisis in the form of extended or blanket guarantees (Financial Stability Board, 2009; Financial Stability Board, 2010) should considerably diminish the disciplining role of depositors' actions. On purely

theoretical grounds, it is difficult to forecast which of these two effects should be stronger. Thus, we test hypothesis H2 in the following form:

> **H2:** *During the recent crisis, the sensitivity of deposit volumes to accounting measures of bank risk in CE countries differed from that during the other periods studied.*

From 2007 onwards, instability in the CE banking industry was primarily 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 hypothesis H3:

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

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

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

Non-financial depositors are usually unsophisticated investors. We can therefore assume that their investment decisions are influenced more by mass-media rumors than by bank fundamentals. Even the small group of sophisticated non-financial depositors must consider mass-media rumors 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' behavior was more strongly influenced by rumors about the financial health of foreign parent companies than by the financial fundamentals of these companies.*

During crisis periods, however, press rumors may convey more relevant information than financial statements. Therefore, it is of interest to investigate whether depositors act differently on the basis of rumors, depending on whether the rumors turn out subsequently to be founded. Because, as noted above, the majority of non-financial depositors are relatively unsophisticated investors, we posit that depositors are unable to differentiate *ex ante* between founded and unfounded rumors. We express this prediction in H6:

H6: *During the recent crisis, depositors acted similarly, whether rumors were founded or unfounded.*

Many parent companies of banks operating in CE countries received state aid during the recent crisis period. On the one hand, this aid should stabilize the condition of a 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 H7 assumes that the two effects offset each other perfectly or nearly so.

H7: *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 those used by Maechler and McDill (2006) and Oliveira et al. (2011). We specify the real growth rate of deposits from non-financial entities ($DEPOSIT\_GR_{t,i}$) as the main dependent variable in these models[1]. Unfortunately, we are unable, in this study, to differentiate between insured and uninsured deposits. However, as discussed in Section 2, in emerging economies, deposit insurance systems are not fully credible, or at least may not be seen to be so by depositors. We expect that this shortcoming of our empirical strategy will bias our analysis

[1] In Section 6, we change the dependent variable and report the relevant results.

against the finding that market discipline exists. The estimated models are built according to the general principles, as expressed by Eq. (1).

$$\begin{aligned} DEPOSIT\_GR_{t,i} = {} & DEPOSIT\_GR_{t-1,i} + a_0 + a_1 MD_{t-1,i} + a_2 CV_{t,i} + a_3 OS_{t,i} + \\ & + a_4 PF_{t-1,s} + a_5 RM_{t,s} + a_6 PH_s + a_7 TCD_{t,k} + \\ & + a_8 INTEREST\_COST_{t,i} + v_{t,i} \end{aligned} \quad (1)$$

In Eq.(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 that capture market rumors 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 $INTEREST\_COST_{t,i}$ is a variable reflecting bank interest costs. Model (1) also includes dummies that control for specific conditions in year *t* in country *k* (*TCD*).

The model parameters are estimated using the Generalized Method of Moments (GMM-SYS) procedure proposed by Blundell and Bond (1998)[2], a method that has been used in market discipline tests such as those of Hadad et al. (2011) and Oliveira et al. (2011). The GMM-SYS, in contrast to other panel model estimators (such as the fixed effects or random effects estimators), enables us to remove the strict exogeneity assumption for regressors and thereby include among them the lagged dependent variable. In our research, we assume that the $INTEREST\_COST_{t,i}$ variable is correlated with past shocks to the dependent variable, a relation that is automatic when the lagged dependent variable is included as a regressor. Because the abandonment of strict exogeneity implies that feedback from the dependent variable to the other variables is allowed, we permit the regressor mentioned above to be only sequentially exogenous. Therefore, we 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, includ-

[2] The sensitivity of our results to the choice of the estimation procedure is discussed in Section 6.

ing control variables, variables testing for market discipline, binary variables encoding ownership structures, variables describing the fundamentals of the parent company, variables capturing market rumors about the parent company, variables identifying parent companies that receive 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 to hypothesis testing, especially when there are heteroscedastic error components. The appropriateness of the set of instruments we use is formally evaluated by the Sargan test of over-identifying 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; Hendry et al., 2009).

Table 1 presents the construction of the independent variables in detail. We will focus our analysis on two issues: 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, then high profitability (*OROA*) and a solid capital base (*EQUITY*) should increase deposit growth rates. In contrast, an elevated share of risky assets (*LOANS*) should negatively affect the dependent variable. To assess 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*, which encodes the years from 2007 to 2010.

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 Eq. (1) indicates, we introduce the lagged dependent variable (*DEPOSIT_GR*) and the variable reflecting contemporaneous interest costs (*INTEREST_COST*). We assume that inertia of 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 domination of the retail or wholesale component of the bank's activities (*NCI_SHARE* and *RELAT_FIX_ASSETS*), and the scale of operations (*ASSETS*). We expect positive signs on the coefficients for *ASSETS* and *RELAT_FIX_ASSETS* and a negative sign on the coefficient

for *NCI_SHARE* because large and retail banks usually report more rapid deposit growth rates than other banks. Lack of strict control over 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 privatization and ownership significance in developing economies suggests that foreign-owned banks follow more aggressive growth strategies than other banks and that government-owned banks suffer from corporate governance problems (Shleifer, 1998; De 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' abilities to compete successfully 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 a low share of risky assets (*PAR_LOANS*) should enjoy favorable deposit growth rates. Similarly, growth in profitability (*PAR_ROA_GR*) or in the capital base (*PAR_EQUITY_GR*) should produce higher deposit inflows. Because parent companies' fundamentals are most likely directly observed only by a limited number of non-financial depositors, we include in our regressions four variables describing mass-media rumors regarding the financial health of parent companies. The first variable (*NEG_RUM1*) is based on the percentage of negative news items among all news items about a parent company in a given year. The second (*NEG_RUM2*) is a binary variable identifying the parent companies that rank among the 50% of parent companies with the highest number of negative news items in a given year. The third (*NEG_RUM3*) is also a binary variable that takes a value of one for the 25% of parent companies with the highest shares of negative news items in total media coverage during the period of the recent crisis. The fourth variable (*NEG_RUM4*) is calculated as a squared value of the NEG_RUM1 variable, to underscore the role of large differences in percentages of negative rumors.

To test H6, we define variables that enable us to differentiate *ex post* between founded and unfounded negative rumors. These variables are based on information from financial statements prepared at the end of the year *t+1*. The binary variable *F_EQ* is set

equal to one when parent company equity capital growth is negative and below the median sample value of the *PAR_EQUITY_GR* variable during the financial year *t+1*. Accordingly, the binary variable *UNF_EQ* is one when parent company equity growth is positive and above the median value of the *PAR_EQUITY_GR* variable during the financial year *t+1*. We assess the veracity of H6 by interacting the variables that identify founded and unfunded negative rumors (*F_EQ* and *UNF_EQ*, respectively) with variables, described above, based on negative rumors. We expect that all the rumor-based variables, as well the interaction terms, will negatively affect deposit dynamics. The use of several variables that indicate the condition of parent companies allow us to thoroughly test H3 and H5−H6.

As noted earlier, the influence on depositor decisions of state aid received by foreign parent companies is theoretically ambiguous in CE countries. H7 proposes that the positive and negative effects of state aid will offset each other. To fully investigate the role of state aid, we define three binary variables. These variables identify the parent companies that received public help but 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*) is set to one for the year in which the aid was distributed, the second (*PAR_HELP2*) is set to one for the year in which public aid was distributed and for the following year, and the third (*PAR_HELP3*) is set to one for the year in which public aid was distributed as well as for the two subsequent years.

Table 1 Explanatory variables and their definitions

Explanatory variable	Definition	Type	Lag
DEPOSIT_GR	The real growth rate of deposits of non-financial entities	SE	L
INTEREST_COST	Ratio of total interest costs to liabilities	SE	C
OROA	Return on assets, measured on the level of operating income	E	L
EQUITY	Ratio of equity capital to assets	E	L
LOANS	Share of loans in total assets	E	L
CIR	Cost-to-income ratio	E	C
NCI_SHARE	Share of net commission and fee income in operating income	E	C
ASSETS	Ratio of a given bank's assets to the GDP of the country in which the bank is licensed	E	C
RELAT_FIX_ASSETS	A variable equal to one for the bank with the most fixed assets in a given year and country and equal to the relative scale of fixed assets for other banks	E	C
GOV	A binary variable identifying banks directly or indirectly controlled by the government in a given year	E	C
FGN	A binary variable identifying banks owned by foreign investors in a given year	E	C
CRISIS	A binary variable equal to one for the years 2007 to 2010 and equal to zero for the other years under study	E	C
PAR_EQUITY	Ratio of equity capital to assets, calculated for parent companies	E	L
PAR_ROA	Return on assets, calculated for parent companies	E	L
PAR_LOANS	The share of loans in total assets, calculated for parent companies	E	L
PAR_ROA_GR	Growth rate of the PAR_ROA variable	E	
PAR_EQUITY_GR	Growth rate of the PAR_EQUITY variable	E	
NEG_RUM1	Percentage of negative news items out of the total number of news items on a given parent company in a given year during the period of the recent crisis	E	C

Explanatory variable	Definition	Type	Lag
NEG_RUM2	A binary variable identifying the 50% of parent companies with the highest values of the PAR_NEG_COV variable in a given year	E	C
NEG_RUM3	A binary variable identifying the 25% of parent companies with the highest shares of negative rumors in total media coverage during the whole of the crisis period	E	C
NEG_RUM4	A variable calculated as a squared value of the NEG_RUM1 variable	E	C
F_EQ	A binary variable equal to one when the value of the PAR_EQUITY_GR variable is negative and below the median value of the latter variable during the financial year *t+1*	E	C
UNF_EQ	A binary variable equal to one when the value of the PAR_EQUITY_GR variable is positive and above the median value of the latter variable during the financial year *t+1*	E	C
PAR_HELP1	A binary variable equal to one in the year in which public help is received by a parent company	E	C
PAR_HELP2	A binary variable equal to one in the year in which public help is received by a parent company and in the next financial year	E	C
PAR_HELP3	A binary variable equal to one in the year in which public help is received by a parent company and in the next two financial years	E	C
BRAND	A binary variable equal to one when a subsidiary uses the same name as its parent company	E	C
POS_RUM1	Percentage of positive news items out of the total number of news items for a given parent company in a given year	E	C
POS_RUM2	A binary variable equal to one for parent companies that had any positive rumors during the recent crisis	E	C
POS_RUM3	A binary variable identifying the 25% of parent companies with the highest shares of positive rumors in total media coverage during the whole of the crisis period	E	C
POS_RUM4	A variable calculated as a squared value of the POS_RUM1 variable	E	C

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

4 Data set

Our study spans the 1994−2011 period and focuses on commercial banks in Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, and Slovenia. We use the abbreviation "banks" for these entities. The estimation period ends in 2010, but the period for which we assess the informational content of rumors also encompasses the year 2011. All bank-specific financial information was obtained from the *BankScope* database. Based on these data, we constructed a panel of 4,344 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. (2012), using the annual reports of banks, official publications of regulatory bodies, and articles in various newspapers. In the final data set, we have 2,264 bank-year observations for banks controlled by foreign investors, 769 observations for government-owned banks, and 1,311 observations for banks owned by private domestic investors. Table 2 presents the descriptive statistics for the dependent variable and selected explanatory variables.

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

	DEPOSIT_GR	INTEREST_COST	OROA	LOANS	EQUITY
Mean	19.80%	−2.00%	6.68%	48.38%	14.59%
Median	12.19%	−0.87%	5.74%	49.15%	10.66%
Standard deviation	41.70%	4.82%	4.34%	20.84%	13.43%
10^{th} percentile	−18.85%	−7.96%	2.65%	20.80%	5.14%
90^{th} percentile	70.28%	2.57%	12.14%	75.10%	27.57%

The mean and median values of the real deposit growth rate are 19.8% and 12.19%, respectively. The distribution of the real deposit growth rate is also characterized 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 CE countries offered only weak protection against inflation. The average share of the loans to non-financial companies is 48.38%, and the median value of the *LOANS* variable is almost identical. The mean and median returns on assets, as measured at the level of operating income, are 6.68% and 5.74%, 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 10.66% of its assets with equity capital.

For the foreign-owned banks, we identified the majority shareholders. We focused 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 were able to identify 96 financial parent companies. Because many parent companies exercised control over multiple subsidiaries for prolonged periods, we have at our disposal 2,030 parent-subsidiary-year observations. The remaining observations for the foreign-owned banks concern banks owned by non-financial companies, banks with dispersed shareholders, banks owned by wealthy individuals, or banks missing detailed data on ownership structure. Figure 1 shows the number of parent companies with an average yearly number of controlled subsidiaries 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. Table 3 presents the distribution of parent-subsidiary-year observations according to the country of origin of a parent company. We find that the banks from Austria, France, Germany, and Italy were the most active in establishing a presence in CE markets.

Figure 1 Number of financial parent companies with given average yearly numbers of subsidiaries

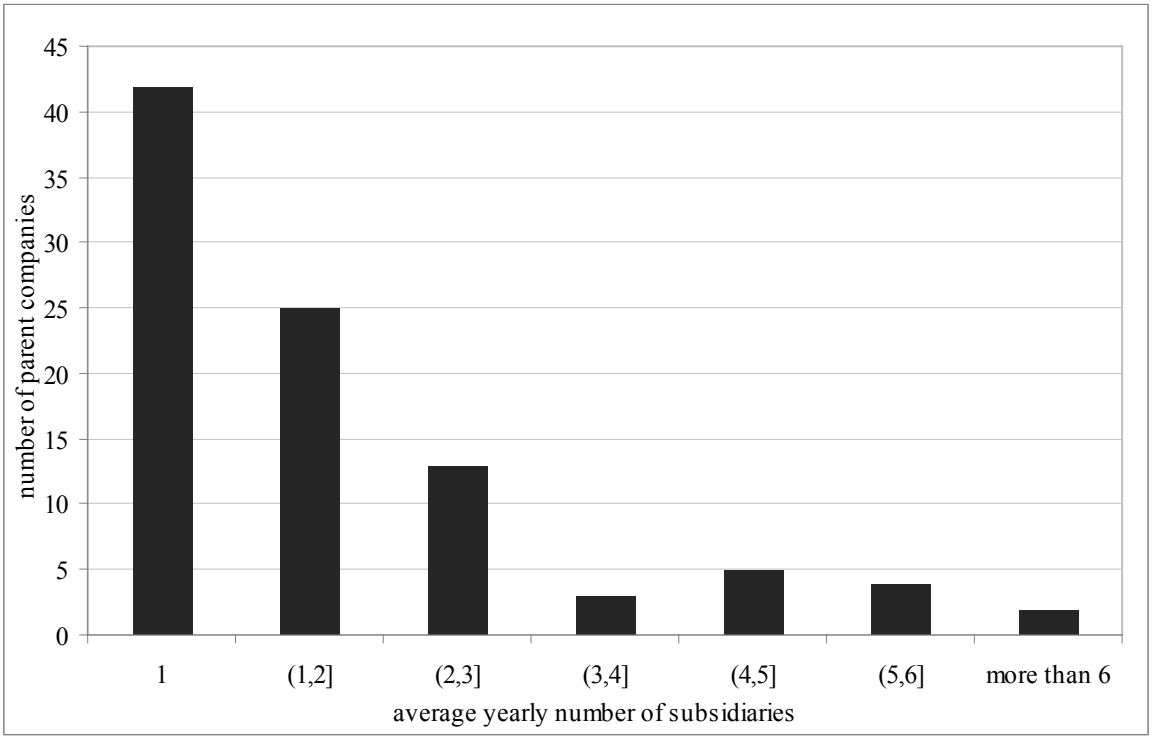

Table 3 Distribution of parent-subsidiary-year observations, according to parent companies country of origin

Parent company from	Subsidiary operate in										
	BULGARIA	CROATIA	CZECH REPUBLIC	ESTONIA	HUNGARY	LATVIA	LITHUANIA	POLAND	ROMANIA	SLOVAKIA	SLOVENIA
AUSTRIA	10.27%	44.51%	36.63%	0.00%	23.69%	0.00%	0.00%	6.28%	15.96%	40.82%	62.37%
BELGIUM	0.00%	0.00%	9.89%	0.00%	3.08%	0.00%	0.00%	6.03%	0.00%	14.80%	0.00%
FINLAND	0.00%	0.00%	0.00%	15.22%	0.00%	2.75%	11.94%	0.00%	0.00%	0.00%	0.00%
FRANCE	19.18%	3.05%	11.72%	0.00%	14.77%	0.00%	0.00%	12.56%	8.92%	8.16%	17.20%
GERMANY	5.48%	16.46%	24.18%	0.00%	24.62%	11.93%	4.48%	29.65%	3.76%	9.18%	7.53%
GREECE	39.04%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	26.76%	0.00%	0.00%
ITALY	10.27%	32.32%	6.59%	0.00%	11.38%	5.50%	8.96%	8.04%	12.68%	11.22%	12.90%
KOREA	0.00%	0.00%	0.00%	0.00%	7.69%	0.00%	0.00%	0.00%	4.23%	0.00%	0.00%
NETHERLANDS	4.79%	0.00%	0.00%	0.00%	4.31%	0.00%	0.00%	11.56%	9.86%	0.00%	0.00%
RUSSIA	0.00%	0.00%	0.73%	13.04%	0.00%	24.77%	0.00%	0.00%	0.00%	0.00%	0.00%
SWEDEN	0.00%	0.00%	0.00%	56.52%	0.00%	31.19%	43.28%	2.26%	0.00%	0.00%	0.00%
USA	0.00%	0.00%	10.26%	0.00%	8.00%	4.59%	0.00%	7.04%	5.16%	7.14%	0.00%
OTHER COUNTRIES	10.96%	3.66%	0.00%	15.22%	2.46%	19.27%	31.34%	16.58%	12.68%	8.67%	0.00%

We retrieved the financial statements of parent companies from the *BankScope* database, as well. Table 4 provides the descriptive statistics for the parent companies. The owners are characterized by significantly lower equity levels than banks operating in CE countries. In contrast, the mean and median shares of loans in parent company assets are higher and exceed 53%. The average long-term profitability of parent companies is low. The mean and median returns on assets, as measured at the level of net income, do not surpass 1%.

Table 4 Descriptive statistics for parent companies

	PAR_EQUITY	PAR_LOANS	PAR_ROA
Mean	6.43%	53.31%	0.57%
Median	4.93%	53.56%	0.48%
Standard deviation	5.45%	17.15%	1.65%
10^{th} percentile	2.70%	33.34%	−0.03%
90^{th} percentile	11.52%	74.56%	1.56%

Testing H3 and H5−H6 required information on market rumors. For this purpose, we accessed and utilized the *Reuters* news service. First, we identified the total number of news items concerning a given parent company during each year of the recent crisis. Next, we determined the number and share of negative news items. We classified a news item 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 pro-

cedures described above worked quite well. The average ratio of negative rumors to all news items concerning a parent company was 26.34%, while the mean yearly number of negative news items was 217.3 during the recent crisis.

We compiled 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 3,000. There are three reasons for this decrease. First, our econometric approach includes lagged variables, growth ratios, as well as variables calculated on the base of mean values of items from financial statements. 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 5, we investigate the question of whether the fundamentals of banks and foreign parent companies affect the growth of deposits. As Table 5 shows, our models possess good econometric properties. In all specifications of the Sargan test, we cannot reject the null hypothesis regarding the validity of the instruments. Notably, the critical assumption of no serial correlation in the disturbances ($v_{t,i}$) is validated. As required by this assumption, we find significant negative first-order serial correlations in the differenced residuals (the AR(1) test) and no evidence of second-order serial correlations in the differenced residuals (the AR(2) test). Independent variables (excluding time and country dummies) are

jointly significant at levels below 1%. In addition, usually six variables are individually significant.

The bank-specific control variables only partially influence deposit growth in the expected directions. On the one hand, the negative signs of the coefficients estimated for the *CIR* variable and the positive ones estimated for the *ASSETS* variable suggest, respectively, that poorly managed banks with high cost-to-income ratios record lower deposit dynamics and big banks report higher deposit growth ratios.. However, neither of these relationships is ever statistically significant. On the other hand, deposit growth is slower for retail banks, as the estimated coefficients for the *RELAT_FIX_ASSETS* variable are negative and significant and the coefficients for the *NCI_SHARE* variable are positive and significantly different from zero. This outcome can be explained by the more cautious growth strategies followed by retail banks compared with wholesale banks and banks with more balanced structures of activities. The lagged dependent variable and the contemporaneous interest cost ratio, as predicted, positively affect deposit growth. However, this influence is statistically significant only in the case of the *DEPOSIT_GR* variable. Therefore, contrary to Kraft and Galac (2007), we do not find evidence that banks in CE countries can fund rapid expansion by offering high deposit rates.

The results of the test of H1 are mixed. Two observations support the hypothesis that depositors discipline banks' decisions in the CE countries. First, equity levels are positively related to the growth of deposits. Moreover, the coefficients obtained for the *EQUITY* variable are stable and significant at levels below 1%. Second, there is evidence that more profitable banks report higher deposit growth rates. The *OROA* variable is significant at the 5% or 10% levels in all specifications in Table 5. Contrary to 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, as it *prima facie* suggests that riskier banks enjoy higher inflows of deposits from non-financial entities. 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. In summary, we establish that traces of depositor discipline are detectable in CE deposit markets even when a vast majority of deposits are 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*. None of the coefficients estimated for the interaction terms is significant. This outcome rejects 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 in all specifications, and the coefficients obtained for the *FGN* variable are positive in all specifications. However, in the entire sample, the influence of ownership structure on deposit growth is not statistically significant. Consequently, the results 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 suggests 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 5 demonstrate that in the CE countries, foreign parent company fundamentals do not influence depositors' decisions. Moreover, during the recent crisis, this outcome did not change. All the interactions of the variables illustrating parent companies' financial health and the variable *CRISIS* remain insignificant. Therefore, there is no evidence that foreign-owned banks controlled by distressed owners had difficulties attracting new deposits during the recent crisis (as stated in H3) when we use fundamentals to identify distressed parent companies.

Table 5 Impact of bank and parent company fundamentals on deposit growth rates

	1		2		3		4		5		6		7		8		9	
DDEPOSIT_GR	0.065	**	0.066	**	0.064	**	0.062	**	0.075	**	0.073	**	0.061	**	0.076	**	0.073	**
	(0.030)		(0.030)		(0.030)		(0.030)		(0.032)		(0.031)		(0.030)		(0.032)		(0.031)	
DINTEREST_COST	2.034		2.040		2.042		2.047		2.210		2.196		1.949		2.245		2.208	
	(1.373)		(1.372)		(1.373)		(1.374)		(1.415)		(1.373)		(1.371)		(1.423)		(1.373)	
DOROA	0.882	**	0.994	**	0.884	**	0.906	**	0.839	*	0.888	**	0.897	**	0.840	*	0.898	**
	(0.439)		(0.507)		(0.438)		(0.443)		(0.440)		(0.437)		(0.442)		(0.441)		(0.438)	
DLOANS	0.258	***	0.240	***	0.257	***	0.250	***	0.263	***	0.254	***	0.252	***	0.262	***	0.256	***
	(0.066)		(0.082)		(0.066)		(0.069)		(0.066)		(0.066)		(0.069)		(0.066)		(0.066)	
DEQUITY	0.609	***	0.553	***	0.607	***	0.606	***	0.597	***	0.600	***	0.604	***	0.596	***	0.601	***
	(0.151)		(0.150)		(0.151)		(0.150)		(0.147)		(0.150)		(0.150)		(0.147)		(0.150)	
DLOANS _X_CRISIS			−0.525															
			(0.751)															
DEQUITY_X_CRISIS			0.063															
			(0.155)															
DOROA_X_CRISIS			0.293															
			(0.200)															
DCIR	−0.066		−0.070		−0.066		−0.060		−0.066		−0.064		−0.062		−0.066		−0.062	
	(0.046)		(0.045)		(0.045)		(0.046)		(0.047)		(0.046)		(0.046)		(0.047)		(0.047)	
DNCI_SHARE	0.212	**	0.216	**	0.212	**	0.209	**	0.210	**	0.205	*	0.209	**	0.210	**	0.206	*
	(0.106)		(0.106)		(0.106)		(0.105)		(0.106)		(0.106)		(0.105)		(0.106)		(0.106)	
DRELAT_FIX_ASSETS	−0.083	*	−0.080	*	−0.082	*	−0.089	*	−0.059		−0.082	*	−0.087	*	−0.059		−0.082	*
	(0.047)		(0.047)		(0.047)		(0.048)		(0.047)		(0.047)		(0.048)		(0.047)		(0.048)	
DASSETS	0.212		0.205		0.209		0.236		0.126		0.215		0.230		0.126		0.220	
	(0.203)		(0.204)		(0.203)		(0.207)		(0.197)		(0.202)		(0.208)		(0.197)		(0.202)	
DGOV	−0.040		−0.043		−0.044		−0.041		−0.038		−0.040		−0.042		−0.039		−0.040	
	(0.027)		(0.027)		(0.031)		(0.027)		(0.027)		(0.027)		(0.027)		(0.027)		(0.027)	
DFGN	0.029		0.028		0.025		0.001		0.027		0.030		0.001		0.028		0.031	
	(0.021)		(0.021)		(0.026)		(0.031)		(0.021)		(0.021)		(0.031)		(0.021)		(0.021)	
DGOV_X_CRISIS					0.020													
					(0.062)													
DFGN_X_CRISIS					0.017													
					(0.043)													
DPAR_EQUITY							0.678						0.302					
							(0.662)						(1.102)					
DPAR_LOANS							−0.001						0.017					
							(0.078)						(0.088)					
DPAR_ROA							0.429						1.126					
							(2.092)						(3.956)					
DPAR_EQUITY_GR									0.061						0.040			
									(0.051)						(0.068)			
DPAR_ROA_GR											0.992						0.502	
											(1.038)						(1.315)	
DPAR_ROA_GR_X_CRISIS																	1.431	
																	(2.053)	
DPAR_EQUITY_GR_X_CRISIS															0.061			
															(0.119)			
DPAR_EQUITY_X_CRISIS													0.751					
													(1.274)					
DPAR_LOANS_X_CRISIS													−0.046					
													(0.114)					
DPAR_ROA_X_CRISIS													−0.883					
													(4.124)					
Constant	−0.137		−0.130		−0.134		−0.143		−0.153		−0.135		−0.139		−0.149		−0.136	
	(0.093)		(0.093)		(0.093)		(0.093)		(0.100)		(0.093)		(0.093)		(0.100)		(0.093)	
no. of observations	2610		2610		2610		2608		2562		2592		2608		2562		2592	
Wald (joint)	91.12	***	91.28	***	92.97	***	100	***	95.11	***	92.37	***	100.3	***	95.19	***	93.18	***
Sargan test (two-step)	124.6		126.2		125.1		126.3		111.8		122.4		126.1		112.1		122.8	
Sargan test (two-step) p-value	0.443		0.404		0.431		0.4		0.756		0.498		0.405		0.749		0.487	
AR(1) test	−9.186	***	−9.178	***	−9.206	***	−9.181	***	−8.927	***	−9.05	***	−9.192	***	−8.922	***	−9.056	***
AR(2) test	1.1		1.125		1.092		1.169		0.9226		0.904		1.176		0.922		0.9191	

Note: This table presents the one-step GMM-SYS estimates. Robust standard errors are given in parentheses. All models include time x country dummies. We treat the INTEREST_COST variable and the DEPOSIT_GR variable as predetermined. For the former, we use lags 1 to 3 and for the latter 2 to 4. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

In Table 6, we turn our attention to the role of negative rumors concerning the parent company's financial situation. As Table 6 documents, our models again possess good econometric properties, implying that the estimates provide a strong 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 one minor difference in Table 6 compared with Table 5, namely, in Specification (11), where we find that foreign-owned banks in general are characterized by higher deposit growth rates. During non-crisis periods, as well as during the recent crisis, parent companies' fundamentals remain insignificant.

By contrast, Table 6 documents that rumors regarding the poor conditions of foreign parent companies played an important role during the recent crisis. Regardless of the methods used to measure rumors, the independent variables based on rumors are statistically significant and influence deposit growth rates negatively. The significance of these variables does not diminish when we control for parent companies' fundamentals throughout the entire sample (Specifications (14) – (17)), nor is it affected when we allow parent companies' fundamentals to influence deposit growth rates in a different manner during the recent crisis (Specifications (18) – (21)). The impact of rumors on deposit growth rates is also economically significant. For example, a 10 percentage points increase in negative coverage (the *NEG_RUM1* variable) results in a more than 1% fall in the deposit growth rate. Having a parent company classified as among the 50% of parent companies with the highest number of negative pieces of information (the *NEG_RUM2* variable) translates, *ceteris paribus*, into a deposit growth rate that is lower by approximately 10 percentage points. The estimated coefficients for the variables based on negative rumors are the largest in absolute terms for the NEG_RUM4 variable. This regularity implies that subsidiaries controlled by universally criticized parent companies suffered the most in competing for deposits.

Therefore, we conclude that negative rumors pertaining to the conditions of foreign-parent companies play a significant autonomous role in explaining depositor behavior. Moreover, during the crisis, the negative influence of rumors is stronger than that of parent companies' fundamentals. In summary, our evidence supports H5 and H3 when we utilize a rumor-based definition of distressed parent companies. Thus, our results supplement previous findings of Levy-Yeyati et al. (2004), Allen at al. (2010), and Forssbæck (2011).

Table 6 Impact of negative rumors concerning parent companies on deposit growth rates

	10		11		12		13		14		15		16		17		18		19		20		21	
DDEPOSIT_GR	0.064	**	0.064	**	0.065	**	0.064	**	0.062	**	0.061	**	0.062	**	0.062	**	0.061	**	0.061	**	0.061	**	0.061	**
	(0.030)		(0.030)		(0.030)		(0.030)		(0.030)		(0.030)		(0.030)		(0.030)		(0.030)		(0.029)		(0.030)		(0.030)	
DINTEREST_COST	2.009		2.044		1.987		2.003		2.030		2.059		2.003		2.021		1.918		1.961		1.898		1.916	
	(1.374)		(1.375)		(1.373)		(1.374)		(1.374)		(1.374)		(1.374)		(1.374)		(1.371)		(1.371)		(1.371)		(1.371)	
DOROA	0.876	**	0.895	**	0.879	**	0.874	**	0.901	**	0.923	**	0.905	**	0.898	**	0.893	**	0.916	**	0.900	**	0.892	**
	(0.438)		(0.436)		(0.438)		(0.438)		(0.442)		(0.440)		(0.442)		(0.442)		(0.441)		(0.438)		(0.442)		(0.441)	
DLOANS	0.261	***	0.261	***	0.261	***	0.260	***	0.252	***	0.253	***	0.253	***	0.252	***	0.254	***	0.251	***	0.254	***	0.254	***
	(0.066)		(0.066)		(0.066)		(0.066)		(0.069)		(0.069)		(0.069)		(0.069)		(0.069)		(0.069)		(0.069)		(0.069)	
DEQUITY	0.608	***	0.607	***	0.608	***	0.608	***	0.606	***	0.605	***	0.606	***	0.606	***	0.603	***	0.600	***	0.603	***	0.603	***
	(0.152)		(0.152)		(0.151)		(0.151)		(0.150)		(0.150)		(0.149)		(0.150)		(0.150)		(0.150)		(0.149)		(0.149)	
DCIR	−0.065		−0.068		−0.065		−0.064		−0.060		−0.062		−0.060		−0.059		−0.062		−0.066		−0.062		−0.061	
	(0.046)		(0.045)		(0.046)		(0.046)		(0.046)		(0.046)		(0.046)		(0.046)		(0.046)		(0.045)		(0.046)		(0.046)	
DNCI_SHARE	0.211	**	0.219	**	0.211	**	0.210	**	0.209	**	0.217	**	0.209	**	0.209	**	0.208	**	0.217	**	0.209	**	0.208	**
	(0.106)		(0.106)		(0.106)		(0.106)		(0.105)		(0.106)		(0.105)		(0.105)		(0.105)		(0.106)		(0.105)		(0.105)	
DRELAT_FIX_ASSETS	−0.086	*	−0.083	*	−0.088	*	−0.085	*	−0.091	*	−0.090	*	−0.093	*	−0.091	*	−0.089	*	−0.085	*	−0.092	*	−0.089	*
	(0.047)		(0.046)		(0.047)		(0.047)		(0.048)		(0.047)		(0.048)		(0.048)		(0.048)		(0.048)		(0.048)		(0.048)	
DASSETS	0.230		0.262		0.235		0.220		0.254		0.288		0.256		0.243		0.239		0.263		0.242		0.231	
	(0.202)		(0.201)		(0.202)		(0.203)		(0.206)		(0.205)		(0.207)		(0.207)		(0.208)		(0.206)		(0.208)		(0.209)	
DGOV	−0.040		−0.040		−0.040		−0.040		−0.041		−0.041		−0.041		−0.041		−0.042		−0.043		−0.042		−0.042	
	(0.027)		(0.027)		(0.027)		(0.027)		(0.027)		(0.027)		(0.027)		(0.027)		(0.027)		(0.027)		(0.027)		(0.027)	
DFGN	0.035		0.043	*	0.032		0.032		0.004		0.011		0.002		0.003		0.005		0.013		0.002		0.003	
	(0.021)		(0.022)		(0.021)		(0.021)		(0.031)		(0.031)		(0.031)		(0.031)		(0.031)		(0.030)		(0.031)		(0.031)	
DPAR_EQUITY									0.740		0.710		0.669		0.708		0.285		0.313		0.285		0.291	
									(0.670)		(0.661)		(0.659)		(0.666)		(1.101)		(1.095)		(1.100)		(1.102)	
DPAR_LOANS									0.002		0.006		0.005		0.002		0.014		0.002		0.017		0.016	
									(0.077)		(0.077)		(0.077)		(0.077)		(0.087)		(0.087)		(0.087)		(0.088)	
DPAR_ROA									0.143		0.361		0.272		0.211		1.164		1.110		1.165		1.166	
									(2.180)		(2.097)		(2.128)		(2.155)		(3.953)		(3.951)		(3.955)		(3.953)	
DPAR_EQUITY_X_CRISIS																	0.752		0.490		0.631		0.720	
																	(1.289)		(1.243)		(1.292)		(1.284)	
DPAR_LOANS_X_CRISIS																	−0.004		0.060		−0.013		−0.021	
																	(0.117)		(0.113)		(0.117)		(0.115)	
DPAR_ROA_X_CRISIS																	−1.587		−0.830		−1.325		−1.444	
																	(4.152)		(4.100)		(4.156)		(4.156)	
DNEG_RUM1	−0.091	*							−0.095	*							−0.117	**						
	(0.050)								(0.054)								(0.052)							
DNEG_RUM2			−0.086	***							−0.089	***							−0.107	***				
			(0.029)								(0.029)								(0.031)					
DNEG_RUM3					−0.057	**							−0.055	*							−0.059	**		
					(0.028)								(0.028)								(0.029)			
DNEG_RUM4							−0.139	**							−0.136	**							−0.148	**
							(0.059)								(0.063)								(0.062)	
Constant	−0.139		−0.144		−0.139		−0.139		−0.145		−0.150		−0.144		−0.144		−0.139		−0.142		−0.140		−0.140	
	(0.092)		(0.092)		(0.093)		(0.093)		(0.093)		(0.092)		(0.093)		(0.093)		(0.093)		(0.093)		(0.094)		(0.093)	
no. of observations	2610		2610		2610		2610		2608		2608		2608		2608		2608		2608		2608		2608	
Wald (joint)	93.11	***	96.5	***	92.53	***	93.92	***	105.4	***	105.6	***	102.9	***	106	***	105.3	***	107.1	***	103	***	106	***
Sargan test (two-step)	125.4		126		125.3		125.3		127.4		128.8		127.1		127		127.3		129.4		126.6		126.7	
Sargan test (two-step) p-value	0.424		0.409		0.424		0.425		0.376		0.343		0.381		0.383		0.377		0.329		0.393		0.39	
AR(1) test	−9.182	***	−9.17	***	−9.171	***	−9.179	***	−9.177	***	−9.162	***	−9.168	***	−9.174	***	−9.189	***	−9.184	***	−9.18	***	−9.186	***
AR(2) test	1.136		1.095		1.1		1.137		1.203		1.163		1.163		1.201		1.219		1.182		1.169		1.21	

Note: This table presents the one-step GMM-SYS estimates. Robust standard errors are given in parentheses. All models include time x country dummies. We treat the INTEREST_COST variable and the DEPOSIT_GR variable as predetermined. For the former, we use lags 1 to 3 and for the latter 2 to 4. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

The results provided in Table 7 falsify H6 because they indicate that the lower deposit growth rates of subsidiaries controlled by negatively rumored parent companies mainly occur when the negative rumors turn out to be founded in the next financial year. All the interaction terms, in Table 7, based on unfounded rumors—thus including, e.g., the *UNF_EQ* variable—are not statistically significant. At the same time, the negative and significant effects of the variables based on negative rumors remain, in Specifications (22)−(25). Moreover, the interaction terms, *NEG_RUM1 x F_EQ*, *NEG_RUM3 x F_EQ* and *NEG_RUM4 x F_EQ*, are significant and negatively influence deposit growth rates. Overall, the results suggest that non-financial depositors in CE countries, contrary to our expectations, had some ability to differentiate *ex ante* between founded and unfounded negative rumors and, in addition, that depositors appear to act rationally on their assessments. Furthermore, our findings support the view that rumors convey relevant information during crisis periods[3].

Table 8 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, public help is interpreted by depositors as 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 and are significantly different from zero at the 1% or 5% levels. As with negative market rumors, our findings here are also important in economic terms. For example, according to Specifications (30) and (31), *ceteris paribus*, public aid received by a parent company lowers the deposit growth rates recorded by a subsidiary by approximately 11 percentage points in the year of a public aid announcement and by seven percentage points in the two-year period starting in the year that public help was distributed. Inclusion of variables illustrating parent company fundamentals (in Specifications (33)−(35)) does not modify the research outcome. The empirical evidence presented in Table 8 thus contradicts H7. Public aid received by a parent company represents a negative news item as far as the deposit growth rates recorded by its subsidiaries are concerned. The stabilizing effect of the public help received by certain parent companies did not offset the reputational damage, at least in the period covered by our study.

[3] We have reached identical outcomes using parent company profitability ratios to differentiate between founded and unfounded rumours. These additional results are available from the authors upon request.

Table 7 Research results and the nature of rumors – founded and unfounded rumors

	22		23		24		25		26		27		28		29	
DDEPOSIT_GR	0.065	**	0.065	**	0.065	**	0.064	**	0.065	**	0.064	**	0.065	**	0.064	**
	(0.030)		(0.030)		(0.030)		(0.030)		(0.030)		(0.030)		(0.030)		(0.030)	
DINTEREST_COST	2.007		2.046		1.990		2.005		2.021		2.047		1.996		2.012	
	(1.374)		(1.375)		(1.373)		(1.374)		(1.373)		(1.375)		(1.373)		(1.374)	
DOROA	0.869	**	0.893	**	0.875	**	0.872	**	0.866	**	0.884	**	0.876	**	0.870	**
	(0.438)		(0.436)		(0.439)		(0.438)		(0.439)		(0.437)		(0.439)		(0.439)	
DLOANS	0.261	***	0.261	***	0.261	***	0.260	***	0.260	***	0.258	***	0.261	***	0.260	***
	(0.066)		(0.066)		(0.066)		(0.066)		(0.066)		(0.066)		(0.066)		(0.066)	
DEQUITY	0.609	***	0.607	***	0.609	***	0.609	***	0.610	***	0.609	***	0.609	***	0.609	***
	(0.152)		(0.152)		(0.151)		(0.151)		(0.152)		(0.152)		(0.151)		(0.151)	
DCIR	−0.065		−0.067		−0.064		−0.064		−0.064		−0.067		−0.064		−0.064	
	(0.046)		(0.045)		(0.046)		(0.046)		(0.046)		(0.045)		(0.046)		(0.046)	
DNCI_SHARE	0.210	**	0.219	**	0.210	**	0.210	**	0.211	**	0.217	**	0.210	**	0.211	**
	(0.106)		(0.106)		(0.106)		(0.106)		(0.106)		(0.106)		(0.106)		(0.106)	
DRELAT_FIX_ASSETS	−0.085	*	−0.083	*	−0.088	*	−0.085	*	−0.085	*	−0.084	*	−0.087	*	−0.084	*
	(0.047)		(0.046)		(0.047)		(0.047)		(0.047)		(0.047)		(0.047)		(0.047)	
DASSETS	0.224		0.261		0.234		0.217		0.218		0.230		0.227		0.215	
	(0.202)		(0.201)		(0.201)		(0.203)		(0.203)		(0.204)		(0.202)		(0.203)	
DGOV	−0.040		−0.040		−0.040		−0.040		−0.040		−0.040		−0.040		−0.040	
	(0.027)		(0.027)		(0.027)		(0.027)		(0.027)		(0.027)		(0.027)		(0.027)	
DFGN	0.034		0.043	*	0.032		0.032		0.032		0.035		0.032		0.032	
	(0.021)		(0.022)		(0.021)		(0.021)		(0.021)		(0.022)		(0.021)		(0.021)	
DNEG_RUM1	−0.124	**														
	(0.053)															
DNEG_RUM2			−0.092	***												
			(0.031)													
DNEG_RUM3					−0.085	**										
					(0.040)											
DNEG_RUM4							−0.157	**								
							(0.062)									
DNEG_RUM1 X F_EQ									−0.119	**						
									(0.055)							
DNEG_RUM2 X F_EQ											−0.055					
											(0.036)					
DNEG_RUM3 X F_EQ													−0.081	**		
													(0.041)			
DNEG_RUM4 X F_EQ															−0.162	**
															(0.064)	
DNEG_RUM1 X UNF_EQ	0.098								−0.005							
	(0.097)								(0.090)							
DNEG_RUM2 X UNF_EQ			0.014								−0.040					
			(0.039)								(0.037)					
DNEG_RUM3 X UNF_EQ					0.047								−0.036			
					(0.059)								(0.040)			
DNEG_RUM4 X UNF_EQ							0.086								−0.064	
							(0.159)								(0.150)	
CONSTANT	−0.139		−0.144		−0.139		−0.139		−0.139		−0.140		−0.139		−0.139	
	(0.092)		(0.092)		(0.093)		(0.093)		(0.093)		(0.092)		(0.093)		(0.093)	
no. of observations	2610		2610		2610		2610		2610		2610		2610		2610	
Wald (joint)	93.22	***	96.6	***	92.65	***	93.73	***	92.58	***	92.46	***	92.85	***	93.69	***
Sargan test (two-step)	125.5		125.6		125.4		125.7		125.5		125.4		125.9		125.6	
Sargan test p-value	0.42		0.417		0.423		0.416		0.419		0.422		0.411		0.418	
AR(1) test	−9.181	***	−9.168	***	−9.17	***	−9.178	***	−9.178	***	−9.173	***	−9.17	***	−9.177	***
AR(2) test	1.151		1.09		1.12		1.146		1.144		1.111		1.106		1.134	

Note: This table presents the one-step GMM-SYS estimates. Robust standard errors are given in parentheses. All models include time x country dummies. We treat the INTEREST_COST variable and the DEPOSIT_GR variable as predetermined. For the former, we use lags 1 to 3 and for the latter 2 to 4. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 8 Public aid received by parent companies and deposit growth rates

	30		31		32		33		34		35	
DDEPOSIT_GR	0,066	**	0,065	**	0,066	**	0,063	**	0,063	**	0,063	**
	(0.030)		(0.030)		(0.030)		(0.030)		(0.030)		(0.030)	
DINTEREST_COST	1,985		1,989		1,979		2,002		2,014		2,014	
	(1.370)		(1.374)		(1.373)		(1.372)		(1.375)		(1.374)	
DOROA	0,888	**	0,886	**	0,893	**	0,915	**	0,908	**	0,913	**
	(0.438)		(0.438)		(0.438)		(0.442)		(0.442)		(0.442)	
DLOANS	0,258	***	0,258	***	0,259	***	0,249	***	0,250	***	0,250	***
	(0.066)		(0.066)		(0.066)		(0.069)		(0.069)		(0.069)	
DEQUITY	0,605	***	0,604	***	0,602	***	0,603	***	0,602	***	0,600	***
	(0.151)		(0.151)		(0.151)		(0.150)		(0.150)		(0.150)	
DCIR	−0,063		−0,063		−0,063		−0,058		−0,059		−0,058	
	(0.046)		(0.046)		(0.046)		(0.046)		(0.046)		(0.046)	
DNCI_SHARE	0,213	**	0,212	**	0,211	**	0,211	**	0,211	**	0,211	**
	(0.106)		(0.106)		(0.106)		(0.106)		(0.106)		(0.106)	
DRELAT_FIX_ASSETS	−0,086	*	−0,085	*	−0,086	*	−0,091	*	−0,090	*	−0,090	*
	(0.047)		(0.047)		(0.047)		(0.048)		(0.048)		(0.048)	
DASSETS	0,224		0,227		0,228		0,244		0,248		0,250	
	(0.206)		(0.205)		(0.205)		(0.210)		(0.209)		(0.209)	
DGOV	−0,040		−0,040		−0,039		−0,041		−0,041		−0,041	
	(0.027)		(0.027)		(0.027)		(0.027)		(0.027)		(0.027)	
DFGN	0,034		0,035	*	0,037	*	0,005		0,005		0,008	
	(0.021)		(0.021)		(0.021)		(0.031)		(0.031)		(0.031)	
DPAR_EQUITY							0,613		0,732		0,736	
							(0.653)		(0.672)		(0.671)	
DPAR_LOANS							0,010		0,001		0,000	
							(0.077)		(0.077)		(0.077)	
DPAR_ROA							0,240		−0,043		−0,117	
							(2.149)		(2.279)		(2.271)	
DPAR_HELP1	−0,107	***					−0,101	***				
	(0.027)						(0.027)					
DPAR_HELP2			−0,072	**					−0,068	**		
			(0.029)						(0.033)			
DPAR_HELP3					−0,091	***					−0,084	***
					(0.026)						(0.029)	
CONSTANT	−0,142		−0,141		−0,142		−0,147		−0,146		−0,147	
	(0.092)		(0.092)		(0.092)		(0.093)		(0.093)		(0.093)	
no. of observations	2610		2610		2610		2608		2608		2608	
Wald (joint)	108	***	100,7	***	105,1	***	119,2	***	109,5	***	114	***
Sargan test (two-step)	126,2		126		127,2		127,4		127,5		128,1	
Sargan test (two-step) p-value	0,403		0,408		0,379		0,375		0,373		0,357	
AR(1) test	−9,177	***	−9,174	***	−9,175	***	−9,172	***	−9,167	***	−9,168	***
AR(2) test	1,123		1,124		1,14		1,176		1,186		1,199	

Note: This table presents the one-step GMM-SYS estimates. Robust standard errors are given in parentheses. All models include time x country dummies. We treat the INTEREST_COST variable and the DEPOSIT_GR variable as predetermined. For the former, we use lags 1 to 3 and for the latter 2 to 4. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

6 Robustness checks

We have performed several robustness checks. First, we changed the dependent variable. As discussed in Section 5, we have analyzed market discipline exercised through deposit volumes. However, some authors (Barajas and Steiner, 2000; Jackowicz, 2004; Hosono, 2005) have established that the two basic channels of market discipline (volumes and prices) may differ significantly in their impact on banks. Unfortunately, as noted in Section 3, we do not have data on interest costs generated solely by deposits of non-financial entities. Therefore, we cannot run a precise test of market price discipline imposed by decisions of non-financial depositors. As a robustness check, we can only verify whether the level of total interest costs has a disciplining effect on banks in CE economies. The modification of the dependent variable implies that we must reformulate hypotheses H1−H4. In this manner, we obtain new hypotheses, H8−H11:

> **H8:** *In the CE countries, bank risk measures are positively related to the level of total interest costs.*
>
> **H9:** *During the recent crisis, the sensitivity of total interest costs to accounting measures of bank risk in CE countries differed from that during the other periods studied.*
>
> **H10:** *During the recent crisis in the CE countries, foreign-owned banks controlled by distressed owners were obliged to pay higher interest costs.*
>
> **H11:** *The uncertain financial conditions of foreign banks enabled state-owned banks in the CE countries to offer lower interest rates on deposits than other banks during the recent crisis.*

To test hypotheses H8−H11, we treat the *INTEREST_COST* variable as the dependent variable and include its lagged value as one of the regressors, while the rest of Eq. (1) remains unchanged. Table 9 provides the estimation results for the models of the level of total interest costs. The outcome of the traditional test of the existence of market discipline (i.e., H8 verification) is still inconclusive but slightly more favorable from the perspective of banking system stability than in the deposit dynamics models. While the high share of loans in assets (*LOANS*) tends to increase total interest costs of banks, the quality of the

capital base (*EQUITY*) is not significantly correlated with the dependent variable. Moreover, Specification (37) suggests that the negative relationship between profitability and the level of total interest costs was present only during the recent crisis.

With the exception of the *OROA* variable, there is no evidence that the sensitivity of total interest costs to banks' fundamentals changed significantly in CE countries in the sub-period starting in 2007. Therefore, the empirical support for H9 is, at best, limited. Contrary to the predictions expressed in H11, the government-owned banks did not benefit indiscriminately from uncertainty regarding the conditions of foreign parent companies, as the coefficient estimated in Specification (38) for the interaction term *GOV_x_CRISIS* is not distinguishable from zero.

Parent company fundamentals in two out of three cases influence the level of total interest costs in the direction stipulated by the market discipline hypothesis. In particular, the subsidiaries controlled by parent companies with a solid capital base (*PAR_EQUITY*) and low share of risky assets (*PAR_LOANS*) report lower values of the dependent variable. However, at the same time, high profitability of parent companies (*PAR_ROA*) correlates positively with the level of total interest costs reported by subsidiaries. Contrary to the conjecture expressed in H10, the sensitivity of subsidiaries' interest costs to parent companies' fundamentals changed almost not at all during the recent crisis. Only in one case, in specifications (42)−(44), can we reject the null hypothesis that the coefficient for the interaction terms is zero.

The statistically significant relationships between parent company fundamentals and the level of total interest costs recorded by subsidiaries, observed in Specifications (39) and (42), can be interpreted either in terms of market discipline or non-market deposit operations. For example, the negative coefficient obtained for the *PAR_EQUITY* variable may stem from the fact that parent companies with abundant equity can provide subsidiaries with relatively cheap loans. The high profitability of parent companies (*PAR_ROA*), in turn, may be boosted by profit transfers from subsidiaries. Because we do not have information on interest costs related solely to deposits of non-financial entities, we are unable to disentangle the effects of market discipline and non-market operations between parent companies and their subsidiaries. Thus, we cannot eliminate the ambiguities in the interpretation of the first robustness check results.

Table 9 Impact of bank and parent company fundamentals on interest costs of banks

	36		37		38		39		40		41		42		43		44	
DDEPOSIT_GR	−0.001		−0.001		−0.001		−0.001		0.000		−0.001		−0.001		0.000		−0.001	
	(0.001)		(0.001)		(0.001)		(0.001)		(0.001)		(0.001)		(0.001)		(0.001)		(0.001)	
DINTEREST_COST	0.352	***	0.350	***	0.352	***	0.348	***	0.327	***	0.344	***	0.347	***	0.327	***	0.344	***
	(0.057)		(0.057)		(0.057)		(0.057)		(0.057)		(0.057)		(0.057)		(0.057)		(0.057)	
DOROA	−0.038	**	−0.024		−0.038	**	−0.034	**	−0.041	**	−0.040	**	−0.034	**	−0.041	**	−0.041	**
	(0.017)		(0.020)		(0.017)		(0.017)		(0.017)		(0.017)		(0.017)		(0.017)		(0.017)	
DLOANS	0.012	***	0.013	***	0.012	***	0.012	***	0.013	***	0.012	***	0.012	***	0.013	***	0.012	***
	(0.003)		(0.003)		(0.003)		(0.003)		(0.003)		(0.003)		(0.003)		(0.003)		(0.003)	
DEQUITY	0.004		0.003		0.004		0.004		0.003		0.004		0.004		0.003		0.004	
	(0.004)		(0.004)		(0.004)		(0.004)		(0.004)		(0.004)		(0.004)		(0.004)		(0.004)	
DLOANS _X_CRISIS			−0.071	*														
			(0.038)															
DEQUITY_X_CRISIS			−0.002															
			(0.004)															
DOROA_X_CRISIS			0.006															
			(0.007)															
DCIR	−0.001		−0.001		−0.001		−0.001		−0.001		−0.001		−0.001		−0.001		−0.001	
	(0.001)		(0.001)		(0.001)		(0.001)		(0.001)		(0.001)		(0.001)		(0.001)		(0.001)	
DNCI_SHARE	0.007	*	0.007	*	0.007	*	0.007		0.007	*	0.007	*	0.007		0.007	*	0.007	*
	(0.004)		(0.004)		(0.004)		(0.004)		(0.004)		(0.004)		(0.004)		(0.004)		(0.004)	
DRELAT_FIX_ASSETS	−0.002		−0.001		−0.002		−0.002		−0.002		−0.002		−0.002		−0.002		−0.002	
	(0.002)		(0.002)		(0.002)		(0.002)		(0.002)		(0.002)		(0.002)		(0.002)		(0.002)	
DASSETS	−0.012	*	−0.012	*	−0.012	*	−0.014	**	−0.011	*	−0.011	*	−0.014	**	−0.011	*	−0.012	*
	(0.007)		(0.006)		(0.007)		(0.006)		(0.007)		(0.007)		(0.006)		(0.007)		(0.007)	
Dgov	−0.001		−0.001		−0.001		−0.001		−0.001		−0.001		−0.001		−0.001		−0.001	
	(0.001)		(0.001)		(0.001)		(0.001)		(0.001)		(0.001)		(0.001)		(0.001)		(0.001)	
Dfgn	−0.004	***	−0.004	***	−0.004	***	−0.003	**	−0.003	***	−0.004	***	−0.003	**	−0.004	***	−0.004	***
	(0.001)		(0.001)		(0.001)		(0.001)		(0.001)		(0.001)		(0.001)		(0.001)		(0.001)	
DGOV_X_CRISIS					0.001													
					(0.002)													
DFGN_X_CRISIS					0.000													
					(0.001)													
DPAR_EQUITY							−0.097	***					−0.129	***				
							(0.028)						(0.039)					
DPAR_LOANS							0.005	*					0.006	**				
							(0.003)						(0.003)					
DPAR_ROA							0.195	**					0.314	**				
							(0.086)						(0.138)					
DPAR_EQUITY_GR									−0.002						0.000			
									(0.001)						(0.002)			
DPAR_ROA_GR											0.066						0.089	
											(0.085)						(0.110)	
DPAR_ROA_GR_X_CRISIS																	−0.082	
																	(0.123)	
DPAR_EQUITY_GR_X_CRISIS															−0.005	*		
															(0.003)			
DPAR_EQUITY_X_CRISIS													0.063					
													(0.048)					
DPAR_LOANS_X_CRISIS													−0.001					
													(0.004)					
DPAR_ROA_X_CRISIS													−0.233					
													(0.152)					
Constant	−0.100	***	−0.100	***	−0.099	***	−0.100	***	−0.100	***	−0.100	***	−0.099	***	−0.100	***	−0.100	***
	(0.002)		(0.003)		(0.003)		(0.002)		(0.003)		(0.002)		(0.002)		(0.003)		(0.002)	
no. of observations	2603		2603		2603		2601		2552		2585		2601		2552		2585	
Wald (joint) test	182.4	***	202.8	***	182.5	***	208.8	***	161.3	***	176.2	***	213.7	***	161.4	***	176.6	***
Sargan test (two-step)	132.9		130.3		133.4		129.5		127.8		127.6		130.2		125.9		128.4	
Sargan test p-value	0.198		0.246		0.191		0.261		0.296		0.3		0.247		0.338		0.283	
AR(1) test	−6.283	***	−6.297	***	−6.287	***	−6.494	***	−6.331	***	−6.343	***	−6.544	***	−6.316	***	−6.345	***
AR(2) test	−0.6155		−0.6328		−0.6121		−0.948		−0.9655		−0.9421		−1.016		−0.9461		−0.9737	

Note: This table presents the one-step GMM-SYS estimates. Robust standard errors are given in parentheses. All models include time x country dummies. We treat the INTEREST_COST variable and the DEPOSIT_GR variable as predetermined. For both variables, we use lags 2 to 4. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Second, as suggested by Roodman (2006), we have checked the sensitivity of the empirical findings to modifications in the number of lags used for the non-strictly exogenous variables. Our results regarding the role of bank fundamentals, rumors and public help announcements turned out to be almost unaffected by the changes in the GMM model specifications, including a case in which the instrument proliferation weakened the Sargan test to the point where it generated the implausibly high p-value of 1.000. Because presentation of the second robustness check would require much space, its results are not presented in this article. They are, however, available from the authors upon request.

Third, the GMM estimator requires several choices about specification, which can affect the results. Therefore, we decided to further investigate the stability of the empirical findings. Specifically, we estimated static panel models as well as pooled OLS models, ignoring the panel nature of the data. The traditional Hausman test suggests that the random effects estimator is the preferred version of the static panel model of deposit dynamics.

Selected results of the third robustness check are presented in Table 10[4]. Overall, our results concerning the role of bank fundamentals, parent company fundamentals, negative rumors, and public aid disbursements in shaping non-financial depositor behavior appear to be robust. The variables describing subsidiary financial conditions (*OROA*, *LOANS*, *EQUITY*) and those describing parent company conditions (*PAR_EQUITY*, *PAR_LOANS*, *PAR_ROA*) change neither the statistical significance nor the directions of impact when the variables are statistically significant. The variables based on rumors continue to negatively affect the inflow of deposits from non-financial entities. However, the significance levels of variables identifying the parent companies that received public help show some vulnerability to the model construction and estimation methods. While the *PAR_HELP1* variable always correlates negatively and significantly with the dependent variable, the *PAR_HELP2* and *PAR_HELP3* variables lose their significance in some specifications unreported here for the sake of brevity.

[4] The full results of the third robustness check, including a test proposed by Guggenberger (2010), are available from the authors upon request.

Table 10 Selected research results when the OLS and random effects estimators are used

	Pooled OLS estimator								Random effects estimator							
	45		46		47		48		49		50		51		52	
DEPOSIT_GR	0.086	***	0.085	***	0.084	***	0.086	***	0.117	***	0.115	***	0.114	***	0.116	***
	(0.023)		(0.023)		(0.023)		(0.023)		(0.018)		(0.018)		(0.018)		(0.018)	
INTEREST_COST	0.812		0.827		0.835		0.816		1.158	***	1.166	***	1.178	***	1.166	***
	(0.640)		(0.638)		(0.638)		(0.638)		(0.402)		(0.402)		(0.402)		(0.402)	
OROA	0.767	**	0.77	**	0.791	**	0.777	**	0.826	***	0.819	***	0.844	***	0.821	***
	(0.361)		(0.360)		(0.357)		(0.360)		(0.260)		(0.259)		(0.260)		(0.260)	
LOANS	0.146	***	0.147	***	0.148	***	0.144	***	0.135	***	0.138	***	0.137	***	0.135	***
	(0.048)		(0.048)		(0.048)		(0.048)		(0.041)		(0.041)		(0.041)		(0.041)	
EQUITY	0.318	***	0.314	***	0.314	***	0.315	***	0.324	***	0.32	***	0.32	***	0.323	***
	(0.103)		(0.103)		(0.103)		(0.103)		(0.073)		(0.073)		(0.074)		(0.074)	
CIR	−0.045		−0.045		−0.048		−0.044		−0.058	**	−0.057	**	−0.061	**	−0.057	**
	(0.035)		(0.035)		(0.035)		(0.035)		(0.029)		(0.029)		(0.029)		(0.029)	
NCI_SHARE	0.148	**	0.148	**	0.156	**	0.149	**	0.173	***	0.177	***	0.186	***	0.175	***
	(0.076)		(0.076)		(0.076)		(0.076)		(0.066)		(0.066)		(0.066)		(0.066)	
RELAT_FIX_ASSETS	−0.077	**	−0.082	**	−0.081	**	−0.08	**	−0.034		−0.039		−0.036		−0.037	
	(0.033)		(0.033)		(0.032)		(0.033)		(0.044)		(0.044)		(0.044)		(0.044)	
ASSETS	−0.102		−0.073		−0.048		−0.09		−0.28		−0.247		−0.232		−0.255	
	(0.152)		(0.150)		(0.149)		(0.154)		(0.200)		(0.201)		(0.201)		(0.200)	
GOV	−0.018		−0.017		−0.019		−0.018		−0.01		−0.009		−0.009		−0.009	
	(0.023)		(0.023)		(0.023)		(0.023)		(0.022)		(0.022)		(0.022)		(0.022)	
FGN	0.017		0.022		0.027		0.021		0.032		0.037		0.04	*	0.037	
	(0.026)		(0.027)		(0.027)		(0.026)		(0.023)		(0.023)		(0.023)		(0.023)	
PAR_EQUITY	−0.039		0.051		−0.015		−0.035		0.138		0.18		0.132		0.089	
	(0.376)		(0.379)		(0.373)		(0.370)		(0.439)		(0.440)		(0.440)		(0.440)	
PAR_LOANS	0.021		0.025		0.028		0.027		0.007		0.014		0.017		0.017	
	(0.056)		(0.056)		(0.056)		(0.056)		(0.053)		(0.053)		(0.053)		(0.053)	
PAR_ROA	1.71		1.278		1.582		1.307		0.922		0.643		0.965		0.592	
	(1.515)		(1.577)		(1.536)		(1.615)		(1.282)		(1.290)		(1.282)		(1.289)	
PAR_HELP1							−0.098	***							−0.104	**
							(0.027)								(0.041)	
NEG_RUM1			−0.137	***							−0.132	*				
			(0.047)								(0.071)					
NEG_RUM2					−0.079	***							−0.071	***		
					(0.021)								(0.026)			
CONSTANT	−0.102		−0.105		−0.108		−0.104		−0.124		−0.129		−0.131		−0.126	
	(0.081)		(0.081)		(0.080)		(0.081)		(0.104)		(0.104)		(0.104)		(0.104)	
no. of observations	2647		2647		2647		2647		2608		2608		2608		2608	
Wald (joint)	101.1	***	114.6	***	116.7	***	122.3	***	189.7	***	193.6	***	196.7	***	195.9	***
R^2	0.241		0.242		0.244		0.243		0.294		0.295		0.295		0.295	

This table presents the pooled OLS and the random effects estimates. Robust standard errors are given in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Fourth, in Section 5, we demonstrated that depositors in CE countries reacted rather strongly to negative rumors about the financial health of parent companies. We felt it would be interesting to check whether there were symmetrical reactions to positive rumors. We therefore hypothesize in H12 that positive rumors were less important for non-financial depositors than negative rumors.

H12: *Non-financial depositors reacted more weakly to positive rumors than to the negative rumors during the recent crisis.*

When identifying positive news items, we used the same procedure that we applied in the case of negative news items, with one notable exception. Because positive rumors were rare during the recent crisis, we were obliged to use a higher number of key words and their possible grammatical variants. The list of key words and expressions included the following: *profitability* / *earning increase*, *situation* / *condition improvement*, *high profitability*, *continue expansion*, *withstand shock* / *crisis*, *improve capital adequacy*, *persistent profit* / *earnings*, *improve assets quality*, *cost reduction*, *revenue increase*, *good* / *bright prospects*, *positive assessment* / *outlook*. Based on the gathered information, we defined four new variables. The variables *POS_RUM1*, *POS_RUM3* and *POS_RUM4* share the same construction as the variables based on negative rumors: *NEG_RUM1*, *NEG_RUM3* and *NEG_RUM4*, respectively. The final new variable (*POS_RUM2*) takes a value of one for parent companies that have any positive rumors during the recent crisis. Its definition differs from that of the *NEG_RUM2* variable because, for more than a half of the studied parent companies, we did not find any positive news items. Table 11 provides the estimation results with regard to positive rumors as determinants of depositor decisions. Our calculations indicate that depositors, as predicted by H12, reacted more strongly to negative than to positive news. Three out of four variables based on positive rumors are not statistically significant. The *POS_RUM4* variable, calculated as a squared value of the share of positive news items in total media coverage, is the only exception. The positive and significant coefficients obtained for this variable suggest, in our opinion, that only the banking groups most highly praised in the press enjoyed deposits inflows. The relatively elevated value of the *POS_RUM4* variable coefficient is linked to its construction and to the generally very low shares of positive rumors in total press coverage. For example, during the recent crisis, the average yearly number of positive news items concerning parent companies was 100 times lower than the average yearly number of negative news items, even though we applied a rather extensive list of key words in identifying positive news items.

Table 11 Impact of positive rumors concerning parent companies on deposit growth rates

	53		54		55		56		57		58		59		60	
DDEPOSIT_GR	0.065	**	0.065	**	0.065	**	0.064	**	0.062	**	0.062	**	0.062	**	0.062	**
	(0.030)		(0.030)		(0.030)		(0.030)		(0.030)		(0.030)		(0.030)		(0.030)	
DINTEREST_COST	2.013		2.069		2.037		1.989		2.032		2.083		2.056		2.009	
	(1.373)		(1.377)		(1.375)		(1.369)		(1.373)		(1.377)		(1.375)		(1.369)	
DOROA	0.878	**	0.890	**	0.882	**	0.876	**	0.902	**	0.912	**	0.907	**	0.899	**
	(0.439)		(0.438)		(0.439)		(0.439)		(0.443)		(0.442)		(0.443)		(0.443)	
DLOANS	0.258	***	0.257	***	0.258	***	0.258	***	0.250	***	0.250	***	0.251	***	0.251	***
	(0.066)		(0.066)		(0.066)		(0.066)		(0.069)		(0.069)		(0.069)		(0.069)	
DEQUITY	0.609	***	0.608	***	0.609	***	0.607	***	0.606	***	0.606	***	0.606	***	0.605	***
	(0.151)		(0.151)		(0.151)		(0.151)		(0.150)		(0.150)		(0.149)		(0.149)	
DCIR	−0.065		−0.066		−0.066		−0.065		−0.060		−0.061		−0.061		−0.060	
	(0.046)		(0.046)		(0.046)		(0.046)		(0.046)		(0.046)		(0.046)		(0.046)	
DNCI_SHARE	0.211	**	0.213	**	0.212	**	0.212	**	0.209	**	0.210	**	0.209	**	0.210	**
	(0.106)		(0.106)		(0.106)		(0.106)		(0.106)		(0.105)		(0.105)		(0.105)	
DRELAT_FIX_ASSETS	−0.083	*	−0.083	*	−0.083	*	−0.084	*	−0.089	*	−0.089	*	−0.089	*	−0.090	*
	(0.047)		(0.047)		(0.047)		(0.047)		(0.048)		(0.048)		(0.048)		(0.048)	
DASSETS	0.207		0.222		0.213		0.210		0.233		0.247		0.239		0.235	
	(0.204)		(0.203)		(0.203)		(0.203)		(0.208)		(0.208)		(0.208)		(0.207)	
DGOV	−0.040		−0.040		−0.040		−0.040		−0.041		−0.041		−0.041		−0.041	
	(0.027)		(0.027)		(0.027)		(0.027)		(0.027)		(0.027)		(0.027)		(0.027)	
DFGN	0.029		0.032		0.030		0.029		0.001		0.004		0.001		0.001	
	(0.021)		(0.021)		(0.021)		(0.021)		(0.031)		(0.031)		(0.031)		(0.031)	
DPAR_EQUITY									0.676		0.704		0.683		0.683	
									(0.662)		(0.664)		(0.662)		(0.663)	
DPAR_LOANS									−0.001		−0.003		−0.001		−0.002	
									(0.078)		(0.078)		(0.078)		(0.078)	
DPAR_ROA									0.420		0.366		0.435		0.386	
									(2.091)		(2.105)		(2.088)		(2.100)	
DPOS_RUM1	1.331								1.019							
	(3.190)								(3.168)							
DPOS_RUM2			−0.025								−0.025					
			(0.023)								(0.023)					
DPOS_RUM3					−0.006								−0.012			
					(0.033)								(0.034)			
DPOS_RUM4							99.585	***							92.062	**
							(38.670)								(39.960)	
CONSTANT	−0.137		−0.139		−0.138		−0.137		−0.142		−0.144		−0.143		−0.142	
	(0.093)		(0.092)		(0.093)		(0.093)		(0.093)		(0.093)		(0.093)		(0.093)	
no. of observations	2610		2610		2610		2610		2608		2608		2608		2608	
Wald (joint)	91.19	***	91.52	***	91.9	***	100.6	***	100.1	***	100.5	***	100.6	***	106.5	***
Sargan test (two-step)	125.1		123.5		124.5		124.6		127		125.4		125.9		126	
Sargan test p-value	0.431		0.469		0.446		0.441		0.385		0.422		0.41		0.408	
AR(1) test	−9.185	***	−9.19	***	−9.186	***	−9.185	***	−9.181	***	−9.184	***	−9.182	***	−9.18	***
AR(2) test	1.095		1.106		1.1		1.089		1.165		1.176		1.17		1.159	

Note: This table presents the one-step GMM-SYS estimates. Robust standard errors are given in parentheses. All models include time x country dummies. We treat the INTEREST_COST variable and the DEPOSIT_GR variable as predetermined. For the former, we use lags 1 to 3 and for the latter 2 to 4. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Fifth, in CE countries, banks do not always use the names of their parent companies, mainly to preserve locally valuable brands. This practice may obscure, at least for unsophisticated depositors, the relationship between a subsidiary and its parent company. Therefore, it is possible that the influence of negative rumors about parent companies on depositor decisions is limited to instances when links between subsidiaries and their foreign owners are well known. We express this prediction in H13.

> **H13:** *Subsidiaries that share their names with financially troubled parent companies suffered the most in the deposit market during the recent crisis.*

To test H13, we interact a *BRAND* variable with variables based on negative rumors, with the aforementioned new variable set equal to one when a subsidiary uses the same name as its parent company. Table 12 presents the empirical results regarding the role of name similarities. Two out of four interactions terms (*NEG_RUM3 x BRAND*, *NEG_RUM4 x BRAND*) are statistically significant and negatively affect deposit dynamics when they enter regressions individually. However, when we simultaneously control for the influence of negative rumors, all the interaction terms lose their significance. As in the case of the distinction between founded and unfounded negative rumors, our findings suggest that non-financial depositors in CE countries showed a surprisingly good ability to rationally assess available information. In this case, non-financial depositors were not misled by different names of subsidiaries and their troubled foreign owners. The empirical results thus contradict H13.

In addition to the robustness checks described above, we tested whether replacement of the lagged explanatory variables by contemporaneous variables, changes in safety nets in CE countries, and the too-big-to-fail status of some parent companies, influenced our findings. Because none of these tests suggested instability of our main results or revealed new, economically interesting outcomes, we do not provide the relevant tables in this article. However, the tables are available from the authors upon request.

Table 12 Similarity of names and the impact of negative rumors on deposit growth rates

	61		62		63		64		65		66		67		68	
DDEPOSIT_GR	0.064	**	0.064	**	0.065	**	0.064	**	0.064	**	0.064	**	0.065	**	0.064	**
	(0.030)		(0.030)		(0.030)		(0.030)		(0.030)		(0.030)		(0.030)		(0.030)	
DINTEREST_COST	2.011		2.035		1.986		2.004		2.012		2.038		1.986		2.004	
	(1.374)		(1.373)		(1.374)		(1.374)		(1.374)		(1.374)		(1.374)		(1.374)	
DOROA	0.874	**	0.874	**	0.882	**	0.873	**	0.880	**	0.910	**	0.881	**	0.874	**
	(0.439)		(0.438)		(0.438)		(0.438)		(0.438)		(0.436)		(0.438)		(0.438)	
DLOANS	0.260	***	0.258	***	0.262	***	0.261	***	0.260	***	0.262	***	0.262	***	0.260	***
	(0.066)		(0.066)		(0.066)		(0.066)		(0.066)		(0.066)		(0.066)		(0.066)	
DEQUITY	0.609	***	0.608	***	0.608	***	0.608	***	0.608	***	0.607	***	0.608	***	0.608	***
	(0.151)		(0.151)		(0.151)		(0.151)		(0.152)		(0.152)		(0.151)		(0.151)	
DCIR	−0.065		−0.065		−0.064		−0.064		−0.066		−0.069		−0.065		−0.064	
	(0.046)		(0.046)		(0.046)		(0.046)		(0.046)		(0.045)		(0.046)		(0.046)	
DNCI_SHARE	0.211	**	0.213	**	0.210	**	0.211	**	0.211	**	0.221	**	0.211	**	0.210	**
	(0.106)		(0.106)		(0.106)		(0.106)		(0.106)		(0.106)		(0.106)		(0.106)	
DRELAT_FIX_ASSETS	−0.085	*	−0.085	*	−0.087	*	−0.085	*	−0.085	*	−0.081	*	−0.088	*	−0.085	*
	(0.047)		(0.047)		(0.047)		(0.047)		(0.047)		(0.047)		(0.047)		(0.047)	
DASSETS	0.219		0.225		0.232		0.216		0.231		0.269		0.236		0.220	
	(0.202)		(0.201)		(0.201)		(0.202)		(0.203)		(0.202)		(0.202)		(0.202)	
DGOV	−0.040		−0.040		−0.040		−0.040		−0.040		−0.041		−0.040		−0.040	
	(0.027)		(0.027)		(0.027)		(0.027)		(0.027)		(0.027)		(0.027)		(0.027)	
DFGN	0.032		0.034		0.031		0.031		0.035	*	0.043	*	0.032		0.032	
	(0.021)		(0.022)		(0.021)		(0.021)		(0.021)		(0.022)		(0.021)		(0.021)	
DNEG_RUM1									−0.123	*						
									(0.072)							
DNEG_RUM2											−0.122	***				
											(0.035)					
DNEG_RUM3													−0.032			
													(0.041)			
DNEG_RUM4															−0.126	
															(0.109)	
DNEG_RUM1 X BRAND	−0.062								0.043							
	(0.054)								(0.076)							
DNEG_RUM2 X BRAND			−0.040								0.053					
			(0.029)								(0.033)					
DNEG_RUM3 X BRAND					−0.067	*							−0.036			
					(0.035)								(0.052)			
DNEG_RUM4 X BRAND							−0.137	**							−0.016	
							(0.065)								(0.122)	
CONSTANT	−0.139		−0.139		−0.140		−0.139		−0.139		−0.146		−0.139		−0.139	
	(0.092)		(0.092)		(0.093)		(0.093)		(0.092)		(0.092)		(0.093)		(0.093)	
no. of observations	2610		2610		2610		2610		2610		2610		2610		2610	
Wald (joint)	91.81	***	91.88	***	92.34	***	93.29	***	93.32	***	97.37	***	92.66	***	93.97	***
Sargan test (two-step)	124.9		125.6		125		124.9		125.5		125.6		125.5		125.2	
Sargan test p-value	0.435		0.418		0.433		0.436		0.421		0.418		0.42		0.428	
AR(1) test	−9.18	***	−9.17	***	−9.175	***	−9.18	***	−9.184	***	−9.178	***	−9.172	***	−9.182	***
AR(2) test	1.124		1.098		1.111		1.138		1.132		1.095		1.104		1.137	

Note: This table presents the one-step GMM-SYS estimates. Robust standard errors are given in parentheses. All models include time x country dummies. We treat the INTEREST_COST variable and the DEPOSIT_GR variable as predetermined. For the former, we use lags 1 to 3 and for the latter 2 to 4. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

7 Concluding remarks

Market discipline has the potential to play a vital role in promoting financial stability. It may encourage banks to augment capital adequacy and choose safer asset structures. In addition, as Ferguson and Stevenson (2007) explain, market discipline can improve banks' incentives to monitor borrowers. In CE countries, depositor discipline is the only viable and universal source of market discipline in banking for three reasons. First, the market for banks' subordinated debt is virtually non-existent. Second, only selected banks are listed on regional stock exchanges. Third, shareholders' goals need not 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).

From the perspective of successfully supplementing regulatory discipline with market discipline in emerging economies, our results are ambiguous. On the one hand, the evidence supporting the claim that bank and parent companies' 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 and parent companies did not increase during the recent crisis. On the other hand, we found that non-financial depositors in CE countries reacted to sources of information other than financial statements. More specifically, subsidiaries controlled by parent companies rumored to be in financial trouble reported significantly (both statistically and economically) lower deposit growth rates. The latter empirical outcome has two possible interpretations. If we assume that decisions based on negative rumors are worse for financial stability than decisions based on fundamentals, we obtain one more piece of evidence for the weakness of depositor-imposed discipline. However, rumors may convey more relevant information than financial statements during crisis periods. In this case, depositors' reactions to rumors simply represent other, equally valuable forms of market discipline. To differentiate between these interpretations, we have tried to check whether depositors' reactions are linked to the informational content of rumors. Surprisingly, we established that mainly unsophisticated non-financial depositors most severely punished banks when negative rumors with regard to the parent companies turned out, during the next financial year, to be founded. It is worth stressing that this regularity was not the only sign of non-financial depositors' rationality. We also found that depositors were not misled by different names used by a bank operating in CE country and its troubled parent company. The last two pieces of evidence support the view

that depositors' sensitivities to market rumors constitute an encouraging sign when we consider market discipline as a mechanism for stabilizing banking systems in the long run. More generally, we believe that the issue of depositor reaction to information that is not contained in financial statements deserves further investigation, not only in the context of emerging markets but also in other markets.

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