



The effect of corporate board attributes on bank stability

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Abstract

This study aims to empirically identify how a bank's board structure (size, independence, and members' affiliations) and quality (experience, background, and skills) affect its risk incentives. Specifically, it investigates whether banks' solvency and corporate governance nexus changed after the 2007–2009 financial crisis. We employ a cross-country sample of 239 commercial and publicly traded banks covering 1997–2016 and a panel regression for 40 countries. We acknowledge a negative relationship between board size and bank stability and demonstrate that an independent board may have constrained rather than encouraged risk in banks. The global financial crisis has not changed much in the corporate governance and stability of banks nexus. These findings are robust even while controlling for a range of alternative sensitivity estimations for bank stability. This result indicates that in the aftermath of the market meltdown, we still need to strengthen corporate governance practices which may mitigate the adverse effects of the crisis on the banking sector.

Keywords Corporate governance · Board structure · Board quality · Banking · Stability · Financial crisis

JEL classification G1 · G21 · G32 · G38

1 Introduction

In recent years, academic, regulatory and prudential policy studies have exhibited an increasing interest in the role of board governance for banking stability during a crisis

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(Basel Committee on Banking Supervision 2010; Battaglia and Gallo 2017; de Haan and Vlahu 2016; Iqbal et al. 2015; Pathan and Faff 2013; Vallascas et al. 2017). After the global financial crisis, it has been widely argued by banking supervisors and regulators that corporate governance can be considered as a mechanism for addressing stability problems and controlling risk within the bank. The main goal of financial supervision is to take on optimal risk in a bank (where optimal is not known), which might conflict with the shareholders' aim to increase the share value. Additionally, the problem of good practices in bank governance relates to agency problems caused by the separation of ownership and hired managers, who take investment risk without appropriate risk assessment and personal responsibility. They do not pay directly for the consequences of excessive risk (Rezaee 2008; Shleifer and Vishny 1997; Zagorchev and Gao 2015). Shareholders' main goal is to increase the firm's value, which encourages managers to take on more risk and shake up the stability of the banking system. Macey and O'Hara (2003) find that the governance mechanism in banks is a more important issue than that in non-banks because banks' responsibilities extend well beyond owners to depositors. Questions about banks' governance–stability nexus have been raised. In fact, it could be difficult to distinguish between risky activities that generate high profit and those that offer high profit as a bonus for risk-taking through unclear activities (Ellul and Yerramilli 2013). Therefore, the presence of a strong board of directors may be important for the control of a bank's risk exposure. It seems crucial to understand and discover whether and how the relation between banks' board characteristics and their stability changed after the global financial crisis. The theoretical literature on the link between corporate governance in banks and their stability is indecisive; there is no scientific consensus on whether the board structure and experience lead to greater or lesser stability in the banking sector.

Throughout the world, many commercial banks collapsed due to the global financial crisis, which started in the US in 2007. The reason for this phenomenon was not only the risky activity of banks, but also factors associated with unobserved bank characteristics like corporate governance. Our study is motivated by a number of post-crisis initiatives and regulatory reports indicating the importance of bank boards in creating bank stability. Following special efforts by the Basel Committee on Banking Supervision and considering that banks are a core chain in the clearing system and play a key role in the functioning of the economy, we try to verify whether a 'strong' board of directors as a good corporate governance practice increases bank solvency and is furthermore necessary for a sound financial system. Is something actually wrong with the corporate governance of commercial banks after the experience of the global financial crisis? We document a significant and negative relationship between the size of a board and bank stability and we find evidence that an independent board structure decreases a bank's risk. Most of the previous studies have only focused on individual characteristics of the board; we consider the term 'strong boards' as the optimal composite of two groups of variables: board structure (size, independence, and members' affiliations) and board quality (experience, background, and skills).

This study has three objectives. First, we verify the relationship between board governance and risk in the banking industry using a wide spectrum of corporate governance characteristics. In our view, an optimal board structure and quality might reflect managers' ability and motivation to safeguard the bank's investments. We expect that banks with strong boards are better governed, and that better corporate

governance creates soundness in the financial system. Second, we account for banks' instability during the 2007–2009 financial crisis and the widespread losses in the banking sector, we believe that these factors result from ineffective corporate governance mechanisms. We expect banks with strong boards to be less risky and better performing during the crisis, when systemic risk occurs. Therefore, we try to verify whether the impact of corporate boards on banks' stability becomes stronger and positive after the global financial crisis. To fill this gap in the literature, we provide empirical evidence on the role of corporate governance in the relationship among specific individual risks in banks. The third goal of the study is to verify how board characteristics may influence bank stability in comparison with bank-specific risk such as the lack of solvency or liquidity. Most papers about the interactions between risk and corporate governance either focus on this relationship only or provide theoretical views. Few studies verify control variables for the effects of bank-specific characteristics and macroeconomic conditions. In comparison, our empirical models consider several control variables such as bank-specific risk, size and activity (the total deposits to total loans ratio as a proxy for a bank's liquidity risk; the indicator of quasi-leverage; the bank's size; total loans to total assets proxies for the bank's activity level and the ratio of non-performing loans to total loans).

This study is closely related to the works of Vallascas et al. (2017), Battaglia and Gallo (2017), Chen and Lin (2016) analysing bank risk-taking and corporate governance. Vallascas et al. (2017) use only board independence as the ratio between the number of independent directors and the total number of board members. Following Battaglia and Gallo (2017), we use the term “strong board” to denote the effectiveness of the board of directors, however our measure of board power is extended by two attributes of boards – structure and quality. We employ the Z-score as a complex bank risk measure based on profitability and solvency. On the other hand, Chen and Lin (2016) verify the role of corporate governance in bank risk during the period of positive yield curve spreads (YCS), where a bank increases its profits by taking further interest rate risk, and during the inverted YCS period, where margins of banks narrow and even become negative. This study contributes to the literature attempts to identify the changes in mechanisms affecting the relationship between bank risk and corporate governance before and after the financial crisis of 2007–2009.

Our study contributes to the existing literature by linking two groups of corporate governance standards (board structure and quality) and empirically examining whether and how the board's attributes can explain the changes in the solvency risk of financial institutions using an international sample of banks. And which of the corporate governance characteristics: board structure or board quality influences bank stability more strongly. In the 10 years since the start of the 2007–2009 financial crisis and special banking supervision and regulatory actions, we verify the outcomes of these special efforts and the effectiveness of banking governance in ensuring a sound financial system across countries. Our paper complements other papers examining governance over long periods of time, which allows us to explore the effect of corporate governance on banks' stability from 1997 to 2016. Finally, we verify the influence of corporate governance on banks' stability using the Z-score ratio, which combines risk and performance measures. We examine the various approaches to computing the time-varying Z-score measures to avoid providing results that are not robust. Since our dataset includes 239 commercial banks from 40 countries, our study

covers a large spectrum of the world financial industry and our sample is suitable from the financial stability perspective. To sum up, we complement the findings of these previous studies by documenting whether and how corporate governance influences the risk behaviours of banks when they face the solvency risk and financial crisis.

The remainder of this paper proceeds as follows. Section 2 provides a literature review of the characteristics of banks' board governance and lays out the hypotheses. Section 3 describes the data and methodologies. Section 4 reports the empirical results, provides a discussion, and presents robustness checks. The last section concludes.

2 Literature review and hypothesis development

Financial regulators have recently taken action to improve corporate governance practices in the banking system due to weaknesses in bank management that led to many bankruptcies. In developing our hypotheses, we start by considering that the board structure and quality influence a bank's risk decisions.

2.1 Banking sector stability

In this section, we briefly discuss the theoretical and empirical literature on the determinants of banking sector stability.

In the empirical literature on financial stability, researchers posited several macroeconomic and idiosyncratic determinants to be significantly related to a bank's contribution to systemic risk. Economic growth is among the most important variables identified in the empirical literature on bank risk. Primarily, the relationship between economic development and bank risk has been an important area of discussion among policymakers (Beck and Levine 2000; Bangake and Eggoh 2011; Chow and Fung 2011; Dal Colle 2016). During the periods of prosperity, banks are more willing to lend, thus moderately control the risk. In the empirical literature on financial stability, several macroeconomic determinants have been emphasized as significantly related to a bank's risk. As country-level economic factor could also influence bank stability, we include the GDP growth rate, real interest rate and unemployment as additional controls. However, a bank's specific controls such as size, leverage and liquidity are often cited as the main drivers of bank risk. Short-term funding and a high leverage ratio could promote instability. Larger banks, as too big to fail, are often more complex and highly interconnected with their competitors and they are exposed to the risk of losing liquidity. Furthermore, Basel III attributes the recent crisis to the build-up of excessive leverage. Macroeconomic and bank-specific factors influenced managers when they made bank investment decisions. The separation of macroeconomic drivers and internal decisions of managers is difficult. The problem of increasing risk in the banking sector is, however, mainly due to banks' internal problems around risk management decisions. Following the global financial crisis, an active debate arose among academicians, regulators, and policy-makers about what drives bank risk (too-big-to-fail considerations, moral hazard arising from deposit insurance) and how to improve corporate governance in banking (Holmstrom 1982; Adams and Mehran 2012; Berger et al. 2013; Caprio et al. 2007; Fahlenbrach and Stulz 2011; Laeven and Levine 2009).

Therefore, in the next steps we will try to present the latest research on the importance of corporate governance in the banking sector.

2.2 Board structure and bank risk

The board of directors is the body of an organization's internal governance system, responsible for delivering the main directions of financing and investment, monitoring, management, and determining the compensation structure (Hermalin and Weisbach 2003; Jensen 1993; Pathan 2009). This study investigates the relevance of board structure to bank risk, considering: size, independence, and affiliation.

The existing literature only partially investigates the relationship between corporate governance and bank stability, usually focusing on the United States and using a specific type of risk measure and governance. The governance literature emphasizes that firms choose board structures to balance advisory benefits with the costs of decision-making.

Considering the size of the board in the review of the literature we find that large banks, especially those with many subsidiaries, are organizationally complex. Therefore, we can assume that banks with more subsidiaries need more board representatives to monitor directors' activities. These arguments suggest a positive average influence of the board size on a bank's performance. Consistently with Dalton et al. (1999), Caprio et al. (2007) insist that large boards may be advantageous because they increase the base of experience and expertise available to the firm. According to Adams and Mehran (2012), there are statistically significant and positive links between the board size and performance in large banks. However, Jensen (1993) and Coles et al. (2008) argue that boards become less effective at control and monitoring when the board size increases. Their analysis suggests that this is due to prolonged decision-making time and the free-riding effect amongst managers. The advisory value of larger boards is relatively simple to compute with their costs. Belkhir (2009) finds no statistically significant effect between the board structure and a bank's performance using a sample of 260 banks and savings-and-loan holdings. Neither Erkens et al. (2012) confirm that the board size is related to bank risk and profitability. In particular, Berger et al. (2012) show that the board structure among US commercial banks is not significantly related to their probability of default or stability. They use a sample of 249 default and 4021 non-default US commercial banks during the recent financial crisis of 2007–2010. Erkens et al. (2012) investigate the relationship between the board composition (number of directors) and bank risk proxied by the standard deviation of weekly stock returns of 296 financial companies across 30 countries during 2007–2008 and they find no support for the proposition that the board size is related to bank stability.

The empirical findings on the independence and affiliation of the board in terms of inside and outside directors (e.g., Hermalin and Weisbach 1988) are inconsistent as regards the relationship between independent board members and bank stability. The main role of independent board members is to safeguard the interests of minority shareholders against potential acquisition and to disallow an excessive executive compensation system for the majority shareholders. The value of independent board members is in their potential to make objective decisions. However, most research does not focus on financial companies. For example, Anderson et al. (2004) show that an independent board decreases the cost of financing for companies. Ashbaugh-Skaife

et al. (2006a) insist that independent members lower a firm's idiosyncratic risk and increase its ratings (Ashbaugh-Skaife et al. 2006b). Prior studies emphasize that board members' independence promotes better bank governance and, consequently, stability. Independent directors are important for banks as they provide incentive compensation to managers (Akhigbe and Martin 2006; Cornett et al. 2009; Newman and Mozes 1999). Battaglia and Gallo (2017) find that the number of independent directors is relevant for the probability of bank insolvency, using a sample of the largest publicly traded commercial banks, bank holding companies, and holding companies headquartered in the European Union over 2006–2010. Wang and Hsu (2013) find no support for the proposition that the presence of independent directors is negatively correlated with bank risk. However, Anderson and Bizjak (2003) note that greater board independence does not generate pay–performance sensitivity, and Subrahmanyam et al. (1997) show a negative relationship between returns and the proportion of a bank's independent directors. It is difficult to apply the board affiliation mechanisms directly to analyse a bank's financial stability. This is more prominent in the banking sector, where affiliated board members are engaged for control (La Porta et al. 1999; Levine 2004; Yeh et al. 2014).

Research on the board structure focuses also on the participation of externally affiliated members of the board. There are potential benefits from including external directors due to their experience and knowledge. However, the presence of external (also foreign) directors may also weaken monitoring because these directors may lack knowledge of local markets or cultural barriers. For example, Liang et al. (2013) and Berger et al. (2009) argue that foreign director participation contributes to better performance in the Chinese banking sector by bringing new techniques and skills. In contrast, Masulis et al. (2012) and Adams et al. (2010) maintain that foreign directors lead to a lower return on assets. We also consider the affiliation of board members as outside directors who work in other institutions and/or serve on other boards. Jiraporn et al. (2009a, 2009b) emphasize that directors who serve on a few board committees are more likely to be absent from board meetings. Fich and Shivdasani (2006) further find that boards with a majority of outside affiliated directors represent weaker corporate governance. Ahn et al. (2010) show that firms with “busy boards” experience more negative financial results. Appendix 1 provides more details (samples, methods, variables, and results) of some relevant studies.

The discussion so far highlights that a ‘stronger’ board structure, meaning a larger size and significant participation by independent and affiliated members, may contribute to a board's effectiveness in controlling managers, consequently facilitating bank stability. In our study, we assume a positive relationship between the board structure and bank stability. This leads us to our first hypothesis:

Hypothesis 1 (H1): Banks with a ‘stronger’ board structure have lower risk and are more stable.

2.3 The impact of board quality on bank stability

Board attributes are another important dimension that may affect a bank's stability. We employ a broad definition of board quality that includes experience, background, and

skills, and the role of these attributes in bank risk. Bank managers' wealth consists of a portfolio of financial assets and human capital (experience, talent, and job-related background). We complement the literature on bank board quality versus risk by first proposing that bank risk reflects the decisions of executives who may have diverse opinions due to differences in their backgrounds, educations, preferences, and risk aversion. Board competences may allow board members to better assess the bank's risk (Walker 2009) or its influence on bank performance (Hagendorff and Keasey 2012; Nguyen et al. 2015).

A growing number of studies discuss the links between a board's skills and risky decisions. Grable (2000) and Christiansen et al. (2008) show that higher education increases participation in financial decisions. Bertrand and Schoar (2003) demonstrate that executives with better education are more aggressive in financial management. Directors with different educational backgrounds, skills, and knowledge provide unique human capital to the board (Terjesen et al. 2009). Accounting for the research period after the 2007–2009 financial crisis, we assume that:

Hypothesis 2 (H2): Bank stability is positively related to board quality that includes experience, background, and skills.

2.4 The financial crisis and the relationship between bank risk and corporate governance

Since the last financial crisis of 2007–2008, an increasing number of initiatives have attempted to mitigate the impact of banks' excessively risky behaviour on financial stability and promote better corporate governance standards. The Basel Committee on Banking Supervision (BCBS) (2006) highlights that 'effective corporate governance practices are essential to achieving and maintaining public trust and confidence in the banking system, which are critical to the proper functioning of the banking sector and economy as a whole'. Many studies investigate poor or weak corporate governance in the banking sector and some of them find a positive correlation between the board structure and risk in the banking sector during the financial crisis period (Akhigbe and Martin 2008; Fortin et al. 2010; Peni and Vähämäa 2012).

The problem of the relationship between corporate governance and bank stability is not new. Researchers studied this dependence during previous crises. Demsetz et al. (1997) document a positive relationship between board corporate governance and bank risk during 1991–1995. Sullivan and Spong (2007) use the data of small, privately held and state-owned banks and find that the board structure tends to increase bank risk aversion. Díaz and Huang (2017) examine the impact of corporate governance on bank liquidity in the United States after the 2007–2009 crisis period and find a positive effect, but only for large banks. Prior studies of corporate governance in the financial sector emphasize that the lack of transparency in banking governance creates opportunities for managers to manipulate earnings and valuations (Caprio et al. 2007; Millon et al. 2009). These studies find that incentive-based compensation has a significant impact on performance measured by reported earnings. Banks with weaker board quality may not implement adequate risk controls. The question is how this can affect a firm's long-term stability.

On the other hand, some researchers emphasize that banks with strong governance attributes may take more risk (Beltratti and Stulz 2012; Pathan 2009). Beltratti and Stulz (2012) use stock return data in 31 countries from July 2007 to December 2008 and document that banks with lower leverage had less negative stock returns during the crisis. The post-crisis literature does not provide much support for the proposition that effective corporate governance practices increase stability in the financial sector, but rather shows mixed results (Cornett et al. 2010; Ellul and Yerramilli 2013; Fernandes and Fich 2016; Gropp and Kohler 2010). Only Vallascas et al. (2017), who use a cross-country sample of banks for 2004–2014, find that an increase in board independence leads to a decrease in bank risk in the post-crisis period. These heterogeneous findings suggest that results may vary with the bank's specific variables such as structure, board attributes, and country-specific controls. The post-crisis corporate governance literature offers no conclusive evidence on the effect of corporate governance on bank risk. We suppose that actions taken by financial regulators to improve corporate governance practices in the banking system changed the relationship between corporate governance and financial stability. Thus, we hypothesize:

Hypothesis 3 (H3): The effect of corporate governance on bank stability is stronger after the 2007–2009 financial crisis the in cross-country dimension.

3 Data and methods

Focusing on the cross-country relationship between bank governance and stability during the global financial crisis, we used panel data comprising 239 commercial public banks from 40 countries for 2002–2016. We collected bank-related measures from the Thomson Reuters Datastream database, the corporate governance bank-related variables from the ASSET4 ESG Thomson Reuters Datastream database, and the country-specific indicators from the World Bank database. The panel is unbalanced and contains 2429 observations. Table 1 presents its structure. Similarly to prior studies (Vallascas et al. 2017), banks from the US and Japan have the largest shares in the sample, equal to 20% and 10%, respectively. The shares of the other countries do not exceed 5%, with the single exception of Italy in the case of the number of observations. The sample covers most of the world's major banks. In particular, it contains 19 world's largest banks measured by total assets that top the S&P Global list (Mehmood and Chaudhry 2018). Moreover, the sample covers 80% of banks taking the first 50 positions of the list and 68% of the whole list of 100 largest banks. We note that due to missing data and lagged variables in the model specifications, the effective sample sizes for the estimation are lower and range between 1000 and 2000 observations. We explain the governance and country specific variables in detail below.

3.1 Bank risk measures

We employ the Z-score as a bank risk measure. It is a popular indicator of a bank's probability of insolvency. The time-varying Z-score takes the following form:

Table 1 Sample composition

Country	number of banks	fraction of banks	number of observ.	fraction of observ.
Australia	6	2.51%	83	3.42%
Austria	2	0.84%	28	1.15%
Belgium	2	0.84%	15	0.62%
Brazil	7	2.93%	71	2.92%
Canada	8	3.35%	108	4.45%
Chile	4	1.67%	28	1.15%
China	8	3.35%	77	3.17%
Colombia	3	1.26%	10	0.41%
Czech Republic	1	0.42%	11	0.45%
Denmark	1	0.42%	1	0.04%
France	4	1.67%	55	2.26%
Germany	2	0.84%	18	0.74%
Greece	4	1.67%	42	1.73%
Hong Kong	4	1.67%	60	2.47%
Hungary	1	0.42%	10	0.41%
India	10	4.18%	75	3.09%
Indonesia	5	2.09%	53	2.18%
Ireland	3	1.26%	30	1.24%
Israel	4	1.67%	39	1.61%
Italy	10	4.18%	128	5.27%
Japan	23	9.62%	272	11.20%
Malaysia	8	3.35%	77	3.17%
Mexico	4	1.67%	31	1.28%
Morocco	1	0.42%	2	0.08%
Netherlands	1	0.42%	1	0.04%
Norway	1	0.42%	7	0.29%
Philippines	4	1.67%	37	1.52%
Poland	8	3.35%	72	2.96%
Portugal	2	0.84%	27	1.11%
Russian Federation	2	0.84%	22	0.91%
Singapore	3	1.26%	42	1.73%
South Africa	5	2.09%	50	2.06%
South Korea	5	2.09%	28	1.15%
Spain	6	2.51%	65	2.68%
Sweden	4	1.67%	16	0.66%
Switzerland	5	2.09%	57	2.35%
Taiwan	9	3.77%	86	3.54%
Thailand	7	2.93%	62	2.55%
United Kingdom	5	2.09%	54	2.22%
United States	47	19.67%	479	19.72%
Total	239	100%	2429	100%

$$Z_{it} = \frac{car_{it} + \mu_{roa,it}}{\sigma_{roa,it}},$$

where car is a bank's capital-asset ratio, while $\mu_{roa,it}$ and $\sigma_{roa,it}$ represent estimates of the expected value and the standard deviation of a bank's return on assets, respectively. Following Lepetit and Strobel (2013), we consider three different versions of the Z-score using different estimates of the return on assets:

- Z1 – where we estimate $\mu_{roa,it}$ and $\sigma_{roa,it}$ using moving means and standard deviations calculated for the last 3 years (Boyd et al. 2006, Section III.A);
- Z3 – where we approximate $\mu_{roa,it}$ by the current period value of roa and calculate $\sigma_{roa,it}$ over the full sample (Hesse and Cihak 2007);
- Z4 – where we approximate $\mu_{roa,it}$ by the current period value of roa and estimate $\sigma_{roa,it}$ using the instantaneous standard deviation of the form $\sigma_{roa,it} = |roa_{it} - \mu_{roa,i}|$, where we calculate $\mu_{roa,it}$ over the whole sample period (Boyd et al. 2006, Section III.B). This approach to the construction of time-varying Z-score measures does not drop initial observations and estimates profitability of a bank (roa) and volatility of results (σ_{roa}) for a long time period.

In all cases, we employ the current period value of the common equity to total asset indicator from Datastream to proxy the car_{it} variable. We note that to calculate the whole-period and rolling-window characteristics, we use data prior to 2002 and extend the sample until 1998, if possible. Finally, due to the high skewness of the data, we work with natural logarithms of the calculated Z-scores. Using the instantaneous standard deviation to measure Z4 makes the indicator highly volatile and results in a considerable fraction of outliers. On the other hand, this measure is the most sensitive to changes in the post-crisis period because, contrary to the alternatives, it uses only the current-period observations.

3.2 Corporate governance measures

Corporate governance measures a bank's systems which ensure that its board uses the best risk management practices and acts in the best interests of its long-term shareholders. As there is a weak theory to guide us in the selection of the most important corporate governance characteristics from the large scope of characteristics, we select the groups of variables that possibly proxy the real aspects of corporate governance. We adopt five corporate governance measures: board size, independence, members' affiliation, experience, and board members' background and skills. The first three indicators are related to the board structure (hypothesis 1), while the latter two describe the board quality (hypothesis 2). Table 2 reports the descriptive statistics of these indicators. We calculate the corporate governance measures according to the ASSET4 ESG Thomson Reuters Datastream glossary. Board size is the total number of board members. Independence is the percentage of independent board members as reported by the bank. Affiliation is the average number of board members with other corporate affiliations. Experience is the average number of years each board member has been on the board. Background and skills are the percentage of board members who have a

specific background or a strong financial background. Each indicator is a number between 0 and 100, which shows how the bank performs compared to the entire ASSET4 universe based on the value in the related index.

3.3 Control variables

We use several bank- and country-specific macroeconomic variables as controls that are commonly thought to have an impact on bank risk. In particular, we employ the total deposits to total loans ratio as a proxy for a bank's liquidity risk. We treat the ratio of market capitalization to total equity as the indicator of quasi-leverage. We measure the bank's size by the logarithm of its total assets. The ratio of total loans to total assets proxies for the bank's activity level. Finally, we approximate credit risk by the ratio of non-performing loans to total loans. The macroeconomic indicators include the logarithm of GDP per capita, GDP growth rate, real interest rates, and unemployment rates.

Table 2 Descriptive statistics of the main variables

Variable	Description	N	Min	Max	Mean	St.dev.	Skewness	Kurtosis
Dependent variables								
Z1	logarithm of Z-score (Boyd et al. 2006, Section III.A)	2129	-1.76	7.79	3.97	1.14	-0.17	0.89
Z3	logarithm of Z-score (Hesse and Cihak 2007)	2327	-0.95	6.05	2.80	0.81	-0.63	1.87
Z4	logarithm of Z-score (Boyd et al. 2006, Section III.B)	2422	-1.84	37.74	3.51	1.49	5.40	115.02
Corporate governance measures								
SIZE	board size	1971	0.00	78.14	33.88	29.30	0.30	-1.49
INDEP	independent board members	1804	0.55	95.27	48.48	31.25	-0.10	-1.47
EXPER	experienced board	1536	3.29	99.98	47.43	28.72	0.34	-1.20
SKILLS	background and skills of board members	1971	0.02	72.38	50.17	26.27	-1.27	-0.27
AFFIL	board members affiliations	1787	0.00	92.59	54.08	28.43	-0.47	-1.09
Bank-specific controls								
DEP%LOA	total deposits to total loans	2429	0.07	31.91	1.07	0.97	22.20	592.76
CAP%CE	ratio of market capitalization to common equity	2393	-15.33	19.03	1.59	1.14	0.31	71.86
NONP_LOA	ratio of non-performing loans to total loans	2350	0.00	64.07	3.04	4.17	5.86	58.26
ASSETS	logarithm of total assets	2429	14.55	27.53	20.07	2.44	0.61	0.09
LOA%ASS	ratio of total loans to total assets	2429	1.76	97.90	64.03	14.02	-0.74	0.77
Country-specific controls								
GDP_GRO	GDP growth rates	2429	-9.13	26.28	2.68	3.17	0.76	4.94
GDP_LOG	logarithm of GDP per capita	2429	6.81	11.43	10.08	1.00	-1.34	0.87
REAL_IR	real interest rate	2426	-12.28	44.64	3.92	5.80	4.20	21.88
UNEMPL	unemployment rate	2395	0.19	27.47	6.79	4.26	2.63	8.50

3.4 Econometric methods

Because the Z1 and Z3 Z-score measures are characterized by significant autocorrelations that are of order even higher than one, we employ dynamic panel data estimators to examine the relationship between the Z-scores and the corporate governance indicators. In particular, we use the two-step system GMM for dynamic panels (Blundell and Bond 1998; see also Baltagi 2013). In most cases, we use the appropriate lags of the dependent variables and the bank characteristics (treated as endogenous variables) as GMM-style instruments and we use the remaining variables as IV-style instruments. When necessary, we modify the composition of instruments appropriately. We employ Stata's function `xtabond2` (Roodman 2009) with option `collapse` for the GMM-style instruments to limit instrument proliferation.¹ We use year-specific dummies to reduce the potential cross-sectional correlation of errors and calculate robust standard errors of the estimates (Windmeijer 2005). We examine the choice of instrument using the Arellano-Bond autocorrelation tests, Hansen's tests for overidentifying restrictions, and the difference-in-Hansen tests of exogeneity of instrument subsets.

For the Z4 measure, autocorrelation does not play a significant role. Therefore, we calculate the standard LSDV-FE estimates with robust, bank-clustered standard errors.

To identify the potential change in the relationships between the Z-score measures and the corporate governance indicators in the post-crisis period, we add the post-crisis dummy and its interaction term with the corporate governance measures (hypothesis 3). The post-crisis dummy takes values equal to 1 after 2008 and is 0 otherwise.

4 Empirical results

This section consists of three parts. First, we summarize the baseline findings on the relationship between the Z-score measures and the corporate governance indicators. Then, we examine the role of financial crisis in shaping the discussed relationships. Finally, we present some additional results that are helpful in understanding the baseline findings of the study.

4.1 Main results

Table 3 summarizes our findings on the relationship between the Z-score measures and the CG indicators. For clarity, in the main body of the paper, we only show the regression coefficients for the CG variables. Full estimation results are presented in Tables 6, 7, 8, 9, and 10 in Appendix 2.

Our empirical findings indicate that banks with bigger board structures are associated with higher levels of risk. The impact of corporate governance on bank stability seems to be weak. We only find a negative relationship between two Z-score measures and the size of the board and affiliation. Our finding of a negative relation between the board size and Z-score ratio is more interesting. It means that stability decreases with 'stronger' board structures. It may seem contrary to intuition, however is consistent with traditional value maximization; well-governed banks may have tried to improve

¹ The exact specifications are available upon request.

Table 3 Summary table of the relations between the Z-score measures, the CG indicators and the control variables

CG variable	Dependent variable																		
	Z1	Z3	Z4	Z1	Z3	Z4	Z1	Z3	Z4	Z1	Z3	Z4	Z1	Z3	Z4	Z1	Z3	Z4	
SIZE	-0.46* (0.24)	-0.14** (0.07)	0.05 (0.26)																
INDEP				0.95 (1.08)	0.15 (0.09)	0.70*** (0.25)													
AFFIL							0.24 (0.35)	-0.28*** (0.1)	0.29 (0.24)										
EXPER										-0.42 (0.61)	0.04 (0.17)	-0.24 (0.49)							
SKILLS													-0.02 (0.19)	0.04 (0.05)	0.09 (0.19)				

The table presents the estimated coefficients for the CG variables and their standard errors (in parentheses). Significant estimates are denoted by asterisks: 0.1*, 0.05**, 0.01***. Full results are reported in Tables 6, 7, 8, 9, and 10 in Appendix 2. An empty cell means that the variable was not included in the regression. Z1 – logarithm of Z-score (Boyd et al. 2006); Z3 – logarithm of Z-score (Hesse and Cihak 2007); Z4 – logarithm of Z-score (Boyd et al. 2006); SIZE – size of a board; INDEP – independent board members; EXPER – experienced board; SKILLS – background and skills of board members; AFFIL – board members’ affiliations

their profitability by increasing the level of risk. Thus, on average the costs associated with directors on large boards seem to outweigh beneficial effects. This may be because large boards have more difficulties in supervising managers and initiating positive activities. It is not consistent with our first hypothesis that banks with a 'stronger' board structure have lower risk and are more stable. However, the results are similar to Coles et al. (2008) and Erkens et al. (2012). The existence of a negative relation between affiliation and Z-score means that directors who serve on a few board committees are more likely to be absent from board meetings and represent weaker corporate governance (Fich and Shivdasani 2006; Jiraporn et al. 2009a, 2009b). The board independence indicator is positively related to the Z4 measure and the board members' affiliation measure correlated negatively with the Z3 variant of Z-score. We demonstrate that an independent board may have constrained rather than encouraged risk-taking in banks. More generally, we find that banks with more independent directors had a lower probability of default. It can be interpreted that banks with stronger corporate governance (small boards and more independent directors) have higher stability. Regarding the proportion of independent directors, we find a result that is in line with Ashbaugh-Skaife et al. (2006a) and Battaglia and Gallo (2017) and it supports our first hypothesis.

In the case of the two board quality indicators – experience as well as background and skills of board members – we find no significant relationship with any of the Z-score measures.

As far as the control variables are concerned (see Tables 6, 7, 8, 9, and 10 in Appendix 2), we find a positive relationship with the ratio of market capitalization to common equity and a negative one with the unemployment rate in most of the regressions. The Z4 measure is also negatively related to the logarithm of total assets and positively correlated with the GDP growth rates. We also document a positive impact of the loans to assets ratio on the Z3 measure. The coefficients of the other bank characteristics all have the expected sign and offer some significant insights. For instance, we observe that bank asset size is negatively associated with bank risk measures. It confirms the thesis about too big banks that can generate risk in the sector. With respect to macroeconomic variables, we find that banks tend to be more stable during prosperity periods (Z-score increases when the GDP growth rates and market capitalization increase). And on the other hand, the relation is negative during recession (Z-score decreases when the unemployment rate rises).

We also study several alternative specifications of the models that include nonlinear CG terms, interaction terms of the CG indicators and the bank characteristics, as well as multiple CG variables in one regression. However, the results do not change the general conclusions of the study and therefore we do not include them in the paper but make them available upon request. Additionally, we also estimate the fixed effects models using the simpler LSDV method that disregards the lagged Z-score terms. Similarly to the previously mentioned checks, the results do not differ much, which suggests that the weak support of the investigated hypothesis should not be attributed to the specific features of GMM approach used in the baseline case. It is more likely that they can be explained by the omission of a significant factor of corporate governance affecting bank stability.

In summary, we find weak evidence in support of hypothesis 1. While we acknowledge a negative relationship between board size and bank stability for two of the three

stability measures, the role of the two remaining board structure indicators seems to be weaker. Also, the results strongly reject hypothesis 2. Factors that significantly influence bank stability, measured by Z-score ratio, are located mainly in banks' specific features and activities, much more than in the corporate governance practices. However, our results support the conclusion that a 'stronger' board structure means more independent directors, but not bigger size.

4.2 The effect of financial crisis

Table 4 presents the results that focus on the impact of the financial crisis on the investigated relationships. The models contain the additional interaction terms of the CG indicators and the crisis dummy variable. The results suggest that the impact of the crisis is rather weak too. The crisis can explain the negative relationship between board size and the Z1 measure documented in Table 3. We also find a positive relationship between board members' background and skills and the Z4 variant of the bank stability measure. In the remaining cases, no statistically significant impact is observed. The negative corporate governance score of board size suggests that the effect of the Basel Committee on Banking Supervision's action to promote better corporate governance standards has not materialized yet. However, the positive relationship between board members' background and skills and bank stability suggests that during the crisis period executive boards of banks with better corporate governance made significant changes by reducing their risk exposure and were more experienced in risk management. Summing up, the results reject hypothesis 3 that the effect of corporate governance on bank stability is stronger after the 2007–2009 financial crisis in the cross-country dimension, which is supported by Beltratti and Stulz (2012) and Wintoki et al. (2012).

4.3 Additional results for the Z-score components

To shed some light on the observed weak relationship between the corporate governance measures and the Z-scores, we investigate the relationship between the former and the components of the Z-score measures: capital-asset ratio, return on assets, and the time-varying standard deviation of return on assets. The results are summarized in Table 5.

The table shows that the CG measures (board experience, independence, and the background and skills of board members) are significantly related only to the capital-asset ratio. We do not find any statistically significant relationships with the remaining components of the Z-score measures.

5 Conclusions

The recent global financial crisis highlights the importance of stability in the banking sector. In response, financial regulators took actions to improve corporate governance practices in the banking system due to weaknesses in bank management that led to many bankruptcies. Prior studies often emphasize the relationship between risks taken and corporate governance. However, there is no consistency in response to the question of how board structure and experience affect bank stability, before and after the 2007–2009 crisis.

Table 4 Summary table of the relations between the Z-score measures, the CG indicators and the control variables accounting for the financial crisis effect

CG variable	Dependent variable														
	Z1	Z3	Z4	Z1	Z3	Z4	Z1	Z3	Z4	Z1	Z3	Z4	Z1	Z3	Z4
SIZE	0.08 (0.29)	-0.03 (0.1)	-0.2 (0.32)												
SIZE · PC	-0.71** (0.33)	-0.14 (0.12)	0.39 (0.27)												
INDEP				-0.03 (1.38)	-0.01 (0.12)	0.58 (0.4)									
INDEP · PC				0.41 (1.24)	0.2 (0.16)	0.22 (0.41)									
AFFIL							0.59 (0.57)	-0.06 (0.19)	0.27 (0.39)						
AFFIL · PC							-0.43 (0.66)	-0.24 (0.18)	0.03 (0.49)						
EXPER										-0.33 (0.67)	0.03 (0.17)	0 (0.52)			
EXPER · PC										-0.02 (0.45)	0.03 (0.16)	-0.42 (0.39)			
SKILLS													-0.33 (0.36)	-0.05 (0.07)	-0.05 (0.25)
SKILLS · PC													0.51 (0.47)	0.16* (0.09)	0.33 (0.3)

The table presents the estimated coefficients for the CG variables and their standard errors (in parentheses). Significant estimates are denoted by asterisks: 0.1*, 0.05**, 0.01***. Full results are reported in Tables 6, 7, 8, 9, and 10 in Appendix 2. An empty cell means that the variable was not included in the regression. Z1 – logarithm of Z-score (Boyd et al. 2006); Z3 – logarithm of Z-score (Hesse and Cihak 2007); Z4 – logarithm of Z-score (Boyd et al. 2006); SIZE – board size; INDEP – independent board members; EXPER – experienced board; SKILLS – background and skills of board members; AFFIL – board members’ affiliations

Table 5 Summary table of the relations between the Z-score components, the CG indicators and the control variables accounting for the financial crisis effect

CG variable	Dependent variable	<i>car</i> (common equity to total assets)	μ_{roa} (return on assets)	σ_{roa} (st. dev. of return on assets)
SIZE		1.95 (1.79)	-0.09 (0.20)	0.10 (0.09)
INDEP		0.62** (0.29)	-0.18 (0.17)	0.04 (0.09)
AFFIL		2.71** (1.33)	-1.07 (1.46)	0.13 (0.11)
Exper		1.38* (0.79)	-0.13 (0.30)	-0.03 (0.13)
SKILLS		0.37 (0.37)	-0.39 (0.27)	-0.04 (0.14)

The table presents the estimated coefficients for the CG variables and their standard errors (in parentheses). Significant estimates are denoted by asterisks: 0.1*, 0.05**, 0.01***. Full results are reported in Tables 11, 12, and 13 in Appendix 2. An empty cell means that the variable was not included in the regression. Z1 – logarithm of Z-score (Boyd et al. 2006); Z3 – logarithm of Z-score (Hesse and Cihak 2007); Z4 – logarithm of Z-score (Boyd et al. 2006); SIZE – board size; INDEP – independent board members; EXPER – experienced board; SKILLS – background and skills of board members; AFFIL – board members’ affiliations

We consider two terms of ‘strong boards’ to mean the optimal board structure (size, independence, and members’ affiliations) and board quality (experience, background, and skills), and use this to explain whether the board’s characteristics affect risk among bank managers and the implications for bank stability. We explore the effect of board structures on bank risk, which is associated with regulation and complexity. Finally, to identify the potential change in the relationships between the Z-score measures and the corporate governance variables in the post-crisis period, we added a post-crisis dummy and its interaction term to the corporate governance measures.

We find weak evidence supporting the hypothesis that a ‘stronger’ board structure decreases banks’ risk. We acknowledge a negative relationship between board size, the board’s affiliation and bank stability. We provide evidence suggesting that one possible explanation for this result is that larger boards have more directors who probably do not deal with risk management and organizational complexity in banks. Probably, the costs associated with large boards seem to outweigh beneficial effects. More generally, we find that strong corporate governance ensuring bank stability means small boards and more independent directors. Overall, our empirical evidence shows that the effect of corporate governance on bank stability practically did not strengthen after the 2007–2009 financial crisis. However, background and skills of board members would make significant changes in managing and reducing bank risk exposure. We suggest that our results could contribute to the current debate on corporate governance standards in the banking industry and also banking regulation when creating tools to prevent bank insolvency.

This study offers several contributions to the literature. First, we analyse board structures by linking two groups of corporate governance standards (structure and quality). Directors with different educational backgrounds, skills, and knowledge provide unique human capital to the board, which might reflect managers’ ability and motivation to safeguard banks’ investments. Moreover, our research empirically examined whether and how the board attributes can explain changes in the insolvency risk of financial institutions in an international sample of banks. Our study provides a summary that offers an explanation of the indecisive results of previous studies. Further studies could focus on this aspect to justify the value of board attributes in particular traditional and non-traditional activities.

Overall, our results imply that the impact of board structure on risk among public banks remains probably weak and the board structure does not have a sufficient impact on a bank’s solvency. We assume that the results are conditioned by the omission of a significant factor of corporate governance affecting banks’ stability, or banks’ stability, measured by the Z-score ratio, is influenced much more by their specific features and activities than by corporate governance practices. However, our results support the conclusion that a ‘stronger’ board structure means more independent directors, but not bigger size. We demonstrate that an independent board may have constrained rather than encouraged risk-taking in banks. The limited relation between board governance controls and bank solvency we document here would help to develop a deeper understanding of bank behaviour in stress situations. In particular, it would be interesting to determine how to better align incentives in corporate governance with the financial system and real economy preferences. We hope that our study contributes to the understanding of corporate governance in the banking sector, motivates further research to protect financial stability and design governance reform proposals.

Appendix 1

Author(s)	Sample	Methods	Corporate governance variables	Stability measure	Influence on bank's stability
Caprio et al. (2007)	The largest 244 banks from 44 countries	OLS regression	Ownership structure and shareholder protection	Market-to-book value, Tobin's Q	Positive
Cornett et al. (2009)	The largest publicly traded bank holding companies in the United States for 1994–2002	OLS regression	Board independence = (1/board size) × [unaffiliated directors/(inside directors + affiliated directors)], CEO pay-performance sensitivity, Percentage of directors who are insiders, percentage of directors affiliated/unaffiliated with the BHC	Loan loss provisions as a % of total loans, realized security gains and losses as % of total assets, earnings before extraordinary items and after taxes to total assets	Greater board independence does not generate pay-performance sensitivity
Belkhir (2009)	260 banks and savings & loan holdings for 2002–2008	OLS and 2SLS regressions	Proportion of outside directors, board leadership structure, and board size	Tobin's Q, stock returns, company's size, stock return over the last 2 years;	No statistically significant effect
Adams and Mehran (2012)	A sample of the 35 largest publicly traded bank holding companies in the US from 1986 to 1999	OLS regression	Board size; fraction of outside director, fraction of non-inside directors, changes in board size and composition, and number of committees	Tobin's Q, ROA, Capital ratio, volatility, bank size	Board size is positively related to performance; board independence is not related to performance
Berger et al. (2012)	A sample of 249 default and 4021 no default US commercial banks during the recent financial crisis of 2007–2010	multivariate logistic regression	Ownership structure; number of outside directors, chief officers, and other corporate insiders normalized by board size	Probability of default during the recent financial crisis of 2007–2010	Board structure of US commercial banks is not related to their probability of default and not decisive for banks' stability
Masulis et al. (2012)	Covers firms in the S&P 1500 index from 1998 to 2006	probit model; two stage least squares	Foreign independent directors, board size, percentage of independent directors, CEO/Chairman duality	Tobin's Q, ROA, Market capitalisation	The market reacts negatively to firms' decision to bring foreign directors on board; firms with foreign

(continued)

Liang et al. (2013)	sample of 50 largest Chinese banks during the period of 2003–2010	GMM, two-step system estimator (Arellano and Bond (1998)).	Board characteristics (size, composition, and functioning of the board)	Bank performance and bank asset quality	Independent directors have positive impacts on bank performance and asset quality; board size has a negative impact on bank performance.	directors exhibit significantly poorer performance.
Anginer et al. (2016)	International sample of banks for 2003–2011	probit and tobit models with country year fixed effects	Board independence, CEO chairman separation, board size, Anti-takeover provision, CEO total compensation	Indicators for bank capitalisation: tier 1 capital, total capital, common equity, tangible capital and market value	Good corporate governance is associated with lower levels of bank capital	
Chen and Lin (2016)	Sample of banks in 43 countries for 2002–2010	two-stage least squares (2SLS) method	Maximum of the direct or total shareholding for a shareholder, number of directors on the board, percentage of independent board members, CEO duality	Non-performing loans/gross loans, loan loss provision/average gross loan, amount of liquidity creation/total assets, required amount of stable funding/available amount of stable funding	Corporate governance can reduce credit, interest rate, and liquidity risks	
Vallascas et al. (2017)	Cross-country sample of large banks for 2004–2014	two-step GMM dynamic panel model (Blundell and Bond 1998)	Board size, board independence, CEO power	Expected Shortfall, Value at Risk, Z-score	Post-2009 an increase in board independence leads to more prudent bank risk-taking	
Battaglia and Gallo (2017)	Sample of 40 European banks for 2006–2010	OLS regression; Random effects GLS	Board size, independent directors, frequency of board meetings, ownership concentration	Marginal Expected Shortfall, Expected Shortfall, Volatility; Z-score	Banks with larger boards sizes and fewer board meetings saw more losses	

Appendix 2

Table 6 Estimation results for board size

Regressors	Dependent variable						
	Z1 (GMM)	Z1 (GMM)	Z3 (GMM)	Z3 (GMM)	Z4 (LSDV)	Z4 (LSDV)	Z4 (LSDV)
Z(-1)	0.47 (0.07)***	0.48 (0.07)***	0.51 (0.08)***	0.51 (0.08)***			
Z(-2)	-0.12 (0.03)***	-0.12 (0.03)***	0.11 (0.04)***	0.1 (0.04)***			
Z(-3)	-0.06 (0.05)	-0.06 (0.05)	0.05 (0.04)	0.05 (0.04)			
SIZE	-0.46 (0.24)*	0.08 (0.29)	-0.14 (0.07)**	-0.03 (0.1)	0.05 (0.26)		-0.2 (0.32)
SIZE*PC		-0.71 (0.33)**		-0.14 (0.12)			0.39 (0.27)
ASSETS	2.82 (13.45)	1.99 (13.46)	0.69 (3.00)	0.33 (2.83)	-47.91 (24.85)*		-49.74 (24.59)**
LOA%ASS	1.45 (1.31)	1.49 (1.3)	1.34 (0.48)***	1.33 (0.46)***	0.44 (0.99)		0.44 (0.99)
NONP_LOA	0.34 (3.06)	0.05 (3.06)	1.16 (1.02)	0.92 (1.1)	-1.96 (1.32)		-1.7 (1.32)
CAP%CE	154.17 (56.31)***	159.5 (56.49)***	54.05 (19.43)***	53.65 (19.42)***	10.27 (24)		9.3 (23.33)
DEP%LOA	16.7 (15.12)	15.28 (15.20)	0.93 (3.10)	0.69 (3.03)	-1.86 (4.21)		-2.25 (4.04)
GDP_GRO	-1.08 (2.09)	-1.14 (2.10)	0.09 (0.42)	0.07 (0.44)	5.06 (2.77)*		4.92 (2.77)*
GDP_LOG	7.28 (18.57)	6.65 (18.21)	6.81 (3.58)*	6.83 (3.43)**	-115.2 (95.5)		-118.4 (94.69)
REAL_IR	2.2 (1.26)*	2.44 (1.30)*	0.85 (0.47)*	0.84 (0.47)*	1.13 (1.39)		1.05 (1.4)
UNEMPL	-12.93 (6.65)*	-13.07 (6.69)*	-2.85 (1.77)	-2.88 (1.80)	-4.54 (2.72)*		-4.6 (2.65)*
n observ.	1369	1369	1471	1471	1824		1824
n instrum.	94	95	94	95			
AB(1)	-6.33 [0.00]	-6.36 [0.00]	-2.95 [0.00]	-2.93 [0.00]			
AB(2)	0.35 [0.73]	0.56 [0.58]	0.13 [0.90]	0.1 [0.92]			

Table 6 (continued)

Regressors	Dependent variable							
	Z1 (GMM)	Z1 (GMM)	Z3 (GMM)	Z3 (GMM)	Z3 (GMM)	Z4 (LSDV)	Z4 (LSDV)	Z4 (LSDV)
Hansen	76.35 [0.16]	74.96 [0.16]	73.54 [0.22]	73.28 [0.20]	73.28 [0.20]			
Diff-in-Hans lev	1.21 [0.98]	1.05 [0.98]	9.16 [0.17]	7.62 [0.27]	7.62 [0.27]			
Diff-in-Hans dep	17.56 [0.23]	17.69 [0.22]	13.79 [0.47]	14.48 [0.42]	14.48 [0.42]			
Diff-in-Hans IV	1.41 [0.84]	1.33 [0.93]	3.63 [0.46]	3.57 [0.61]	3.57 [0.61]			
Time dummies	YES	YES	YES	YES	YES	YES	YES	YES
Post-crisis dummy	NO	YES	NO	YES	YES	NO	NO	YES

In parentheses, standard errors (with the Windmeijer (2005) correction for Z1 and Z3 and the robust, bank-clustered versions for Z4) are reported. Significant estimates are denoted by asterisks: 0.1*, 0.05**, 0.01***. Brackets contain *p*-values of the test statistics. Excluding autocorrelations, all the remaining coefficient estimates and their standard errors are multiplied by 100

Z(-t) – lagged dependent variables; SIZE*PC – interaction effect of the corporate governance indicator and the post-crisis dummy variable; n observ. – number of observations; n instrum. – number of instruments; AB(t) – Arellano-Bond test of 1-th order autocorrelation; Hansen – Hansen test of overidentifying restrictions; Diff-in-Hans – difference-in-Hansen tests of exogeneity of instruments subsets; GMM-style instruments for levels (lev), lags of the dependent variable (dep), and IV-style instruments (IV)

Table 7 Estimation results for the board independence

Regressors	Dependent variable					
	Z1 (GMM)	Z1 (GMM)	Z3 (GMM)	Z3 (GMM)	Z4 (LSDV)	Z4 (LSDV)
Z(-1)	0.53 (0.08)***	0.53 (0.08)***	0.43 (0.08)***	0.43 (0.09)***		
Z(-2)	-0.11 (0.04)***	-0.12 (0.04)**	0.1 (0.04)***	0.11 (0.04)***		
Z(-3)	-0.05 (0.05)	-0.04 (0.05)	0.06 (0.04)*	0.06 (0.03)*		
INDEP	0.95 (1.08)	-0.03 (1.38)	0.15 (0.09)	-0.01 (0.12)	0.7 (0.25)***	0.58 (0.4)
INDEP*PC		0.41 (1.24)		0.2 (0.16)		0.22 (0.41)
ASSETS	-4.15 (19.67)	-5.69 (19.19)	9.87 (5.4)*	8.77 (5.32)*	-53.86 (25.4)**	-54.21 (25.45)**
LOA%ASS	4.75 (4.06)	2.9 (3.7)	0.95 (0.53)*	1.08 (0.53)**	0.07 (1.01)	0.03 (1.03)
NONP_LOA	-2.39 (3.37)	-1.78 (3.32)	1.42 (0.96)	1.78 (1.16)	-2.5 (1.35)*	-2.42 (1.32)*
CAP%CE	240.12 (106.15)**	195.13 (107.23)*	22.75 (20.39)	26.66 (20.81)	7.03 (23.46)	6.18 (23.28)
DEP%LOA	0.65 (17.49)	-1.85 (18.61)	9.2 (3.97)**	8.19 (4.62)*	-1.44 (4.47)	-1.79 (4.63)
GDP_GRO	-2.3 (3.12)	-2.64 (2.92)	1.35 (0.68)**	1.25 (0.66)*	5.22 (2.88)*	5.1 (2.9)*
GDP_LOG	-11.23 (26.28)	-9.49 (25.45)	17.05 (6.51)***	16.15 (6.65)**	-97.7 (106.07)	-98.17 (106.65)
REAL_IR	4.45 (2.95)	2.87 (2.45)	0.1 (0.44)	0.25 (0.44)	1.46 (1.36)	1.51 (1.39)
UNEMPL	-8.44 (9.82)	-10.04 (9.3)	0.59 (1.7)	-0.36 (1.89)	-4.62 (3.13)	-4.83 (3.21)
n observ.	1297	1297	1389	1389	1674	1674
n instrum.	78	79	89	90		
AB(1)	-6.02 [0.00]	-6.17 [0.00]	-2.77 [0.01]	-2.69 [0.01]		
AB(2)	0.03 [0.97]	0.13 [0.90]	-0.12 [0.90]	-0.24 [0.81]		
Hansen	60.68 [0.12]	60.3 [0.11]	58.82 [0.52]	57.36 [0.54]		
Diff-in-Hans lev	3.18 [0.67]	2.25 [0.81]	2.12 [0.91]	2.85 [0.83]		
Diff-in-Hans dep	14.87 [0.39]	14.32 [0.43]	13.04 [0.52]	11.71 [0.63]		
Diff-in-Hans IV	2.19 [0.53]	2.05 [0.73]	4.10 [0.39]	3.33 [0.65]		

Table 7 (continued)

Regressors	Dependent variable							
	Z1 (GMM)	Z1 (GMM)	Z3 (GMM)	Z3 (GMM)	Z3 (GMM)	Z4 (LSDV)	Z4 (LSDV)	Z4 (LSDV)
Time dummies	YES	YES	YES	YES	YES	YES	YES	YES
Post-crisis dummy	NO	YES	NO	NO	YES	NO	NO	YES

In parentheses, standard errors (with the Windmeijer (2005) correction for Z1 and Z3 and the robust, bank-clustered versions for Z4) are reported. Significant estimates are denoted by asterisks: 0.1*, 0.05**, 0.01***. Brackets contain *p*-values of the test statistics. Excluding autocorrelations, all the remaining coefficient estimates and their standard errors are multiplied by 100

Z(-) – lagged dependent variables; INDEP*PC – interaction effect of the corporate governance indicator and the post-crisis dummy variable; n observ. – number of observations; n instrum. – number of instruments; AB(i) – Arellano-Bond test of i-th order autocorrelation; Hansen – Hansen test of overidentifying restrictions; Diff-in-Hans – difference-in-Hansen tests of exogeneity of instruments subsets; GMM-style instruments for levels (lev), lags of the dependent variable (dep), and IV-style instruments (IV)

Table 8 Estimation results for board members affiliations

Regressors	Dependent variable			
	Z1 (GMM)	Z1 (GMM)	Z3 (GMM)	Z4 (LSDV)
Z(-1)	0.48 (0.07)***	0.48 (0.07)***	0.45 (0.1)***	0.46 (0.1)***
Z(-2)	-0.12 (0.03)***	-0.12 (0.03)***	0.1 (0.04)***	0.1 (0.04)***
Z(-3)	-0.08 (0.05)*	-0.08 (0.05)*	0.04 (0.04)	0.04 (0.04)
AFFIL	0.24 (0.35)	0.59 (0.57)	-0.28 (0.1)***	-0.06 (0.19)
AFFIL*PC		-0.43 (0.66)		-0.24 (0.18)
ASSETS	2.93 (16.22)	1.09 (17.6)	0.88 (4.27)	1.54 (3.99)
LOA%ASS	1.28 (1.45)	1.2 (1.29)	1.36 (0.57)**	1.29 (0.52)**
NONP_LOA	-0.18 (3.4)	-0.1 (3.23)	0.71 (1.18)	0.86 (1.09)
CAP%CE	168.93 (68.72)**	174.69 (65.33)***	61 (21.59)***	59.4 (19.64)***
DEP%LOA	17.25 (18.52)	16.49 (18.11)	3.06 (3.2)	3.29 (2.01)
GDP_GRO	-2.22 (2.4)	-2.39 (2.48)	-0.04 (0.63)	-0.02 (0.6)
GDP_LOG	8.3 (22.31)	6.73 (23.63)	9.37 (4.59)**	9.75 (4.39)**
REAL_IR	2.14 (1.32)	2.19 (1.19)*	0.64 (0.54)	0.63 (0.45)
UNEMPL	-13.46 (7.68)**	-13.82 (7.37)*	-2.28 (1.45)	-2.25 (1.36)*
n observ.	1281	1281	1372	1372
n instrum.	94	95	94	95
AB(1)	-6.16 [0.00]	-6.26 [0.00]	-2.45 [0.01]	-2.46 [0.01]
AB(2)	0.02 [0.99]	0.03 [0.98]	-0.68 [0.50]	-0.61 [0.55]
Hansen	79.63 [0.11]	78.67 [0.10]	77.58 [0.14]	77.83 [0.12]
Diff-in-Hans lev	1.78 [0.94]	1.89 [0.93]	8.5 [0.20]	6.85 [0.34]
Diff-in-Hans dep	16.18 [0.3]	16.65 [0.28]	12.22 [0.59]	11.59 [0.64]
Diff-in-Hans IV	1.90 [0.76]	1.91 [0.86]	2.26 [0.69]	1.89 [0.86]
				1653

Table 8 (continued)

Regressors	Dependent variable							
	Z1 (GMM)	Z1 (GMM)	Z3 (GMM)	Z3 (GMM)	Z3 (GMM)	Z4 (LSDV)	Z4 (LSDV)	Z4 (LSDV)
Time dummies	YES	YES	YES	YES	YES	YES	YES	YES
Post-crisis dummy	NO	YES	NO	NO	YES	NO	NO	YES

In parentheses, standard errors (with the Windmeijer (2005) correction for Z1 and Z3 and the robust, bank-clustered versions for Z4) are reported. Significant estimates are denoted by asterisks: 0.1*, 0.05**, 0.01***. Brackets contain p -values of the test statistics. Excluding autocorrelations, all the remaining coefficient estimates and their standard errors are multiplied by 100

Z(-) – lagged dependent variables; AFFIL*PC – interaction effect of the corporate governance indicator and the post-crisis dummy variable; n observ. – number of observations; n instrum. – number of instruments; AB(i) – Arellano-Bond test of i -th order autocorrelation; Hansen – Hansen test of overidentifying restrictions; Diff-in-Hans – difference-in-Hansen tests of exogeneity of instruments subsets; GMM-style instruments for levels (lev), lags of the dependent variable (dep), and IV-style instruments (IV)

Table 9 Estimation results for the board experience

Regressors	Dependent variable					
	Z1 (GMM)	Z1 (GMM)	Z3 (GMM)	Z3 (GMM)	Z4 (LSDV)	Z4 (LSDV)
Z(-1)	0.14 (0.11)	0.15 (0.11)	0.39 (0.12)**	0.4 (0.12)**		
Z(-2)	0.02 (0.07)	0.03 (0.08)	0.08 (0.05)*	0.08 (0.05)*		
Z(-3)	-0.06 (0.05)	-0.06 (0.05)	0.05 (0.05)	0.05 (0.05)		
EXPER	-0.42 (0.61)	-0.33 (0.67)	0.04 (0.17)	0.03 (0.17)	-0.24 (0.49)	0 (0.52)
EXPER*PC		-0.02 (0.45)		0.03 (0.16)		-0.42 (0.39)
ASSETS	-19.9 (20.37)	-16.48 (19.77)	-3.53 (5.88)	-3.05 (5.52)	-74.28 (29.7)**	-74.3 (29.19)**
LOA%ASS	2.41 (1.29)*	2.34 (1.26)*	1.04 (0.51)**	1.02 (0.52)**	0.84 (1.25)	0.86 (1.25)
NONP_LOA	-1.31 (4.1)	-1.22 (4.16)	1.68 (1.18)	1.77 (1.22)	-1.31 (1.6)	-1.75 (1.68)
CAP%CE	152.51 (56.95)***	146.42 (53.59)***	37.6 (26.37)	38.08 (27.26)	12.12 (26.76)	13.16 (27.84)
DEP%LOA	-5.86 (18.57)	-4.74 (18.81)	2.31 (3.59)	2.56 (3.58)	-8.01 (3.93)**	-7.66 (3.96)*
GDP_GRO	-4.15 (2.52)	-3.85 (2.5)	-0.12 (0.76)	-0.15 (0.78)	7.01 (3.3)**	7.06 (3.3)**
GDP_LOG	-26.8 (24.22)	-22.92 (23.94)	3.68 (6.04)	4.16 (5.93)	-129.9 (122.09)	-136.51 (123.89)
REAL_IR	1.79 (1.27)	1.66 (1.24)	-0.1 (0.68)	-0.05 (0.69)	2.08 (1.75)	1.79 (1.77)
UNEMPL	-12.85 (6.05)**	-12.29 (6.06)**	-2.68 (1.55)*	-2.72 (1.49)*	-1.79 (3.01)	-1.21 (3.02)
n observ.	1099	1099	1181	1181	1441	1441
n instrum.	93	94	94	95		
AB(1)	-2.02 [0.04]	-1.96 [0.05]	-2.38 [0.02]	-2.39 [0.02]		
AB(2)	-1.91 [0.06]	-1.93 [0.05]	-0.19 [0.85]	-0.2 [0.84]		
Hansen	74.51 [0.17]	75.64 [0.13]	74.82 [0.19]	74.31 [0.18]		
Diff-in-Hans lev	2.49 [0.87]	1.8 [0.94]	4.91 [0.56]	5.29 [0.51]		
Diff-in-Hans dep	14.79 [0.32]	15.03 [0.31]	7.5 [0.91]	7.53 [0.91]		
Diff-in-Hans IV	0.79 [0.94]	2.24 [0.81]	0.53 [0.97]	1.31 [0.93]		

Table 9 (continued)

Regressors	Dependent variable							
	Z1 (GMM)	Z1 (GMM)	Z3 (GMM)	Z3 (GMM)	Z3 (GMM)	Z4 (LSDV)	Z4 (LSDV)	Z4 (LSDV)
Time dummies	YES	YES	YES	YES	YES	YES	YES	YES
Post-crisis dummy	NO	YES	NO	NO	YES	NO	NO	YES

In parentheses, standard errors (with the Windmeijer (2005) correction for Z1 and Z3 and the robust, bank-clustered versions for Z4) are reported. Significant estimates are denoted by asterisks: 0.1*, 0.05**, 0.01***. Brackets contain p -values of the test statistics. Excluding autocorrelations, all the remaining coefficient estimates and their standard errors are multiplied by 100

Z(-t) – lagged dependent variables; EXPER*PC – interaction effect of the corporate governance indicator and the post-crisis dummy variable; n observ. – number of observations; n instrum. – number of instruments; AB(i) – Arellano-Bond test of i-th order autocorrelation; Hansen – Hansen test of overidentifying restrictions; Diff-in-Hans – difference-in-Hansen tests of exogeneity of instruments subsets; GMM-style instruments for levels (lev), lags of the dependent variable (dep), and IV-style instruments (IV)

Table 10 Estimation results for the background and skills of board members

Regressors	Dependent variable					
	Z1 (GMM)	Z1 (GMM)	Z3 (GMM)	Z3 (GMM)	Z4 (LSDV)	Z4 (LSDV)
Z(-1)	0.47 (0.07)***	0.48 (0.07)***	0.48 (0.09)***	0.47 (0.09)***		
Z(-2)	-0.12 (0.03)***	-0.12 (0.03)***	0.1 (0.04)***	0.1 (0.04)***		
Z(-3)	-0.06 (0.05)	-0.06 (0.05)	0.04 (0.04)	0.05 (0.04)		
SKILLS	-0.02 (0.19)	-0.33 (0.36)	0.04 (0.05)	-0.05 (0.07)	0.09 (0.19)	-0.05 (0.25)
SKILLS*PC		0.51 (0.47)		0.16 (0.09)*		0.33 (0.3)
ASSETS	0.64 (14.91)	2.19 (14.47)	-1.25 (3.37)	-0.88 (3.13)	-47.9 (25.09)*	-47.82 (25.12)*
LOA%ASS	1.08 (1.28)	0.99 (1.16)	1.38 (0.51)***	1.33 (0.48)***	0.46 (0.99)	0.5 (0.98)
NONP_LOA	0.6 (3.29)	0.49 (3.02)	1.1 (1.05)	1.25 (0.97)	-1.88 (1.33)	-1.75 (1.32)
CAP%CE	142.24 (59.31)**	129.03 (60.22)**	56.42 (21.35)***	52.63 (19.91)***	10.39 (24.13)	9.76 (23.77)
DEP%LOA	14.64 (16.53)	14.57 (15.76)	0.94 (2.96)	1.17 (2.93)	-1.8 (4.14)	-1.78 (4.4)
GDP_GRO	-1.37 (2.24)	-1.09 (2.23)	0 (0.56)	0.09 (0.53)	5.04 (2.79)*	4.93 (2.82)*
GDP_LOG	5.39 (19.88)	5.2 (18.8)	6.46 (4.14)	6.78 (4.14)	-108.72 (95.99)	-117.62 (96.22)
REAL_IR	1.74 (1.2)	1.49 (1.17)	0.73 (0.48)	0.66 (0.46)	1.1 (1.39)	1.22 (1.43)
UNEMPL	-13.48 (7.41)*	-12.55 (7.16)*	-3.05 (1.61)*	-2.91 (1.42)**	-4.47 (2.71)	-4.37 (2.74)
n observ.	1369	1369	1471	1471	1823	1823
n instrum.	94	95	94	95		
AB(1)	-6.20 [0.00]	-6.31 [0.00]	-2.87 [0.00]	-2.84 [0.01]		
AB(2)	0.38 [0.71]	0.25 [0.80]	-0.03 [0.98]	-0.02 [0.98]		
Hansen	78.89 [0.12]	77.88 [0.11]	72.93 [0.23]	69.44 [0.30]		
Diff-in-Hans lev	1.41 [0.97]	1.41 [0.97]	7.77 [0.26]	7.32 [0.29]		
Diff-in-Hans dep	19.93 [0.13]	18.65 [0.18]	11.84 [0.62]	10.95 [0.69]		
Diff-in-Hans IV	5.46 [0.24]	6.87 [0.23]	3.97 [0.41]	6.88 [0.23]		

Table 10 (continued)

Regressors	Dependent variable							
	Z1 (GMM)	Z1 (GMM)	Z3 (GMM)	Z3 (GMM)	Z3 (GMM)	Z4 (LSDV)	Z4 (LSDV)	Z4 (LSDV)
Time dummies	YES	YES	YES	YES	YES	YES	YES	YES
Post-crisis dummy	NO	YES	NO	NO	YES	NO	NO	YES

In parentheses, standard errors (with the Windmeijer (2005) correction for Z1 and Z3 and the robust, bank-clustered versions for Z4) are reported. Significant estimates are denoted by asterisks: 0.1*, 0.05**, 0.01***. Brackets contain p -values of the test statistics. Excluding autocorrelations, all the remaining coefficient estimates and their standard errors are multiplied by 100

Z(-) – lagged dependent variables; SKILLS*PC – interaction effect of the corporate governance indicator and the post-crisis dummy variable; n observ. – number of observations; n instrum. – number of instruments; AB(i) – Arellano-Bond test of i -th order autocorrelation; Hansen – Hansen test of overidentifying restrictions; Diff-in-Hans – difference-in-Hansen tests of exogeneity of instruments subsets; GMM-style instruments for levels (lev), lags of the dependent variable (dep), and IV-style instruments (IV)

Table 11 Estimation results for the common equity to total assets dependent variable

Regressors		Independent CG indicator			
	SIZE	SKILLS	EXPER	INDEP	AFFIL
Y(-1)	0.8 (0.08)***	0.71 (0.07)***	0.56 (0.07)***	0.73 (0.09)***	0.72 (0.07)***
CG	1.95 (1.79)	0.62 (0.29)**	2.71 (1.33)**	1.38 (0.79)*	0.37 (0.37)
ASSETS	17.63 (36.12)	36.43 (27.99)	53.53 (41.92)	28.66 (31.97)	27.13 (37.37)
LOA%ASS	3.69 (2.36)	4.6 (1.87)**	5.82 (2.69)**	1.49 (2.68)	4.25 (2.56)*
NONP_LOA	-7.18 (5.37)	-1.41 (5.85)	-5.42 (6.87)	2.07 (5.22)	-4.66 (7.14)
CAP%CE	34.18 (18.78)*	36.42 (19.76)*	30.21 (11.80)**	30.89 (30.85)	17.88 (20.98)
DEP%LOA	-6.55 (6.77)	-3.35 (6.25)	-19.38 (15.27)	22.59 (14.64)	24.23 (37.73)
GDP_GRO	-4.32 (6.26)	5.33 (4.87)	9.98 (4.66)**	9.54 (5.44)*	12.2 (6.33)*
GDP_LOG	-12.08 (42.35)	13.81 (31.20)	-5.06 (51.09)	28.28 (30.74)	49.22 (53.56)
REAL_IR	-2.08 (2.55)	1.15 (1.74)	-0.13 (2.87)	3.07 (3.17)	4.19 (3.11)
UNEMPL	29.32 (13.24)**	18.9 (14.29)	36.73 (12.38)***	3.32 (11.94)	13.79 (15.45)
n observ.	1828	1828	1440	1698	1668
n instrum.	47	49	48	40	40
AB(1)	-3.34 [0.00]	-3.25 [0.00]	-2.39 [0.02]	-2.66 [0.01]	-3.31 [0.00]
AB(2)	-0.99 [0.32]	-1.12 [0.26]	0.88 [0.38]	-1.22 [0.22]	0.06 [0.96]
Hansen	21.42 [0.37]	30.22 [0.11]	24.41 [0.27]	13.48 [0.41]	9.79 [0.71]
Diff-in-Hans lev	2.38 [0.88]	5.33 [0.50]	5.58 [0.47]	8.74 [0.19]	6.67 [0.35]
Diff-in-Hans dep	13.52 [0.49]	17.35 [0.24]	17.16 [0.29]	3.82 [0.58]	3.17 [0.67]
Diff-in-Hans IV	1.93 [0.38]	6.48 [0.17]	6.22 [0.10]	4.10 [0.39]	0.77 [0.94]
Time dummies	YES	YES	YES	YES	YES
Post-crisis dummy	NO	NO	NO	NO	NO

In each case, common equity to total assets is the dependent variable and one of the corporate governance indicator is employed as a regressor. In parentheses, standard errors (with the Windmeijer (2005) correction) are reported. Significant estimates are denoted by asterisks: 0.1*, 0.05**, 0.01***. Brackets contain *p*-values of the test statistics. Excluding autocorrelations, all the remaining coefficient estimates and their standard errors are multiplied by 100. Y(-1) – lagged dependent variable; n observ. – number of observations; n instrum. – number of instruments; AB(i) – Arellano-Bond test of *i*-th order autocorrelation; Hansen – Hansen test of overidentifying restrictions; Diff-in-Hans – difference-in-Hansen tests of exogeneity of instruments subsets; GMM-style instruments for levels (lev), lags of the dependent variable (dep), and IV-style instruments (IV)

Table 12 Estimation results for the return on assets dependent variable

Regressor	Independent CG indicator				
	SIZE	SKILLS	EXPER	INDEP	AFFIL
Y(-1)	0.32 (0.15)**	0.31 (0.15)**	0.42 (0.09)**	0.27 (0.14)*	0.20 (0.16)
CG	-0.09 (0.20)	-0.18 (0.17)	-1.07 (1.46)	-0.13 (0.30)	-0.39 (0.27)
ASSETS	-20.74 (14.34)	-22.96 (12.69)*	-22.67 (20.87)	-19.09 (15.35)	-33.91 (21.97)
LOA%ASS	0.38 (1.11)	0.31 (1.16)	-0.04 (1.83)	1.16 (0.94)	0.42 (1.38)
NONP_LOA	-4.38 (1.56)**	-4.49 (1.54)**	-7.89 (4.58)*	-4.16 (1.52)**	-4.56 (2.00)**
CAP%CE	3.06 (4.54)	2.87 (4.6)	4.28 (8.15)	5.89 (4.49)	3.4 (6.15)
DEP%LOA	12.07 (9.78)	12.84 (9.95)	5.74 (7.01)	11.33 (9.67)	14.32 (15.44)
GDP_GRO	0.95 (1.71)	0.92 (1.74)	-0.25 (1.97)	1.41 (1.46)	1.06 (1.86)
GDP_LOG	-39.42 (17.66)**	-38.85 (15.69)**	-32.08 (19.76)	-38.92 (16.10)**	-50.31 (22.42)**
REAL_IR	1.72 (1.17)	1.72 (1.11)	2.17 (1.30)*	2.27 (1.11)**	2.25 (1.36)*
UNEMPL	-1.92 (2.24)	-2.29 (2.26)	0.92 (2.68)	-1.33 (2.00)	-2.45 (2.64)
n observ.	1725	1725	1360	1599	1572
n instrum.	80	80	85	80	80
AB(1)	-2.63 [0.01]	-2.64 [0.01]	-3.13 [0.00]	-2.46 [0.01]	-2.14 [0.03]
AB(2)	-0.9 [0.37]	-0.9 [0.37]	-0.07 [0.94]	-0.98 [0.33]	-1.16 [0.24]
Hansen	57.9 [0.30]	57.33 [0.32]	64.15 [0.27]	54.61 [0.41]	49.88 [0.60]
Diff-in-Hans lev	2.76 [0.84]	2.85 [0.83]	6.25 [0.40]	2.42 [0.88]	3.27 [0.78]
Diff-in-Hans dep	6.12 [0.19]	7.61 [0.11]	8.99 [0.11]	3.3 [0.51]	4.21 [0.38]
Diff-in-Hans IV	0.92 [0.97]	1.1 [0.95]	5.57 [0.23]	1.01 [0.96]	3.98 [0.55]

Table 12 (continued)

Regressor	Independent CG indicator				
	SIZE	SKILLS	EXPER	INDEP	AFFIL
Time dummies	YES	YES	YES	YES	YES
Post-crisis dummy	NO	NO	NO	NO	NO

In each case, return on assets is the dependent variable and one of the corporate governance indicator is employed as a regressor. In parentheses, standard errors (with the Windmeijer (2005) correction) are reported. Significant estimates are denoted by asterisks: 0.1*, 0.05**, 0.01***. Brackets contain p-values of the test statistics. Excluding autocorrelations, all the remaining coefficient estimates and their standard errors are multiplied by 100. Y(-1) – lagged dependent variable; n observ. – number of observations; n instrum. – number of instruments; AB(i) – Arellano-Bond test of i-th order autocorrelation; Hansen – Hansen test of overidentifying restrictions; Diff-in-Hans – difference-in-Hansen tests of exogeneity of instruments subsets; GMM-style instruments for levels (lev), lags of the dependent variable (dep), and IV-style instruments (IV)

Table 13 Estimation results for the standard deviation of return on assets as the dependent variable

Regressor	Independent CG indicator				
	SIZE	SKILLS	EXPER	INDEP	AFFIL
Y(-1)	0.58 (0.07)***	0.41 (0.10)***	0.47 (0.10)***	0.63 (0.08)***	0.39 (0.14)***
Y(-2)	0.02 (0.04)	0.01 (0.04)	-0.02 (0.06)	0.05 (0.05)	-0.02 (0.05)
Y(-3)	-0.45 (0.10)***	-0.45 (0.10)***	-0.31 (0.09)***	-0.44 (0.11)***	-0.49 (0.10)***
CG	0.10 (0.09)	0.04 (0.09)	0.13 (0.11)	-0.03 (0.13)	-0.04 (0.14)
ASSETS	-8.08 (4.41)*	-7.96 (4.74)*	3.35 (4.02)	-6.96 (7.27)	-0.09 (9.56)
LOA%ASS	-0.27 (0.47)	-0.34 (0.5)	-0.09 (0.45)	-0.24 (0.58)	0.12 (0.76)
NONP_LOA	2.31 (1.36)*	2.31 (1.45)	1.94 (1.18)	1.67 (1.34)	3.22 (1.54)**
CAP%CE	-27.84 (20.97)	-45.72 (27.81)	-24.18 (24.11)	-28.77 (23.67)	-31.08 (32.86)
DEP%LOA	-4.37 (2.53)*	-4.1 (2.15)*	-0.29 (1.1)	-6.56 (2.99)**	-11.38 (5.11)**
GDP_GRO	-1.09 (0.91)	-0.39 (0.97)	0.57 (1.01)	-0.98 (0.99)	0.46 (1.18)
GDP_LOG	-11.19 (5.5)**	-10.15 (5.32)*	3.43 (4.69)	-10.42 (5.55)*	-2.27 (10.06)
REAL_IR	-0.26 (0.49)	-0.36 (0.52)	-0.02 (0.51)	-0.19 (0.68)	0.25 (0.74)
UNEMPL	-0.23 (1.59)	1.23 (2.04)	1.77 (1.7)	-1.42 (1.87)	1.3 (2.76)
n observ.	1390	1390	1108	1318	1302
n instrum.	94	93	93	89	88
AB(1)	-3.08 [0.00]	-2.98 [0.00]	-3.08 [0.00]	-2.89 [0.00]	-2.69 [0.01]
AB(2)	0.88 [0.38]	0.87 [0.39]	1.03 [0.31]	0.94 [0.35]	0.68 [0.49]
Hansen	74.71 [0.19]	70.22 [0.28]	65.9 [0.41]	67.92 [0.23]	68.72 [0.18]
Diff-in-Hans lev	8.7 [0.19]	4.29 [0.51]	5.65 [0.34]	9.87 [0.13]	7.65 [0.18]
Diff-in-Hans dep	18.33 [0.19]	15.01 [0.31]	12.63 [0.48]	16.18 [0.30]	17.69 [0.17]
Diff-in-Hans IV	2.14 [0.71]	5.94 [0.20]	1.47 [0.83]	2.12 [0.71]	4.78 [0.31]

Table 13 (continued)

Regressor	Independent CG indicator				
	SIZE	SKILLS	EXPER	INDEP	AFFIL
Time dummies	YES	YES	YES	YES	YES
Post-crisis dummy	NO	NO	NO	NO	NO

In each case, standard deviation (calculated for rolling windows with 3 observations) of return on assets is the dependent variable and one of the corporate governance indicator is employed as a regressor. In parentheses, standard errors (with the Windmeijer (2005) correction) are reported. Significant estimates are denoted by asterisks: 0.1*, 0.05**, 0.01***. Brackets contain p-values of the test statistics. Excluding autocorrelations, all the remaining coefficient estimates and their standard errors are multiplied by 100. $Y(-t)$ – lags of the dependent variable; n observ. – number of observations; n instrum. – number of instruments; $AB(i)$ – Arellano-Bond test of i -th order autocorrelation; Hansen – Hansen test of overidentifying restrictions; Diff-in-Hans – difference-in-Hansen tests of exogeneity of instruments subsets; GMM-style instruments for levels (lev), lags of the dependent variable (dep), and IV-style instruments (IV)

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