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Audit quality, bank risks, and cross-country regulations.

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Abstract

The recent turmoil in global financial markets has accentuated the need to better understand the fundamental determinants of bank risks. A large body of literature has emerged to address this issue in depth. However, the role of auditing in monitoring and shaping bank risk taking has not hitherto been considered. In this paper we examine the link between audit quality, banks' equity risk and cross-market regulatory differences in the G10 countries in the run-up to the 2007-2009 financial crisis. We find that higher audit quality is, on average, associated with lower systematic risk and this link is stronger in countries with weaker regulations. Our empirical findings bear important strategic implications for bank regulators and supervisors with an interest in improving auditing standards and banking sector policies.

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1. Introduction

Auditing provides an effective means to align the objectives of managers and stakeholders, thereby facilitating the resolution of the principal-agent conflict portrayed in agency theory (Simunic, 1984). Accordingly, greater audit quality is paramount in promoting investors' confidence in the credibility of company financial information (Krishnan, 2003) and should be reflected in lower systematic risk and risk premium. The existing literature largely supports this view (Teoh and Wong, 1993; Krishnamurthy and Zhou, 2006; Khurana and Raman, 2004).

At the same time, the role of auditors as shareholders' agents raises concerns about their independence and objectivity. This predilection is particularly pronounced in the business of financial intermediation, where the optimal resolution of the agency problem is impeded by the high levels of leverage at which financial firms operate and by pervasive regulatory intervention. In the presence of high leverage and limited liability, banks' dominant stockholders are inclined to collude with managers and gain at the expense of minority shareholders and depositors by pursuing risky projects. Consequently, the burden of overseeing bank risk-taking falls on the shoulders of the latter agents who would logically represent the consumers of the audit information. The audit quality is therefore of great importance for these agents. However, minority shareholders and depositors are unlikely to evaluate robustly the quality of the audit process owing to their scarce knowledge of audit procedures and auditors' incentives.[1] Instead, they assess the reliability of auditors' opinions and recommendations on the basis of indirect proxies of audit quality and reputation, such as the auditors' size and brand name. For this reason, the risk premium required by investors decreases as a function of the perceived quality and reputation of the auditor.

Against this background, a plethora of theoretical and empirical contributions suggests that stricter prudential regulations (e.g. deposit insurance, financial safety net, and disclosure requirements) reduce depositors' monitoring incentives. The reduced depositor discipline, in turn, aggravates the moral hazard problem and compromises the role of auditing. This issue has been repeatedly flagged by regulators and led to the introduction of various remedial measures. However, the regulatory actions varied across countries and little information is available on their intertemporal effects on the role of auditing in different markets.

Despite these material concerns, no scholarly research has hitherto considered the link between auditing and banks' equity risk. The lack of research in this area is somewhat surprising given recent evidence unambiguously linking audit quality to banks' ratings (Douthett et al., 2001) and given the important role that auditors played in the 2007-2009 financial crisis (Woods et al., 2009). Accordingly, the objective of our work is to fill this gap in the literature by addressing the direct influence of audit quality on banks' equity risk. We offer two important contributions to the literature.

First, we examine the effect of audit quality on banks' systematic risk for an extensive international sample of publicly traded institutions immediately before the 2007-2009 financial crisis. We demonstrate that audit quality had a direct effect on bank risk-taking in the run up to the crisis, robust to different sub-periods and a comprehensive set of control variables. We use alternative measures of risk to validate our empirical results.

Second, we examine whether, and to what extent, the relationship between audit quality and bank risks is affected by cross-country regulatory differences. Our findings could prove useful to policy makers for formulating, implementing and evaluating auditing standards and banking regulations aimed at promoting greater market discipline. We control for various aspects of national bank regulations, including a variety of measures of information disclosure, strength of external audit, law regulation, and diversification requirements, as well as the design of the

[1] This may require access to audit working papers and clients' private data (Moizer, 1997).

country's deposit insurance scheme. Overall, we find that the relationship between audit quality and bank risks is stronger, the weaker the regulations in the reference country.

The remainder of the paper is organised as follows. Section 2 reviews pertinent literature and outlines a set of testable hypotheses. The research methodology and the dataset that we use are presented in Sections 3 and 4, respectively. Section 5 discusses the empirical findings, Section 6 outlines a set of robustness tests and Section 7 concludes the paper.

2. Literature review and hypotheses formulation

In this paper, we examine the effect of audit quality on the market's perception of banks' risk exposure and the extent to which different regulatory regimes affect this relationship.

2.1. Audit quality and bank risks

Banks encounter various types of risk, which largely emanate from their unique set of operations and their asset-liability composition. The assets they hold are exposed to credit risk, while the liability side of their balance sheets is subject to liquidity risk. In addition, banks are affected to varying degrees by market and operational risks. Historically, due to these risks and the essential role financial institutions play in the economy[2], they have received special attention from regulators and researchers. This interest has led to substantial literature attempting to model the major risks faced by financial firms, with researchers proposing numerous parameterisations of the standard market model (see for example Chamberlain, Howe, and Popper, 1997; Elyasiani and Mansur, 1998; Flannery, Hameed, and Harjes, 1997). However, the majority of studies concentrate on the identification of banks' risks, and there are only a few works analysing the determinants of risk exposures. Furthermore, the rare studies that analyse the risk determinants typically limit their methodological assessments to company-specific financial information (Flannery and James, 1984; Demsetz and Strahan, 1997), thereby providing somewhat limited evidence.

Even more puzzling is that none of the academic studies has hitherto considered the role of auditing in the investors' assessment of banks' risk exposure. However, we argue that the auditors' monitoring role is crucial for solving banks' agency problems and has important bearings on the market's assessment of risk. This view is supported partially by Douthett et al. (2001) who analyse a sample of 252 banks and conclude that banks employing a Big4 audit firm receive significantly higher ratings. Other contributions in the area further suggest that Big4 audit firms are associated with higher credibility. Thus, De Angelo (1981) finds that audits of Big4 audit firms are of a higher quality.

Previous research also indicates that the audit quality differentiation between Big4 and non-Big4 audit firms is recognised by investors. Teoh and Wong (1993) find that the earnings response coefficient for the clients of Big4 audit firms is significantly higher than for non-Big4 firms' auditees. Krishnamurthy and Zhou (2006) document that Andersen's clients experienced significant share price decline after the audit firm was indicted for the Enron affair. However, this effect was less pronounced for the companies switching from Andersen to another Big4 audit firm.

Against this background, the existing evidence in the literature also points to the fact that, under certain conditions, audit quality can be positively associated with risk (see, for example, Lee et al., 2003; Clarkson and Simunic, 1994; Feltham, Hughes, and Simunic, 1991; Datar, Feltham, and Hughes, 1991). In a theoretical study, Datar et al. (1991) postulate that riskier IPO companies exhibit demand for higher audit quality. In general, empirical research, dominated by studies focusing on firms headquartered in the US, finds little support for this theory (Watkins, Hillison, and Morecroft, 2004). Yet, a few studies report results that are

[2] The main functions performed by financial institutions are outlined in Cornett and Saunders (2010).

aligned with the theory's prediction (Feltham et al., 1991). Furthermore, Clarkson and Simunic (1994) and Lee et al. (2003) also report a positive relationship between audit quality and new issues' risk, but only for countries with a relatively less litigious regulatory environment.

In agreement with the aforementioned evidence in the banking literature, we argue that investors assign a different level of confidence to banks audited by Big4 audit firms compared to banks audited by non-Big4 firms. This should, in turn, lead to differences in the market's perception of these banks' risk. We hence put forward the first hypothesis as follows:

Hypothesis 1: Banks audited by Big4 audit firms face a different level of risk compared to banks audited by non-Big4 audit firms, ceteris paribus.

2.2. Regulations, audit quality and bank risks

National bank regulations and supervisory provisions have been consistently acknowledged as key drivers of firms' profitability and risk taking. The most prominent factors recognised in the literature include liquidity and diversification requirements, the deposit protection provision, accounting and information disclosure constraints, and the quality of political and court systems.

A number of works examine the impact of cross-country differences in regulations on bank performance. Analysing a sample of 13 OECD countries over 1985-1990, Bartholdy et al. (2001) find that the existence of explicit deposit insurance lowers the deposit interest rate by 25 basis points. Analysing a comprehensive sample of banks across 80 developed and developing countries over 1988-1995, Demirgüç-Kunt and Huizinga (1999) report that both the market financial structure as well as legal and institutional settings have a significant impact on banks' profitability and interest margins. The authors also find that indicators of better contract enforcement, efficiency of the legal system and lack of corruption are associated with lower realised interest margins and lower profitability, while the design of the deposit insurance scheme in the country significantly affects bank margins. Further contributions in the area also flag bank regulatory provisions as a vital determinant of individual banks' credit risk (Barth, Caprio, and Levine, 2001, 2004, 2008), banks' systemic risk in general (Demirgüç-Kunt and Detragiache, 2002) and banks' interest rate risk (Zagonov, Keswani, and Marsh, 2011).

In terms of auditing, previous research concludes that quality differentiation between Big4 and non-Big4 auditors depends strongly on the institutional characteristics of the country in which the audit firms operate. Choi, Kim, and Liu (2008) use audit fees as a proxy for audit quality and report that fees are higher in markets with strong legal liability regimes; the Big4 auditors' premiums decline as countries' legal liability regimes strengthen. This view is also supported by Francis and Wang (2008) who analyse a sample of 42 countries over the 1994 to 2004 period and find that clients of Big4 audit firms report higher earnings quality, particularly in countries with a stronger investor protection regime. In contrast, the entities audited by non-Big4 auditors seem to be unaffected by differences in investor protection regimes.

Given this evidence, it is imperative to analyse the direct influence of heterogeneous cross-country regulatory provisions on the effectiveness of auditing activities in curbing bank risks. Therefore, we formulate the following hypothesis:

Hypothesis 2: The association between audit quality and the market's perception of banks' risk exposure is influenced by cross-country regulatory differences.

3. Methodology

We examine whether the quality of a bank's auditor has bearings on the market's assessment of the bank's risk. The existing literature offers copious approaches to capture bank risks. Most of them fall within three primary categories.

First, the risk exposure of an individual bank can be inferred from its credit rating. However, we choose not to follow this approach because it has been subjected to severe criticism in recent years. Researchers emphasise the conflict of interest that inherently exists between credit rating agencies and issuers they review and point to overconfidence of the credit rating agencies in the run up to the financial crisis (Cornaggia, Cornaggia, and Hund, 2015). Further, the credit ratings are not consistently available for all banks in our sample.

Second, many studies employ accounting measures of bank risk, such as liquidity, profitability, and loan performance indicators, among others. However, the accounting measures of risk are backward looking rather than forward looking measures of financial performance. In addition, the accounting measures are subject to the idiosyncrasies of accounting practices implemented in different countries. The latter is of particular importance to our cross-country analysis as many banks in the sample are subject to different accounting rules.

A third approach to assess bank risks is based on market data. Market indicators reflect the capital market's assessment of bank financial conditions and prove effective in summarising multifarious institutional and economic factors in one easy-to-interpret measure of risk. For this reason, and given the general unreliability of the aforementioned approaches, we employ market measures of risk in our analysis. In particular, we use the individual bank systematic risk, measured by the market beta, as our dependent risk variable. Systematic risk has been used as a measure of risk in numerous empirical studies (Haq and Heaney, 2009; Baele, De Jonghe, and Vander Vennet, 2007; Stiroh, 2006; Strahan, 2006; Akhigbe and Whyte, 2004; Saunders, Strock, and Travlos, 1990; Aharony, Saunders, and Swary, 1988). In their recent survey of the existing literature on the risk factors affecting bank returns, Baele et al. (2015) note that the market factor is the only factor over which the literature reaches a consensus. The authors demonstrate that the market factor together with another two factors (real estate and Fama-French high-minus-low – HML) are the only risk factors from a broad set of factors that are reliably related to returns of US banks during the 1986 to 2006 period.

To the extent that banks' investor base is typically dominated by institutional investors from the financial sector with diversified portfolio holdings (Keswani, Stolin, and Tran, 2016), we concentrate on banks' systematic risk instead of diversifiable idiosyncratic (and total) risk. We use as our primary indicator of bank risk the market beta, which represents a universal measure of systematic risk. In the robustness section, we further confirm our baseline results by employing alternative measures of bank risk-taking, which capture credit and insolvency risks.

To analyse the relationship between audit quality and bank risk we follow a two-stage approach. The first step involves the identification of banks' exposures to changes in market prices. In the second step, we treat the estimated market measures of risk as dependent variables and relate them to a number of auditing, bank-level and market-level control variables.

3.1. Identification

We identify the sensitivity of bank returns to changes in market prices via an augmented parameterisation of the market model.[3] We regress weekly stock returns on bank *i*, calculated

[3] We control for the effect of the real estate market, in line with Baele et al. (2015). We also control for the foreign exchange risk, as we deal with an international sample of banks. The explanatory power of the foreign exchange factor was acknowledged by Kasman, Vardar, and Tunç (2011), Ryan and Worthington (2004), Chamberlain, Howe, and Popper (1997), and Choi, Elyasiani, and Kopecky (1992), among others. To check the robustness of our results, we employ multiple extended specifications of the market model: a three-factor model (with the interest rate and foreign exchange factors), a five-factor model (with the interest rate, foreign exchange, and Fama-French factors), and a six-factor model (with an additional momentum factor). The five- and six-factor models are only estimated for the countries with consistently available Fama-French and momentum factors. Our results are robust to model choice.

as logarithmic first difference transformations of Wednesday stock prices, on a market factor, a measure of the real estate market activity, and unanticipated changes[4] in foreign exchange. Market portfolios are proxied by the broad domestic value-weighted equity market indexes for each country in the sample. The historical values for each market index are obtained from DataStream. For the foreign exchange factor we use the JP Morgan trade-weighted multilateral foreign exchange index of the domestic currency against a broad-based basket of other currencies. The real estate indexes are represented by the European Public Real Estate Association/National Association of Real Estate Investment Trust (EPRA/NAREIT) Equity REIT Index series compiled by the Financial Times.

Based on the existing empirical evidence documenting the presence of a time-varying element in the distribution of bank stock returns (Elyasiani and Mansur, 1998), we employ a GARCH (*n; m*) based econometric approach to estimate the factor sensitivities:

$$R_{it} = \alpha + \beta_{i,M}R_{M,t} + \beta_{i,FX}R_{FX,t} + \beta_{i,REIT}R_{REIT,t} + \varepsilon_{it} \quad (1)$$

$$h_{it} = \omega_0 + \gamma_1\varepsilon^2_{i,t-1} + \gamma_2 h_{i,t-1} \quad (2)$$

$$\varepsilon_{it}|\Omega_{t-1} \sim N(0, h_{it}) \quad (3)$$

The dependent variable R_{it} is the random return on bank *i* over the one-year Treasury Bill rate of the corresponding country. $R_{M,t}$ is the domestic value-weighted equity index returns over the one-year Treasury Bill rate, $R_{FX,t}$ is the excess return of the bank's domestic currency foreign exchange index on a broad-based basket of other currencies, and $R_{REIT,t}$ is the excess return of the real estate index of bank *i*'s domestic country. ε_{it} is a random error, h_{it} is the conditional variance of ε_{it}, and Ω is the information set. The order of lags (*n;m*) ensures the adequate treatment of serial correlation in squared returns, with the formal Engle ARCH Lagrange multiplier test and Ljung-Box Q-statistic determining the correct lag structure. The coefficients are estimated using a quasi-maximum likelihood procedure with the normal likelihood function and robust standard errors as suggested by Bollerslev and Wooldridge (1992). Consistent with Bollerslev (1987) and Elyasiani and Mansur (1998), GARCH (1,1) adequately describes the return behaviour for most banks in our sample, and higher order models are rarely used.

3.2. Estimation

In the second step, we start by examining the relationship between the estimated measure of bank systematic risk (β_M) and the quality of a bank auditor (Equation 4). We then assess whether the relationship between bank risk and audit quality are affected by differences in cross-country regulatory characteristics (Equation 5). Our baseline regression models are based on the cross-section of sample banks and countries and take the following form:

$$\text{Bank Risk}_i = f(\text{Auditor Quality}_i, \text{Bank Controls}_i) \quad (4)$$

$$\text{Bank Risk}_i = f(\text{Auditor Quality}_i, \text{Bank Controls}_i, \text{Regulatory Characteristics}_j) \quad (5)$$

The dependent variable, Bank Risk$_i$, is the estimated measure of bank systematic risk (β_M). In the robustness section, we use a number alternative measures of bank risk-taking, including proxies for bank credit and insolvency risks. Our main findings and conclusions remain robust to the choice of risk measure. The bank-specific control variables and the country-level

[4] The unanticipated changes are calculated as the difference between the actual changes in the respective foreign exchange or real estate indexes at time *t* and those forecasted via the appropriate specification of the ARMA (*k*,*l*) model. For most countries, the ARMA (*k*,*l*) model is specified with autoregressive (*k*) and moving average (*l*) parameters ranging from 1 to 3.

regulatory characteristics are discussed in detail in the Data Sample section and Appendix A. Subscripts *i* and *j* refer to bank and country, respectively.

To control for endogeneity of auditor choice, with safer banks being potentially more likely to hire a Big4 auditor, parameter estimation is carried out by the Generalised Method of Moments (GMM) technique with fixed-effect corrections, allowing the use of lagged variables as instruments. We use the J-statistic of over-identifying restrictions, testing the null of instrument validity, to successfully confirm that the instruments are valid in each respective estimation and, therefore, that the model specification cannot be statistically rejected.

We closely monitor any outliers arising as a result of measurement or coding errors. We retain all non-technical outliers depicting genuine variability in the data, as we presume they convey constitutive information about the temporal and cross-sectional heterogeneity of panel units. To achieve more stable estimates, we reduce the impact of these extreme observations by applying type I winsorisation[5], with fixed cut-off points of $mean \pm 4 \times st.deviation$ for all time-variant variables.

4. Data sample

We use a sample of 274 publicly traded banks from the G10 countries[6] as well as other important regions of Asia (Hong Kong) and the Pacific Rim (Australia). As we examine the role of auditing in shaping bank risks in the run-up to the 2007-2009 financial crisis, we require that each bank has balance sheet and share price data continuously available from January 1997 to December 2007.[7] The formal implementation of the Basel 2 capital accord in our sample countries has taken place in/after 2007 and, therefore, is not considered in the analysis. The requisite dataset is constructed by merging data from the BankScope, Bloomberg, and DataStream databases.

[Table 1 here]

Table 1 presents descriptive statistics on bank-level financial indicators by country. For each bank, we calculate a number of financial ratios to control for various channels of bank risk-taking. First, we expect the markets' assessment of bank risk to be influenced by the equity-to-total assets ratio (capital ratio; CAP), which is commonly perceived as the key measure of bank solvency. The capital ratio, measured as the book value of equity scaled by total assets,

[5] Type I winsorisation commonly refers to the procedure of replacing outliers with exact values of interval limits, whereas with Type II winsorisation, outliers are transformed to predestined weighted averages between their original and the cut-off values.

[6] These include Belgium, Canada, France, Germany, Italy, Japan, Spain, Sweden, Switzerland, United Kingdom, and United States. We choose to focus on the G10 countries for consistency, as all internationally active G10 banks were required to comply with the Basel 1 accord over the sample period (the Basel Committee for Banking Supervision was initially established by the central bank governors of the G10 countries). We enrich the sample by including two further important financial regions not represented in the G10 group: Hong Kong and Australia. Over the sample period, regulatory authorities in both Hong Kong and Australia elected to comply with Basel 1 and its subsequent amendments. The size of the banking sectors in the two countries is also comparable to that of other G10 countries in our sample. For instance, Australia ranks consistently ahead of such G10 countries as Belgium and Sweden (see http://www.bis.org/statistics/full_bis_cbs_csv.zip).

[7] We restrict our attention to the pre-crisis period as the cross-country nature of our sample complicates the exercise of controlling for the following factors: (1) cross-country variation in the post-crisis regulatory responses affecting the banking industry (see Casu, Deng and Ferrari, 2016; Tanda, 2015; Claessens and Kodres, 2014); (2) to the extent that a (post-)crisis increase in the volatility of bank stock returns - and their market betas - reflects the market's perception of banks' financial health and, potentially, audit quality, it has also been attributed to plentiful policymakers' announcements, restrictions on financial market transactions, intensified trading and fire sales, and other such factors (see Beber and Pagano, 2013 and Ben-David et al., 2012); (3) it has been established in the literature that cross-country correlations increase during crisis episodes relative to correlations during tranquil times.

indicates a bank's ability to cover its unexpected losses on the market and banking books. Second, we expect that banks diversifying their revenue sources to a greater extent are less exposed to adverse market and economic conditions. Therefore, we calculate the proportion of total operating income derived from non-interest revenues (NOIR). Non-interest income includes net fee income, net commission income, and net trading income. As banks' revenues become more diversified, market risk exposure should decline. Third, as more profitable banks may have less incentive to take risks, we compute net interest margin (NIM) as the ratio of net interest income to total assets. Finally, we include the natural logarithm of bank assets as a proxy for size (SIZE). The expected sign on the SIZE variable is unclear. On one hand, larger banks should be less risk-averse due to the "too-big-to-fail" phenomenon. On the other hand, they should be more diversified, due to economies of scale and scope, and thus better positioned to weather adverse market conditions.

To examine whether cross-country regulatory differences have a bearing on the relationship between audit quality and the market's perception of bank risk, we construct a set of country-level variables that measure the strength of bank regulation and institutional quality on the basis of the surveys by Barth, Caprio, and Levine (2001, 2004 and 2008) and Kaufmann, Kraay, and Mastruzzi (2008). In particular, we control for the level of regulatory imposed information disclosure (DISCLOSURE) and diversification requirements (DIVERSIFICATION), the strength of external audit (AUDIT STRENGTH), the generosity of the country's deposit insurance (GENEROSITY), and the rule of law (LAW) in each country. The detailed definitions of the regulatory variables are in Appendix A, while Table 1 provides descriptive statistics for these indicators. The correlations between all control variables are presented in Table 2.

[Table 2 here]

The relatively high correlations between some independent variables, reported in Table 2, may raise a concern of multicollinearity. In turn, multicollinearity between the regressors may lead to biased standard errors and, thus, incorrect inferences. To check whether these variables are collinear, we perform a VIF (variance inflation factor) test. None of the explanatory variables reports a VIF value of more than 10, with the highest observed value of 5.209, indicating that multicollinearity should not constitute a problem (Chaterjee and Price, 1977).

5. Empirical results

We start by discussing the results of the first stage estimation, and continue thereon by testing the empirical hypotheses addressing the relationship between market measures of risk and audit quality.

5.1. Bank risk exposures

We assess the risk exposure of banks via the four-factor GARCH model described by Equation (1). The model is estimated separately for each year and the entire sample of 274 banks using weekly return observations. The estimation period spans 1997-2007, resulting in 11 annualised beta coefficients for each institution and risk factor. Table 3 presents pertinent statistics for the estimated measures of risk for selected aggregates.

[Table 3 here]

The majority (70.5 percent) of the analysed banks are significantly affected by systematic risk, which is captured by the market beta. In a number of alternative parameterisations of the model in Equation (1), we find that the market factor dominates by far other systematic factors in explaining bank returns, thereby justifying our choice to use market beta as a proxy for

systematic risk. We also observe that, on average, the market beta increases over the sample period from an average of approximately 0.5772 in 1997 to 0.9098 in 2007. However, the increase is not monotonic and the lowest average value of 0.34 is reported for the year 2000. Banks headquartered in Belgium and the UK have the highest average market beta, at 1.1968 and 1.1696, respectively, while German and Swiss banks are significantly less exposed to the market over the sample period, with average betas of 0.3218 and 0.3232, respectively. Furthermore, 18.4 and 24.9 percent of banks are exposed to foreign exchange and real estate risks respectively. The majority of the significant foreign exchange coefficients are negative. This supports the widespread view that banks tend to maintain a positive mismatch between assets and liabilities denominated in domestic and foreign currencies respectively.

5.2. Audit quality and bank risk

Column (1) of Table 4 presents the estimation results of regressing a bank's market beta (β_M) on the measure of audit quality, which we proxy by the bank's auditor size, and a set of bank level control variables (Equation 4). In particular, we argue that Big4 auditors deliver audits of superior quality owing to their greater experience and excessive costs of reputational externalities arising from the failure to provide an acceptable level of service. To this end, we construct a dummy variable AUD_BIG, which takes a value of one for the Big4 auditors, and zero otherwise. The estimated coefficient for the AUD_BIG variable is negative and significant (-0.189; 10% level), suggesting that, *ceteris paribus*, the market beta of a bank audited by a Big4 firm is almost 0.2 lower, on average, than the corresponding market beta of a bank audited by a non-Big4 firm. Thus, focusing on the sub-sample of Canadian banks as of year-end 2004, a shock leading to a 100 basis points decline in the value of the index would, on average, translate into Canadian banks audited by a non-Big 4 firm losing approximately 168 million US dollars more in their average market value, compared to their Big4 audited counterparts. Therefore, these results are consistent with Hypothesis 1, which predicts that banks audited by Big4 audit firms have different systematic risk compared to banks audited by non-Big4 audit firms. Specifically, our results indicate that Big4 audit firms are associated with a lower level of bank equity risk. The bank capital ratio CAP is negatively associated with market risk (-3.460), whereas the bank's net interest margin (NIM) is positively related to bank risk (26.429). We also find that the market seems to view non-interest generating activities as increasing banks' systematic risk exposure in the run up to the financial crisis. The latter is captured by variable NOIR (0.877), calculated as the ratio of the bank's non-interest income to total operating revenue.

[Table 4 here]

We next test whether the risk - auditor quality relationship is affected by the introduction of the IAS/IFRS. In column (2) of Table 4 we include a dummy variable, IFRS, which assumes a value of one for the years after the IAS/IFRS was adopted at a country level. The results reveal that the level of market beta for banks reporting under the IAS/IFRS tends to be almost 0.22 points lower than the corresponding level of market risk for banks reporting under domestic standards. This relationship is highly significant economically and statistically (at the 5% level). This is consistent with the findings of Barth, Landsman, and Lang (2008), suggesting that the market reacted favourably to the introduction of a common set of accounting standards. We further include the interaction between AUD_BIG and IFRS in column (3) of Table 4. Under the model specification, the impact of audit quality on bank risk exposure f (∂MRK /∂AUD_REG) is determined by the provision of the IAS/IFRS accounting standards. The coefficient on the interaction variable is insignificant, suggesting that market participants do

not consider the transition to the IAS/IFRS as altering the association between audit quality and bank equity risk.

In Table 5 we analyse the impact of banking regulations on the relationship between audit quality and bank risk (Equation 5).

[Table 5 here]

We first analyse the impact of audit regulation on banks' equity risk (Column 1 of Table 5). The coefficient on the AUD_REG variable is negative and highly significant (-0.110; 1% level), indicating that an additional point increase in the value of the index is associated with an average decrease of 0.11 in the value of market beta. This observation suggests that investors believe banks face a lower level of risk, on average, in countries with stricter audit regulations. The interaction between AUD_BIG and AUD_REG is, however, positive and significant (0.067; 1% level), suggesting that employing a Big4 auditor is less advantageous in countries with higher levels of audit regulations.

To understand whether the effect of audit quality on banks' systematic risk exposure is biased by the level of regulatory imposed disclosure, we include the measure of information disclosure (DISCLOSURE) and the interaction between AUD_BIG and DISCLOSURE in column (2). The coefficient on variable DISCLOSURE is negative (-0.231) and significant at the 1% level, implying that a one point increase in the disclosure index leads to a decline of 0.2 in the market beta. Thus, investors' confidence increases with the amount of information available for individual banks. However, the interaction term DISCLOSURE *AUD_BIG is positive and highly significant (0.235; 1% level), suggesting that the instrumental, risk offsetting, effect of employing a Big4 auditor diminishes as the level of regulatory enforced disclosure increases. In countries with greater disclosure requirements, investors can easily access instruments to assess bank quality, and the perceived added value of high quality audit is lower.

In column (3) of Table 5 we analyse the extent to which the efficacy of audit quality in curtailing the investors' perceived risk is affected by the level of regulatory imposed diversification requirements (DIVERSIFICATION). The coefficient of the diversification requirements variable is negative and highly significant (-0.188; 1% level), indicating that a point increase in the diversification index leads to a reduction of approximately 0.2 in the market beta. In other words, in countries with stricter regulatory diversification rules, the investors' perceived bank risk is lower. The interaction variable DIVERSIFICATION*AUD_BIG is, however, positive (0.235; 1% level), suggesting that the importance of audit quality is lower the stronger the diversification requirements imposed by the regulator.

Finally, in column (4) of Table 5 we analyse how the provision of generous deposit insurance influences the role of audit quality in reducing bank risk-taking, as perceived by the market participants. The generosity of the deposit protection scheme (GENEROSITY) in our study serves as a proxy for the level of market discipline in a reference country. In particular, we argue that the lower the level of deposit protection, the greater the expected levels of market discipline and market monitoring of bank risks. We find that banks are perceived to face greater risks in countries with lower (greater) level of market discipline (deposit protection). Employing a Big4 auditor does not counter the risk associated with lower market discipline.

Including the audit quality variable (AUD_BIG) as well as its interactions with the variables proxying various regulatory characteristics in Table 5 might cause multicollinearity. We conduct a VIF test to ensure that multicollinearity does not bias our conclusions. The highest value of the VIF test for explanatory variables is 8.718, confirming the robustness of our results to multicollinearity.

6. Robustness tests

In this section we conduct a set of additional robustness tests for our main results. First, we control for auditor specialisation. We expect an auditor with greater expertise in the financial industry to detect and prevent fraudulent financial reporting by banks more efficiently, leading to lower perceived risk. We assume that auditors enjoying a greater market share and more experience possess greater financial industry specific expertise. In line with Danos and Eichenseher (1982), we use market share to proxy auditors' industry experience and hence expertise in each reference country. We measure auditor's market share by the percentage of client assets audited within the financial industry in a given country. An auditor capturing the largest market share in the financial industry is defined as SPECIALIST. According to the results presented in the first column of Table 6, the main findings discussed in the previous section remain robust to auditor specialisation. Banks employing both SPECIALIST and NON-SPECIALIST Big4 auditors are perceived to be safer by the market.

[Table 6 here]

Second, we corroborate our baseline results by employing four alternative measures of bank risk-taking. In particular, we consider the exposure of bank stock returns to movements in the domestic real estate market (β_{REIT} from Equation 1) and unanticipated surprises in the foreign exchange index (β_{FX} from Equation 1), bank credit risk, and bank insolvency risk. We follow Wahlen (1995) and Delis and Staikouras (2011) and measure credit risk by the ratio of non-performing loans to total loans (NPL). The higher the proportion of non-performing loans, the higher the credit risk. Consistent with hypothesis 1, and the empirical findings presented in the previous section, we expect to find a negative relationship between audit quality and the measure of credit risk. To capture bank insolvency risk, we focus on the Z-score, which is inversely related to the probability of bank default (Laeven and Levine, 2009). The Z-score is calculated as (ROA + CAR)/σ(ROA), where ROA is the rate of return on assets, CAR is the bank's capital-asset ratio, and σ(ROA) is the standard deviation of ROA over the last 5 years including the current year. In line with Laeven and Levine (2009), we use the natural logarithm of the Z-score in our estimations. As a higher Z-score indicates greater financial strength, we expect that it is positively related to audit quality. Our main findings on the negative relationship between bank risk and audit quality remain qualitatively unchanged, as suggested by the estimation results reported in the last four columns of Table 6.

Finally, we re-estimate all regressions for alternative sub-samples of banks, markets, and sub-periods.[8] In particular, we repeat our analyses excluding the U.S. to test whether the findings are driven by the large number of U.S. banks in the sample; the results remain statistically unchanged. Further, we investigate whether the results are affected by the level of prevailing market discipline in different countries. To explore this possibility, we drop Australia and Hong Kong from the sample since there is no explicit deposit insurance scheme in these countries, implying a greater level of market discipline. This has little effect on the results. We also repeat our analyses for two sub-periods, before and after year 2000, to examine whether the reported findings are affected by the "dotcom bubble". The results hold for both sub-periods.

7. Concluding remarks

The risk exposures of financial intermediaries have been the subject of considerable research over the last decades. However, the majority of studies concentrate on modelling the firms' risk exposures, with only a few contributions addressing the identification of the factors

[8] The results of these and of all other unreported robustness tests described in this section are available from the authors upon request.

determining these risk sensitivities. Surprisingly, none of these works has explicitly considered the role of auditors in monitoring and shaping the risk exposure of banks.

In our work we attempt to fill this gap in the literature by examining the role of audit quality on banks' equity risk. We believe the question is of particular interest in the light of strong evidence to suggest that auditors played an important role in the 2007-2009 financial crisis.

We analyse an extensive international sample of banks over the 1997 to 2007 period and demonstrate that audit quality significantly influences the market's perception of banks' risk exposure. Banks employing a Big4 auditor have, on average, lower systematic risk. The relationship between bank risk and audit quality is, however, affected by the institutional and regulatory differences across countries in our sample. We find that the instrumental effect of employing a Big4 auditor diminishes as the level of regulatory enforced disclosure increases. In other words, the perceived added value of high quality audit decreases with the level of publically available information.

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Table 1. Descriptive statistics for company and market specific factors

This table presents summary statistics (mean, median, and standard deviation) for the annual company- and market-specific financial ratios over 1997-2007. All company-specific measures are from BankScope database. The market-specific regulatory measures are based on individual questions and answers from Barth, Caprio, and Levine's (2001, 2004, 2008) database and on the authors' calculations. All financial ratios are calculated for each bank *i* and then averaged across a sample period and the sample countries. Numbers corresponding to the average value of the variable concerned are presented without parentheses, the median of the variable is presented with round parentheses and the standard deviation is in square parentheses. For an exact definition of each ratio see Appendix A.

	Australia	Belgium	Canada	France	Germany	Hong Kong	Italy	Japan	Spain	Sweden	Switzerland	UK	US
Bank specific													
CAP	0.066	0.038	0.052	0.082	0.035	0.107	0.072	0.051	0.082	0.040	0.090	0.054	0.090
	(0.063)	(0.037)	(0.050)	(0.082)	(0.031)	(0.103)	(0.072)	(0.052)	(0.070)	(0.039)	(0.079)	(0.057)	(0.087)
	[0.016]	[0.009]	[0.009]	[0.043]	[0.016]	[0.026]	[0.016]	[0.012]	[0.031]	[0.004]	[0.034]	[0.014]	[0.020]
NIM	0.023	0.013	0.022	0.019	0.010	0.022	0.028	0.018	0.031	0.014	0.014	0.022	0.036
	(0.023)	(0.013)	(0.022)	(0.022)	(0.008)	(0.021)	(0.028)	(0.018)	(0.029)	(0.013)	(0.015)	(0.022)	(0.036)
	[0.006]	[0.003]	[0.004]	[0.010]	[0.006]	[0.006]	[0.006]	[0.004]	[0.013]	[0.003]	[0.003]	[0.007]	[0.008]
NOIR	0.467	0.462	0.447	0.496	0.385	0.276	0.384	0.157	0.323	0.415	0.490	0.405	0.270
	(0.390)	(0.469)	(0.461)	(0.455)	(0.360)	(0.253)	(0.386)	(0.132)	(0.328)	(0.421)	(0.383)	(0.414)	(0.240)
	[0.197]	[0.079]	[0.140]	[0.131]	[0.247]	[0.088]	[0.085]	[0.134]	[0.071]	[0.130]	[0.263]	[0.087]	[0.185]
SIZE	10.938	12.736	11.113	10.081	11.134	11.322	9.786	7.868	9.509	13.929	9.084	11.838	8.276
	(11.163)	(12.764)	(12.281)	(8.888)	(10.565)	(11.076)	(9.452)	(7.798)	(9.115)	(13.908)	(9.098)	(11.777)	(7.804)
	[1.474]	[0.483]	[1.951]	[2.244]	[1.696]	[0.887]	[1.529]	[0.694]	[1.881]	[0.336]	[0.760]	[1.289]	[1.987]
Number of banks	9	3	9	13	10	9	13	64	13	3	12	9	107
Market specific													
AUD_REG	5.000	6.000	3.000	6.000	4.000	4.000	2.000	4.000	6.000	5.000	7.000	5.000	3.000
DISCLOSURE	5.000	3.000	3.000	6.000	5.000	5.000	5.000	4.000	4.000	5.000	3.000	6.000	4.000
DIVERSIFICATION	1.000	3.000	3.000	4.000	2.000	3.000	2.000	2.000	2.000	3.000	2.000	3.000	3.000
GENEROSITY	0.000	1.000	2.000	2.000	1.000	0.000	2.000	2.000	2.727	1.000	1.000	2.000	2.000

Table 2. Correlation matrix

This table presents the bivariate correlations between the considered explanatory variables. Spearman (Pearson) correlation coefficients are above (below) the diagonal. Variable definitions and sources are outlined in Appendix A. *p*-values are in parentheses.

	CAP	NIM	NOIR	SIZE	AUD_REG	DISCLOSURE	DIVERSIFICATION	GENEROSITY
CAP		0.616	0.032	-0.216	-0.302	-0.067	0.389	0.066
		(0.000)	*(0.104)*	*(0.000)*	*(0.000)*	*(0.001)*	*(0.000)*	*(0.001)*
NIM	0.551		-0.130	-0.360	-0.577	-0.076	0.427	0.376
	(0.000)		*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*
NOIR	0.032	-0.244		0.622	0.136	0.205	0.181	-0.255
	(0.099)	*(0.000)*		*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*
SIZE	-0.243	-0.363	0.522		0.256	0.311	0.018	-0.394
	(0.000)	*(0.000)*	*(0.000)*		*(0.000)*	*(0.000)*	*(0.354)*	*(0.000)*
AUD_REG	-0.100	-0.449	0.248	0.234		0.139	-0.333	-0.402
	(0.004)	*(0.000)*	*(0.000)*	*(0.000)*		*(0.000)*	*(0.000)*	*(0.000)*
DISCLOSURE	-0.055	-0.120	0.166	0.312	0.114		0.068	-0.146
	(0.004)	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*		*(0.000)*	*(0.000)*
DIVERSIFICATION	0.331	0.343	0.092	0.042	-0.185	0.181		0.328
	(0.000)	*(0.000)*	*(0.000)*	*(0.029)*	*(0.000)*	*(0.000)*		*(0.000)*
GENEROSITY	0.034	0.353	-0.263	-0.380	-0.406	-0.165	0.332	
	(0.077)	*(0.000)*	*(0.000)*	*(0.000)*	*(0.000)*	*(0.002)*	*(0.000)*	

Table 3. Descriptive statistics for the estimated risk coefficients

This table presents summary statistics (mean, median, and standard deviation) for the market measures of risk over the 1997 to 2007 period. The risk measures are represented by the coefficient estimates from a three-factor GARCH market model. Specifically, as presented by Equations (1) – (3), for each bank-year, we run a three-factor time series regression of bank weekly excess returns on the excess market returns (MRK), the unanticipated changes in the respective foreign exchange (FX) factors, and excess returns on the domestic real estate investment trust index (REIT): $R_{it} = \alpha + \beta_{i,M}R_{M,t} + \beta_{i,FX}R_{FX,t} + \beta_{i,REIT}R_{REIT,t} + \varepsilon_{it}$. The estimation requires at least 30 weekly return observations for each bank-year. The unanticipated changes in the respective foreign exchange factor at time *t* are calculated as the difference between the actual changes in this factor and the ones forecasted via an appropriate specification of the autoregressive moving average (ARMA) model. ***, ** and * denote statistical significance at the 1%, 5% and 10% level, respectively, for the appropriate mean/median/variance equality tests for the values reported in Panels B and C. Panel A reports the corresponding statistics for the entire sample of banks, Panels B and C report the statistics separately for the sub-sample of banks audited by Big4 and non-Big4 audit firms, respectively

	Mean	Median	St. Dev
Panel A: All banks			
β_M	0.603	0.542	0.551
β_{FX}	-0.0004	-0.0003	0.009
β_{REIT}	0.118	0.083	0.317
Panel B: Banks audited by Big4 audit firms			
β_M	0.649	0.602	0.535
β_{FX}	-0.001	-0.001	0.009
β_{REIT}	0.113	0.082	0.301
Panel C: Banks audited by non-Big4 audit firms			
β_M	0.415***	0.258***	0.574**
β_{FX}	0.001***	0.000**	0.011***
β_{REIT}	0.139*	0.088	0.375***

Table 4. GMM panel regression of bank risk and audit quality

This table reports the generalized method of moments (GMM) estimates for the model presented by Equation (4): Bank Risk$_i$ = f (Auditor Quality$_i$, Bank Controls$_i$). The dependent variable, the measure of banks' market risk, is represented by the β_M coefficient estimates from a three-factor GARCH market model described by Equations (1) – (3). The main explanatory variable, a proxy of audit quality, is represented by the Big4 audit company dummy variable (AUD_BIG), which takes a value of one for the Big4 auditors, and zero otherwise. The bank specific control variables are as follows: the ratio of book value of equity capital to bank's total assets (CAP); the natural logarithm of the bank's total assets (SIZE); bank's net-interest margin (NIM); the ratio of non-interest income to bank's total operating revenue (NOIR). Column (1) reports the coefficient estimates of the model with the audit quality variable (AUD_BIG) and the bank-specific control variables listed above; Column (2) reports the estimation results for the model augmented with the international financial reporting standards dummy variable (IFRS), which equals one for the years after IFRS was adopted at the country level, and zero for the years preceding IFRS adoption; Column (3) presents the results for the model augmented with the IFRS dummy variables and the interaction of the AUD_BIG and IFRS variable (AUD_BIG*IFRS). All variables are discussed in Appendix A. *J*-statistics tests for over-identifying restrictions. *t*-statistics are reported in italics below each coefficient estimate. ***, ** and * denote statistical significance at the 1%, 5% and 10% level, respectively.

	(1)	(2)	(3)
AUD_BIG	-0.189	-0.140	-0.128
	*-1.78**	*-1.74**	*-1.34*
IFRS		-0.222	-0.089
		*-2.28***	*-1.70**
AUD_BIG*IFRS			-0.148
			*-1.99***
Coefficient	-1.081	-1.472	-1.522
	*-2.09***	*-2.33***	*-2.43***
SIZE	0.130	0.188	0.193
	*3.61****	*3.28****	*3.33****
CAP	-3.46	-3.355	-3.557
	*-3.06****	*-2.79****	*-2.79****
NIM	26.429	21.972	22.171
	*3.02****	*2.51***	*2.53***
NOIR	0.877	0.707	0.711
	*2.09***	*1.71**	*1.72**
Observations	2373	2373	2373
J-statistics	1.108	1.003	1.002
p-value	*(0.575)*	*(0.605)*	*(0.606)*
Adj. R^2	0.47	0.48	0.48

Table 5. GMM panel regression of bank risk, cross-country regulation, and audit quality

This table reports the generalized method of moments (GMM) estimates for the model presented by Equation (5): Bank Risk$_i$ = f (Auditor Quality$_i$, Bank Controls$_i$, Regulatory Characteristics$_j$). The dependent variable, the measure of banks' market risk, is represented by the β_M coefficient estimates from a three-factor GARCH market model described by Equations (1) – (3). The main explanatory variables include: a proxy of audit quality represented by the Big4 audit company dummy variable (AUD_BIG), which takes a value of one for the Big4 auditors, and zero otherwise; and, depending on specification, the following country-specific regulatory characteristics: AUD_REG, the index of audit regulation; DISCLOSURE, the index of information disclosure; DIVERSIFICATION, the index of regulatory imposed diversification requirements; and GENEROSITY, which is an index measuring the generosity of the deposit protection scheme adopted in the referenced country. The bank specific control variables are as follows: the ratio of book value of equity capital to bank's total assets (CAP); the natural logarithm of the bank's total assets (SIZE); bank's net-interest margin (NIM); the ratio of non-interest income to bank's total operating revenue (NOIR). All columns report the coefficient estimates for the audit quality variable (AUD_BIG) and the bank-specific variables. In addition, Column (1) reports the coefficient estimates for the model augmented with the AUD_REG variable and its interaction with the AUD_BIG variable (AUD_REG*AUD_BIG); Column (2) reports the results for the model augmented with the DISCLOSURE variable and its interaction with the AUD_BIG variable (DISCLOSURE*AUD_BIG); Column (3) presents the estimates for the model augmented with the DIVERSIFICATION variable and its interaction with AUD_BIG (DIVERSIFICATION*AUD_BIG); Column (4) reports the estimation results for the model with the GENEROSITY variable and its interaction with AUD_BIG (GENEROSITY*AUD_BIG); and Column (5) presents the estimation results for the model augmented with all the country-level regulatory variables and interactions of these variables with the audit quality variable. All variables are discussed in Appendix A. J-statistics tests for over-identifying restrictions. *t*-statistics are reported in italics below each coefficient estimate. ***, ** and * denote statistical significance at the 1%, 5% and 10% level, respectively.

	(1)	(2)	(3)	(4)	(5)
AUD_BIG	-0.149	-0.952	*-0.561*	0.169	-0.298
	*-2.45***	*-8.43****	*-4.94****	*1.51*	*-1.26*
AUD_REG	-0.110				-0.165
	*-8.91****				*-2.51***
AUD_REG*AUD_BIG	0.067				0.073
	*5.24****				*2.59****
DISCLOSURE		-0.231			-0.012
		*-12.15****			*-1.27*
DISCLOSURE*AUD_BIG		0.235			0.014
		*9.98****			*1.58*
DIVERSIFICATION			-0.188		0.327
			*-7.76****		*2.98****
DIVERSIFICATION *AUD_BIG			0.235		-0.087
			*5.63****		*-3.71****
GENEROSITY				0.185	0.109
				*4.02****	*1.14*
GENEROSITY*AUD_BIG				-0.038	0.056
				-0.67	*0.59*
Constant	0.283	0.818	0.432	-0.606	0.031
	*1.74**	*5.89****	*2.63***	*-3.70****	*0.78*
SIZE	0.066	0.064	0.061	0.080	0.082
	*5.42****	*5.17****	*5.09****	*6.30****	*10.70****
CAP	-1.663	-1.867	-1.973	-1.018	-0.284
	*-4.61****	*-4.52****	*-4.08****	*-1.84**	*-1.69**
NIM	4.751	7.084	7.320	4.726	0.134
	*3.41****	*5.08****	*6.187****	*4.43****	*1.54*
NOIR	0.305	0.278	0.269	0.211	0.268
	*2.98****	*2.69****	*2.58****	*1.96**	*3.51****
Observations	2373	2373	2373	2373	2373
J-statistics	12.235	14.164	8.694	14.227	16.230
p-value	*(0.282)*	*(0.117)*	*(0.466)*	*(0.114)*	*(0.062)*
Adj. R^2	0.22	0.21	0.21	0.20	0.25

Table 6. Robustness tests

This table reports the generalized method of moments (GMM) estimates for the model presented by Equation (4): Bank Risk$_i$ = f (Auditor Quality$_i$, Bank Controls$_i$). The dependent variable, the measure of banks' risk, is represented interchangeably by: systematic market risk [β_M] (Column 1); foreign exchange risk [β_{FX}] (Column 2); real estate risk [β_{REIT}] (Column 3); credit risk [NPL] (Column 4); and insolvency risk [Z-Score] (Column 5). The measures of market, real estate, and foreign exchange risks are represented by the coefficient estimates from a three-factor GARCH market model described by Equations (1) – (3). NPL is the ratio of non-performing loans to total loans, while Z-score is a measure of bank insolvency risk inversely related to the probability of bank default. The Z-score is calculated as (ROA + CAR)/σ(ROA), where ROA is the rate of return on assets, CAR is the bank's capital-asset ratio, and σ(ROA) is the standard deviation of ROA over the last 5 years including the current year. The main explanatory variables are as follows: the ratio of book value of equity capital to bank's total assets (CAP); the natural logarithm of the bank's total assets (SIZE); bank's net-interest margin (NIM); the ratio of non-interest income to bank's total operating revenue (NOIR); the Big4 audit company dummy variable (AUD_BIG), which takes a value of one for the Big4 auditors, and zero otherwise; and the Big4 audit company specialisation dummy variable (AUD_BIG_SPECIALIST) indicating a Big4 auditor with the greatest market share in a particular country. All variables are discussed in Appendix A. J-statistics tests for over-identifying restrictions. *t*-statistics are reported in italics below each coefficient estimate. ***, ** and * denote statistical significance at the 1%, 5% and 10% level, respectively.

	(1)	(2)	(3)	(4)	(5)
	β_M	β_{FX}	β_{REIT}	NPL	Z-Score
AUD_BIG		-0.007	-0.057	-0.002	0.515
		*-2.24***	*-1.71**	*-1.52*	*3.43****
AUD_BIG_SPECIALIST	-0.284				
	*-3.24****				
AUD_BIG_NON-SPECIALIST	-0.237				
	*-2.90****				
WALD	2.127				
p-value	*(0.145)*				
Coefficient	0.275	-0.021	0.640	0.027	4.570
	0.41	*-2.20***	*1.57*	*-0.50*	*4.66****
SIZE	0.030	0.002	-0.058	0.006	-0.328
	0.41	*2.76****	*-1.46*	*1.78**	*-3.65****
CAP	-2.047	-0.009	0.226	-0.732	1.948
	*-2.53***	*-0.58*	*0.28*	*-4.09****	*1.82**
NIM	7.971	0.112	1.122	0.317	2.435
	*2.05***	*1.81**	*0.31*	*2.17***	*1.15*
NOIR	0.148	0.002	0.033	0.015	-1.47
	*2.28***	*1.07*	*0.55*	*1.74**	*-2.18***
Observations	2373	2373	2373	2030	1715
J-statistics	28.849	50.236	41.760	51.324	56.129
p-value	*(0.883)*	*(0.153)*	*(0.438)*	*(0.129)*	*(0.086)*
Adj. R^2	0.51	0.05	0.09	0.81	0.62

Appendix A. Variable definitions

The definition of company-specific financial variables is provided in Panel A, while Panel B presents the market-specific variables. Firm-level variables are from BANKSCOPE database. The market-specific regulatory measures are based on individual questions and answers from the Barth, Caprio, and Levine (2001, 2004, 2008) and Kaufmann, Kraay, and Mastruzzi (2008) databases, as well as on the authors' calculations.

Panel A. Bank-specific variables	
CAP [Capital ratio]	Equity capital/Total assets
NIM [Net Interest margin]	Net interest income/Total earning assets
SIZE [Bank's total assets]	Log(Total assets)
NOIR [Non-interest income]	Non-interest income/Total operating income
Panel B. Market-specific variables	
AUD_REG [Audit regulation]	The index ranges from 0 to 7, based on (yes=1; no=0): (1) Is an external audit a compulsory obligation for banks? (2) Are auditing practices for banks in accordance with international auditing standards? (3) Is it required by the regulators that bank audits be publicly disclosed? (4) Are auditors required by law to communicate directly to the supervisory agency any presumed involvement of bank directors or senior managers in illicit activities, fraud, or insider abuse? (5) Are external auditors legally required to report to the supervisory agency any other information discovered in an audit that could jeopardize the health of a bank? (6) Can supervisors take legal action against external auditors for negligence? (7) Has legal action been taken against an auditor in the last 5 years?
DISCLOSURE [Information disclosure]	The index of information disclosure ranges between 0 and 6 and is based on the following questions (yes=1, 0=no): (1) Does accrued, though unpaid, interest/principal enter the income statement while the loan is still non-performing? (2) Are financial institutions required to produce consolidated accounts covering all bank and any non-bank financial subsidiaries (including affiliates of common holding companies)? (3) Are off-balance sheet items disclosed to the public? (4) Must banks disclose their risk management procedures to the public? (5) Are bank directors legally liable if information disclosed is erroneous or misleading? (6) Have they been enforced in the last 5 years?
DIVERSIFICATION [Diversification index]	The index assumes values between 0 and 5, based on (yes=1, 0=no): (1) Are there explicit, verifiable, and quantifiable guidelines regarding asset diversification? (For example, are banks required to have some minimum diversification of loans among sectors, or are there sectoral concentration limits)? (2) Are banks limited in their lending to single or related borrowers? (3) Are banks limited in their sectoral concentration? (4) Are banks required to hold either liquidity reserves or any deposits at the Central Bank? (5) Are banks allowed to hold reserves in foreign denominated currencies or other foreign denominated instruments?
GENEROSITY [Index of generous deposit insurance]	The index ranges between 0 and 2, and is constructed based on the following (yes=1, 0=no): (1) Is there an explicit deposit insurance protection system? (2) Is the country ratio of Deposit insurance coverage/GDP-per-capita ≥ median ratio (Deposit insurance coverage/GDP-per-capita) over all analysed countries?