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# Leverage, Bank Employee Compensation and Institutions*

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**Abstract**

This paper investigates the empirical relationship between financial structure and employee compensation in the banking industry. Using an international panel of banks, we show that well-capitalized banks pay higher wages to their employees. Our results are robust to changes in measurement, model specification and estimation methods. In order to account for the positive association between bank capital and employee compensation, we illustrate a stylized 3-period model and show that well-capitalized banks have incentives to pay higher wages to induce monitoring. Such monitoring rents of employees at capitalized banks are expected to be higher in societies with weak institutions. Further empirical analysis shows that the weaker is institutional quality of a country the stronger is the positive relationship between bank capital and wages - supporting our theoretical conjectures. High compensations in the financial industry received increasing criticism over the course of years following the great recession, whereas capitalization of banks has been encouraged. Our paper is the first to highlight that there is an empirically visible trade-off between the two and that institutions strongly interact with this relationship.

**Keywords:** Bank Financial Structure, Wage Determination, and Human Capital.

**JEL Classification:** G3, G21, J24 and J31.

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# 1 Introduction

Rising wages in the financial industry across the globe has been drawing attention of academics as well as policy makers. Because of the lucrative compensation schemes it provides, the finance industry became increasingly attractive for high human capital over the last few decades. Philippon and Reshef (2012) document that the compensations of financiers account for about 15-25% of the overall income inequality rise in the U.S. since 1980. In a related paper, Philippon (2010) discusses the counterproductive aggregate consequences implied by the over-accumulation of human capital in the financial sector and suggests that employee compensations in the financial industry might imply a potential room for policy intervention. In this paper, we provide an empirical analysis to highlight the role of bank-capital - a highly policy sensitive bank-level variable - in explaining the variation in wages paid by banks.

Our study is motivated by a recent literature, pioneered by Vermijmeren and Derwall (2010), Chemmanur et al. (2013), and Akyol and Vermijmeren (2013), which investigated the role of firm's leverage in explaining the employee compensation in the non-financial sector. Using firm-level balance sheet data, this literature finds that firms with high leverage on average pay higher wages. The theoretical argument underlying this empirical pattern is that because the potential of bankruptcy generates a job-loss risk for a firm's employees they need to be compensated to work for companies with higher leverage - as pointed out by Titman (1984) and Berk et al. (2010). Human capital cost of debt is potentially also relevant for the effectiveness of leverage in determining the wages in the financial industry as it matters for the non-financial corporate sector. However, we highlight in our analysis that an additional effect of bank leverage on wage determination could exist. Specifically, as pointed out by Holmstrom and Tirole (1997) and Bolton et al. (2013) well-capitalized banks have higher incentives to spend resources on monitoring borrowers compared to the banks with high leverage. This is especially true in the context of weak institutional settings, where public enforcement of loan repayment is not strong.[1] We argue that monitoring is an essential task for bank employees. This implies that inducing a higher quality of borrower monitoring would require a redistribution of bank turnovers to employees, which suggests a negative association between banks' leverage and wages. These two counteracting effects motivate an investigation of the empirical relationship between bank capital and employee compensation as we conduct in this paper.

First, by utilizing a stylized theoretical model that builds upon Berk et al. (2010) and Holmstrom and Tirole (1997) we motivate the theoretical relevance of our analysis. Our theoretical conjectures suggest that extending monitored loans are more profitable for low leveraged banks. Monitored loan extension increases banks' per-employee labor expenditures. However, the employees of capitalized banks face lower likelihood of job loss due to liquidation, decreasing the human capital risk and

[1] See also Dell'Ariccia and Marquez (2006).

hence the wage compensation in a competitive labor market. Whether the former effect would dominate the latter depends on the quality of institutions and the regulatory framework of the society, which determine borrowers' incentives to shirk from repaying and loan officers' incentives to monitor loans.

Second, in order to test the impact of bank capital on employee compensation, we utilize an international bank-level dataset. To the contrary of the findings of non-financial corporate sector studies, we show that well capitalized - low leveraged - banks pay higher wages to their employees. This result implies that human capital costs of bankruptcy are potentially not as important in the banking industry as they are in the non-financial sector in determining wages. Our result also provides an indirect evidence for the argument of Holmstrom and Tirole (1997) on monitoring incentives of well-capitalized banks. Specifically, the argument of Holmstrom and Tirole (1997) is that skin in the game for the bank induces banks to monitor borrowers. Monitoring generates a surplus for the bank, which needs to be redistributed to the employees in order to implement monitoring. Further regression analysis confirms this underlying theory: The positive association between bank capital and employee compensation is stronger in countries, where institutional quality is weaker - forcing capitalized banks to redistribute larger monitoring rents to their employees. Our benchmark results are robust to the inclusion of various bank and country level control variables, bank (or country) and year fixed effects and various measures of bank capital (leverage) definitions. The empirical results are also valid at different sub-samples of the data-set. Finally, we utilize lagged values of bank-capital in our regressions and employ an instrumental variable analysis to address endogeneity concerns.

The findings from the paper carry high policy relevance. We show that high employee compensation schemes in the banking sector are mainly observed at well-capitalized banks. On the one hand, high compensation levels of the financial industry employees received increasing criticism of the policy makers over the course of years following the great recession. On the other hand, bank capitalization has been encouraged to avoid solvency as well as liquidity driven bank failures. Our paper is the first to highlight that there is an empirically visible trade-off between the two bank-level variables that policy might need to pay attention and institutional quality strongly interacts with the relationship between capital and wages in the banking sector.

This paper contributes to several lines of research. The first one is the literature, which studies the bank-level implications of capital. Relevant for our analysis, some papers theoretically examine the relationship between bank capital and monitoring, arguing that higher capital leads to better monitoring incentives. In Holmstrom and Tirole (1997) and Dell'Ariccia and Marquez (2006), capital strengthens monitoring incentives and enhances firms' access to credit. Bolton, Freixas and Gambocarta (2013) argue that long-term relationship lending can survive only with well-capitalized banks. Mehran and Thakor (2010) investigate the effects of capital on monitoring incentives in a dynamic framework. Our theoretical argument, which we also test using a panel data analysis,

is that bank capital incentivizes monitoring and thereby increases labor expenditures. Highly relevant to this theoretical line of research, a non-exhaustive list of papers empirically study the relationship between bank capital and bank performance. For example, Berger (1995) examines the relationship between bank capital and bank profitability in the U.S. and finds that capital ratio and return on equity are positively related in the 1980s but not in the early 1990s. Barth, Caprio and Levine (2004) provide international evidence that higher capital ratios (more stringent capital requirements) are associated with fewer non-performing loans. Bhattacharya (1982), Furlong and Keeley (1989), and Repullo (2004) argue that higher capital ratios encourage banks to invest in safer assets, such as lower-risk loans or securities. Berger and Bouwman (2013) investigate how the effects of bank capital on performance varies across banking crises, market crises and normal times. Our paper is the first attempt to focus on the implications of bank capital for the compensation of bank employees.

Bankruptcy implies a probability of job loss for a company's employees, and bankruptcy risk positively varies with a firm's debt stock. Building upon this line of intuition, a theoretical literature argues that firms with higher leverage have to pay their employees higher wages. Titman (1984) points out that because of bankruptcy costs, the incentives of employees to make firm-specific investments depend on the firm's leverage. Maksimovic and Titman (1991) argue that employees are reluctant to do business with a highly levered firm because financial difficulties can affect the firm's incentive to honor its implicit contracts. Finally, Berk et al. (2010) develop a theoretical model and show that in a competitive labor market, firms with high leverage will have to pay higher wages. Recently, Vermijmeren and Derwall (2010), Chemmanur et al. (2013), and Akyol and Vermijmeren (2013) tested the predictions of Berk et al. (2010) using non-financial corporate sector data from U.S. and Dutch publicly traded companies. Vermijmeren and Derwall (2010) and Chemmanur et al. (2013) uncover a positive association between firms' debt stock and employee compensation. Akyol and Vermijmeren (2013) show that a company's debt stock positively co-varies with its wage compensation as well as with aggregate unemployment rates. Different from the studies that concentrate on non-financial corporate sector we uncover a negative association between bank debt and wages.

Our paper also contributes to the literature on wages and human capital in the financial industry by researching the impact of bank capital on the compensation of human capital. A recent paper by Acharya et al. (2014) analyzes the effects of non-executive compensation on bank risk taking. The authors use a U.S. sample of bank holding companies (BHCs) and non-executive pay elasticities to BHC performance rather than absolute compensation. They show that higher elasticities before the recent financial crisis was related to higher risk and lower firm value during the crisis period - a result mainly driven by peer group effects. Our approach establishes a relationship between capitalization and employee compensations controlling for risk taking with a market measure (volatility of market value) and bank performance.

Philippon and Reshef (2012) study the compensation of human capital in the U.S. finance industry over the last century. The authors find that workers in finance earn the same education-adjusted wages as non-financial workers until 1990, but by 2006 the premium becomes about 50% on average. Top executive compensation in finance follows the same pattern and timing, where the premium reaches 250%. Consistent with the findings from our work they also show that changes in earnings risk can explain at most one half of the increase in the average premium. Also in the literature, Goldin and Katz (2008) document a large increase in the fraction of Harvard undergraduates who have worked in the financial sector since 1970, and the increase in their wage premium. Similarly, Kaplan and Rauh (2010) and Bakija et al. (2012) study the evolution of earnings of individuals with very high incomes, with a particular emphasis on the financial sector. More recently, Jarque and Prescott (2013) develop a theoretical model to show that the employee compensation could be important for bank risk-taking, whereas Cole, Kanz and Klapper (2013) conduct an experiment with commercial bank loan officers and find that high powered compensation schemes raise the quality of loan screening. Our theoretical argument in this paper suggests that monitoring banks need to redistribute benefits from monitoring to their employees, and an aggregate rise in the monitoring activity should be positively related with the level of employee compensations in the financial industry.

We also relate to the literature on law and finance view of financial development. Several papers in this area, pioneered by La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1997, 1998, 1999 and 2000), argue that legal origin of a country is essential in determining the development of financial sector and the implied aggregate consequences of finance.[2] Also related to this line of research and our paper, Giannetti (2003) provides empirical evidence and argues that the quality of institutions mitigate the extent of agency problems and enhance lending in an economy. Moreover Klapper and Love (2004) analyze corporate governance and firm performance in emerging markets. Excluding banks from their analysis, they show that the relationship between good governance and firm performance is stronger in weaker legal systems [3] -with weak shareholder protection and poor judicial efficiency. Our analysis confirms the relationship between firm-level (bank-level in our case) governance practices and country level institutional environment by documenting that the positive association of bank-capitalization is stronger on compensation of employees in countries with weak institutional development. The findings suggest a role for institutional environment to be a substitute for bank-level incentive schemes.

The paper is organized as follows. Section 2 illustrates the theoretical foundations, which motivates our empirical analysis. Section 3 presents the data we utilize in our empirical analysis. Section 4 presents the empirical specification and the results including an extensive list of robustness checks and an extension for understanding the role of institutions in explaining the relationship between

[2]See La Porta et al. (2008) for a detailed analysis of economic consequences of legal origins on various dimensions.

[3]A similar pattern is observed in Aggarwal et al. (2011) where the institutional environment of international institutional investors affect firm-level corporate governance.

bank-capital and employee compensation. Section 5 concludes the paper.

# 2 Theory: Human Capital Risk vs. Monitoring Incentives

In this section we illustrate two competing models to highlight the theoretical relationship between banks' capital structure and employee compensation. The arguments that we present in this section are simple extensions of two lines of research that have been extensively cited in corporate finance and banking theory. Using these models, we will argue that the capital-wage relationship in the banking sector warrants an empirical analysis.

## 2.1 Liquidation, Capital and Wages

At first we present a stylized model to highlight the negative impact of bank capital on employee compensation through job-loss costs associated with bankruptcy. The intuition of our model builds upon the framework by Berk et al. (2010).[4] In this respect, let us consider a 3-date environment. The dates are denoted as 1, 2 and 3. There is a distribution of banks, which differ in their capital structure. Specifically, each bank is endowed with $K$ units of investable funds on day-1. $D$ units of this initial $K$-endowment is external debt, which we assume to be deposit finance without loss of generality. The day-1 deposit finance is distributed uniformly across banks with $D \in [0, K]$.

Each unit of investable fund generates $r$ units of cash flow on day-1. On day-2 the bank goes through a refinancing stage. If refinancing is obtained, the bank gets to re-invest $K$ to receive $r > 1$ unit rate of return on day-3. If the bank cannot refinance, it doesn't have an opportunity to reinvest on day-3. The size of the day-1 deposit finance determines the probability of refinancing $p(D/K)$ with $p'(.) < 0$, $p(0) = 1$ and $p(1) = 0$. We interpret the stage of refinancing as a period, when liquidation due to bankruptcy can potentially occur. As standard we assume the higher bank's debt the higher is the probability of liquidation.

On day-1, each bank's equity holders hire an employee (a loan office) from a perfectly competitive labor market to operate the investable funds available to the bank. The bank employee supervises day-1 and day-3 investment activities and receives wage income of $w_1(D)$ on day-1 and $w_3(D)$ on day-3, where the latter is conditional on having obtained refinance on day-2. If the bank does not get to raise refinancing on day-2, the employee looses his job and he becomes unemployed on day-3. We set the day-3 value of an unemployed to $V$.

[4]There are others who worked out similar theoretical models. Some important examples are Harris and Holmstrom (1982) and Titman (1984).

**Assumption 1.** Banks offer to employees a flat wage rate. This means $w_1(D) = w_3(D) = w(D)$ for any bank characterized by the deposit level $D$.

Since the labor market is competitive and the probability of being able to refinance on day-2 declines with the size of day-1 debt - and hence the probability of being employed for the worker - we obtain the following intuitive result.

**Proposition 2.1** *The wage profile $w(D)$ is a (weakly) monotonically increasing function of the day-1 debt (leverage) of the bank.*

**Proof** Consider two banks 1 and 2 with $D_1 > D_2$. Since the day-1 labor market is perfectly competitive, the following should hold in equilibrium:

$$w(D_1) + p(D_1)w(D_1) + (1 - p(D_1))V = w(D_2) + p(D_2)w(D_2) + (1 - p(D_2))V.$$

For $V$ small enough $p(D_1) < p(D_2)$ gives $w(D_1) > w(D_2)$. When the outside option of a bank employee, $V$, is large enough then $w(D_1) = w(D_2)$ for all $D_1$ and $D_2$. To see that note that

$$w(0) = \theta(V) + V,$$

where $\theta$ is a wedge above the outside option. It is clear that $\theta'(V) < 0$ as long as $V$ is above some threshold $\bar{V}$, because $w(0) = \theta(V) + V \leq rK$ has to hold for any $V$. Then for $V$ large enough $\theta = 0$, which would imply for all $D > 0$ $w(D) = V$. □

Berk et al. (2010) argue that the probability of bankruptcy associated with debt increases the human capital risk of a firm's employees, which under perfectly competitive labor markets implies a monotonically increasing wage profile with respect to debt. The result we present at proposition 2.1 is an intuitive extension of Berk et al. (2010) into a framework with banks and the wage determination of their employees. Our hypothesis states that if and only if the outside option of a laid off bank employee, $V$, is small enough, then bank capital should have a negative impact on employee compensation. This effect seizes to exist when employees' outside options - potentially induced by low bank-specific human capital - are large enough.

## 2.2 Monitoring, Capital and Wages

We now extend our stylized model with a lender monitoring function - as in Holmstrom and Tirole (1997) - and hypothesize that bank capital could also have a positive impact on employee compensation.

Suppose that banks lend the $K$ units of investable funds to entrepreneurs on days 1 and 3, who run investment projects. Entrepreneurs do not have any investable funds on either of the days. As in Holmstrom and Tirole (1997) on day-1 (and on day-3) each entrepreneur can choose one project from a mutually exclusive set. In the entrepreneurial project set there is a *good* project with no private benefit, a *medium quality* project with low private benefit and a *bad* project with high private benefit. Each project requires one unit of investment at the beginning of day-1 (or day-3). The good project succeeds with probability 1 at the end of the investment period and generates $r > 1$ units of cash flow. The low private and the high private benefit projects succeed and return $r$ with probability $p_H$ and $p_L$ respectively, where the former yields the entrepreneur a non-contractible private benefit of $b$ units of cash flow and the latter a non-contractible private benefit of $B$ units at the end of an investment period - with $B > b$.

**Assumption 2.** $r - 1 > p_H r - 1 + b > p_L r - 1 + B$.

As before there is a distribution of banks in the economy each endowed with $K$ units of investable funds and differ in the amount of day-1 deposit finance. A bank can engage in *no*, *low* or *high* levels of monitoring of the entrepreneur to rule out the opportunistic behavior that could lead to a private benefit action. Specifically, bank's equity holders pay $\omega_h$ and $\omega_\ell$ units of additional wage compensation - on top of the base salary $w(D)$ - if the bank engages respectively in high and low monitoring activity, where $\omega_h > \omega_\ell$.

As in Holmstrom and Tirole (1997), the bank cannot ex-ante commit to engage in low or high monitoring and would choose to monitor only if it is in bank equity-holders' best interest. Similarly, the entrepreneur cannot commit to not undertake a private benefit action if he doesn't have the incentives to run the good project. Denoting the bank's rate of return from investment activity as before by $r_b$, bank's limited commitment implies that $r_b$ should be large enough to induce the bank to monitor. If bank cannot be incentivized to monitor, the entrepreneur would always take a high private benefit action if this is in his best interest.

Using this simple moral hazard set-up, Holmstrom and Tirole (1997) show that entrepreneurs receive funding only if banks provide monitoring services, where bank capital positively influences bank's monitoring incentives. The intuition is as follows. When the bank finances entrepreneur's project with its own capital, the repayment to the bank on each loan is higher, which implies that the bank has more to lose from a defaulting entrepreneur. This strengthens the monitoring incentive of a well-capitalized bank. In our simple extension to the Holmstrom and Tirole (1997), there is a distribution of banks with heterogenous capital levels and monitoring activity is undertaken by bank employees. Based on our simple extension of Holmstrom and Tirole (1997), we obtain the following result.

**Proposition 2.2**

*i. Banks with relatively low levels deposit finance (leverage) engage in the high monitoring activity, whereas banks with intermediate levels of day-1 deposit finance undertake the low monitoring activity. Banks with high enough deposit finance do not monitor the entrepreneurs.*

*ii. Well-capitalized banks pay higher wages to their employees compared to their low-capitalized counterparts to compensate them for their monitoring efforts.*

*iii. The higher private benefits from shirking (B), the higher are the rents that capitalized banks need to redistribute to employees.*

Proposition 2.2 suggests that bank's capital could have a positive impact on employee compensation through monitoring incentives - counteracting the refinancing (liquidation) effect highlighted at proposition 2.1.

### 2.3 Testable Hypothesis

The prediction of our theoretical argument is that if the job-loss risk of financial employees within the banking sector is negligible, then bank's capital is expected to have a positive impact on employee compensation. The intuition is that, on the one hand, the probability of job loss resulting from a bank default should increase the competitive wages offered by low-capitalized banks. On the other hand, if the human capital risk is relatively low, then bank capital should positively impact employee compensation through monitoring incentives. We would like to also note that the positive effect of capital on wages should be higher the lower is quality of institutions, which according to the theoretical terminology above increases the private benefit from shirking and not repaying for borrowers.

In the following we will test the theoretical prediction of our model using a cross-country bank-level panel data analysis. Specifically, controlling for a set of factors that could have explanatory power for wages of bank employees and bank (or country) and year fixed effects, we will explore the empirical relationship between bank capital and employee compensation and how cross-country institutional quality differences affect this relation.

## 3 Data

Our analysis utilizes bank-level data from BankScope and Datastream, macro data from WDI database, and data on institutional quality and regulatory and supervisory framework from World Bank's World Governance Indicators and Bank Regulation and Supervision Surveys (Barth et al.

(2013)), respectively. We work with an unbalanced panel of 1619 banks with a time span of 1995-2012 from 64 countries. The banks in the sample are all publicly traded companies. We use Bankscope to obtain total personnel expenses, the total number of employees, total assets, book value of equity, market value of equity (calculated as the market capitalization of the bank over its total assets), capital ratio, net interest margin, non-interest income, non-performing loans, and return on average equity at the bank-level.

For the macro variables, we refer to WDI database. Our country control variables include real GDP per-capita, aggregate real GDP, annual growth rate of the per-capita real GDP, CPI inflation, Trade over GDP and finally the unemployment rate. The data on the quality of institutions is extracted from WGI dataset, which includes data items on control of corruption, government effectiveness, regulatory quality, rule of law and accountability. We use the legal origin of the countries (English vs. Others (French, German, Scandinavian and Socialist)) from La Porta et al. (2008). Regulatory and supervisory data is from Barth et al. (2013) and includes the independence of the supervisory authority from banks' legal action, the percent of the 10 biggest banks rated by domestic and international rating agencies, the private monitoring index, external ratings and creditor monitoring, and finally the external governance index. Table 1 provides the summary statistics of our analysis.[5]

Table 1 about here.

It can be seen from Table 1 that the average employee wage of the banks in our sample is about 63.000 dollars. The average market value of equity to total assets ratio is 11.8% and the book value of equity over total assets and over risk-weighted assets are 9.3% and 14.1%, respectively. The average bank has about 2800 employees. The average bank size in the sample is relatively high, because we work with publicly traded banks only. Having said that we would like to note that there are still many small scale banks in the sample, especially from the U.S..

# 4 Empirical Analysis

## 4.1 Benchmark Empirical Specification

In line with the studies that aimed to address the relationship between firm-level leverage and wage compensation, we measure wages as the logarithm of the per employee personnel expenditures (as in Chemmanur et al. (2013) and Akyol and Vermijweren (2013)). The baseline empirical specification

[5]See Table A1 in the Appendix for variable descriptions and data sources.

that we estimate is:

$$\begin{aligned} ln(Wage)_{c,i,t} &= \alpha * \left(\frac{Equity}{Total\ Assets}\right)_{c,i,t-1} \\ &+\beta_1 * ln(Total\ Assets)_{c,i,t-1} \\ &+\beta_2 * Volatility_{c,i,t-1} + \beta_3 * Net\ Int.\ Margin_{c,i,t-1} \\ &+\beta_4 * Market - to - Book_{c,i,t-1} + \beta_5 * Non - Int.\ Income_{c,i,t-1} \\ &+\beta_6 * \left(\frac{Non - Performing\ Loans}{Total\ Loans}\right)_{c,i,t-1} \\ &+\Gamma * CountryControls_{c,t} \\ &+\eta_i + \gamma_t + \epsilon_{c,i,t}. \end{aligned} \tag{1}$$

In our regression specification $\ln(Wage)_{c,i,t}$ is the logarithm of the average employee compensation of a bank $i$ in country $c$ in period $t$ computed as the logarithm of total personnel expenses divided by the total number of employees of the bank. The variables $\eta_{c,i}$ and $\gamma_t$ capture bank and year fixed effects respectively.

The ratio $\left(\frac{Equity}{Total\ Assets}\right)_{c,i,t-1}$ captures the first lagged value of bank's market value of equity to total assets ratio and it is the key right-hand-side explanatory variable for our empirical analysis. Additional bank-level control variables that we include on the right hand side are as follows: Logarithm of the lagged value of total assets captures possible structural differences among banks in different sizes. Lagged volatility, which captures bank risk, is the standard deviation of daily market values - calculated annually given that the bank has data for at least 100 days in that year, where the market value data is extracted from Datastream. A bank with more volatile market value is more likely to default, so we expect a positive relation between earnings volatility and wages if the bankruptcy channel is to hold. We also control for the efficiency of banks by including net interest margin. We expect this variable to have a positive impact on wages. Market to book ratio of the bank is included to capture bank's growth opportunities. All else equal, we expect employees in growth banks to accept lower wages, which increases cash flows for the bank's investments and expected pay increases in the future. Non-traditional banking activities - controlled by Non-Interest-Income-over-Gross-Revenues - involve fee generating activities such as underwriting and trading. Such financial institutions may offer high wages to their employees to attract talented workers. Finally, we expect that non-performing loans, which proxy asset quality, are related with low employee compensation.

*CountryControls* is a vector of time-varying country control variables. The vector of *CountryControls*, which could be important in determining the average wages in a society, includes real GDP-per-capita-growth, real GDP-per-capita, real GDP, Inflation, Trade-over-GDP, and Unemployment.

As an alternative baseline we replace bank-fixed effects with country-fixed and bank-specialization-

fixed effects and also estimate the following pooled OLS regression in order to observe the cross-sectional properties of our benchmark model:

$$\begin{aligned} ln(Wage)_{c,i,t} &= \alpha * \left(\frac{Equity}{Total\ Assets}\right)_{c,i,t-1} \\ &+\beta_1 * ln(Total\ Assets)_{c,i,t-1} + \beta_2 * ln(Total\ Assets)_{c,i,t-1} \\ &+\beta_3 * Volatility_{c,i,t-1} + \beta_4 * Net\ Int.\ Margin_{c,i,t-1} \\ &+\beta_5 * Market - to - Book_{c,i,t-1} + \beta_6 * Non - Int.\ Income_{c,i,t-1} \\ &+\beta_7 * \left(\frac{Non - Performing\ Loans}{Total\ Loans}\right)_{c,i,t-1} \\ &+\Gamma * CountryControls_{c,t} \\ &+\mu_c + \theta_i + \gamma_t + \epsilon_{c,i,t}. \end{aligned} \quad (2)$$

In this specification $\mu_c$ captures the country fixed effects and $\theta_i$ captures the bank's specialization fixed effects. To the end of banks' specialization categories using Bankscope database we identify 10 bank clusters as we present in table 2.

Table 2 about here.

We are considering both panel as well as pooled OLS models in order to separately investigate the effect of bank-leverage on wage compensation across as well as within banks.

### 4.2 Benchmark Results

We summarize our baseline empirical estimation results from panel fixed effects and pooled OLS regressions in table 3. Panel (A) contains the coefficient estimates from regressions with bank and year fixed effects, whereas panel (B) presents pooled OLS regression estimates with country, year, and-specialization fixed effects.

The baseline regression results that we present in panels (A) and (B) of table 3 reveal a positive association between bank's market value of equity-over-assets ratio (inverse of leverage) and logarithm of the average wage per employee. Specifically, the coefficient estimate of $\alpha$ in the baseline regression is positive and statistically significant at the 1% level after controlling for bank as well as country level characteristics.[6] Furthermore, comparing the results in panel (A) against panel (B) also shows that the results come from within-bank as well as cross-bank effects. Specifically, panel (A) bank-fixed effect regressions suggest that increases in a bank's leverage (declining equity

[6]The results are similar when we control for number of employees, suggesting they are not driven by the layoffs in the financial industry.

over assets ratio) would imply contractions in average wage compensation for that particular bank. Panel (B) results indicate that banks with higher leverage pay on average lower average wages.

The effect of bank's equity ratio on wage compensation is also economically significant, especially in cross-sectional regressions. A one standard deviation increase in equity-ratio (0.088) is associated with an increase of 1.6% ($= 0.088 * 0.182$) in per employee compensation. This increase amounts to around 3% of a standard deviation in per employee compensation. Nevertheless, cross-sectional one standard deviation increase in equity-ratio (0.094) is associated with an increase of 3.46% ($= e^{0.094*0.387} - 1$) in per employee compensation. This increase amounts to around 7% of a standard deviation in per employee compensation, it costs around 6.1 million US dollars for a bank with 2800 employees -approximately the size of the average bank in our sample.

Table 3 about here.

The relationship between average employee compensation and other bank-level control variables are mostly as expected. An increase in the size of *total assets* is associated with higher compensation, indicating the importance of heterogeneity in bank size for an average employee (see John and Qian (2003) showing positive size compensation correlation in CEO compensation in the U.S.). *Net interest margin* has a positive impact on wages when we concentrate on within firm effects, whereas a negative effect prevails with the cross-sectional regression specification. *Non-interest income* has a positive and significant coefficient in both specifications proving higher compensation are extended as a result of efficiency in high income generating activities. Bank's market value volatility, *Volatility*, is positive and significant indicating that bank's default risk increases average employee pay. This result indicates that risk-taking might be incentivized by employee compensation schemes. *Market-to-book ratio* is negative (only significant in pooled OLS regressions) showing that growth banks pay lower wages. Finally, the coefficient estimates of *Non Performing Loans over Total Loans* ratio is mostly insignificant throughout our regressions, although the coefficient estimate - as expected - is negative in both specifications.

We would like to highlight that all of our bank-level right-hand-side variables - including bank's market value of equity over total assets ratio - are included in both regression specifications with their first-lagged values to lower potential endogeneity biases between our explanatory variables and average employee pay. Also, some of our country-level variables turn out to be significant - also in bank-fixed effect regressions - highlighting the importance of country characteristics in the determination of wages in the banking industry. In particular, real GDP per-capita, the growth rate of real GDP per-capita and the unemployment rate have significant impact on average bank employee compensation. To sum up, our baseline results indicate a strong positive impact of capital on employee compensation in the banking sector. In the next subsection, we test the robustness of this key empirical finding.

## 4.3 Robustness

This subsection provides an extensive list of robustness checks to ensure that the key empirical results are not driven by mismeasurement of our bank leverage measure as well as model misspecification. Furthermore, we instrument bank leverage and conduct 2SLS estimation in order to rule out reverse causality concerns. Specifically, in 4.3.1 we employ alternative measures of bank leverage. In 4.3.2 we provide an instrumental variable analysis. In 4.3.3 we control for additional factors that can explain wage determination in the banking industry. Finally, 4.3.4 shows that the key empirical result of the paper is also robust to running the regressions for alternative sub-samples.

### 4.3.1 Alternative Measures of Bank Leverage

In our benchmark specification we chose to use market value of leverage, as the best proxy for banks' incentive to monitor because market leverage acts as the actual skin in the game for the shareholders. Yet, to what extent are the results specific to the choice of our bank leverage measure - the market value of equity over total assets ratio? In order to address this question, we rerun our panel and pooled OLS regressions with two alternative leverage measures: (i) the ratio between book value of equity over total assets and (ii) the regulatory capital ratio. The table 4 presents the regression results with these alternative measures of bank leverage.

Table 4 about here.

Our results with alternative leverage measures are broadly similar to the baseline with a few exceptions. Specifically, as we illustrate in columns 1-2 of table 4, our baseline result - that bank-capital and employee compensation is positively associated - is robust when we concentrate on book value of equity on the right-hand-side instead of the market value of equity. Both bank-fixed and country-fixed effect wage regressions have a positive and significant coefficient - at 5% level - for the ratio between book value of equity and total assets. In both regressions, the coefficient estimates for the other control variables are in line with the baseline results - with the exception of the Market-to-Book ratio.

When we use the regulatory capital ratio as our key explanatory variable, on the one hand we seize to have a significant coefficient for capital in bank-fixed effect regressions. However, the coefficient estimate continues to be positive. On the other hand, at country-fixed effect regressions bank capital is significant at 5% level. These results indicate that simple leverage ratio is a more significant negative determinant of employee compensation compared to regulatory capital ratio, as it matters both in cross-section and time dimension. This conclusion is consistent with the

theoretical foundation that we presented in section 2: A risk weighted measure of leverage - such as the regulatory capital ratio - would capture also the unemployment risk associated with bank's financial structure and imply a stronger positive impact of leverage on compensations through the unemployment (human capital risk) channel counteracting the monitoring incentives channel. Furthermore, this regulatory ratio may not be a good measure of skin in the game for the bank, since it can be manipulated by the bank as argued by Acharya et al. (2013), for example.

These results indicate that our baseline results are not driven by a specific type of bank leverage measure that we control as our key right-hand-side variable.

#### 4.3.2 Instrumental Variable Analysis

There is an empirical association between equity and wages as we highlighted in our discussions so far. However, high wages can also imply low leverage. For instance, higher ranked bank managers who can directly interact with the board (and influence) may have greater ability to affect their own pay as well as the level of bank capital. This potential endogeneity problem has already been partly addressed in our study, because throughout our analysis we utilized lagged values of bank-capital on the right hand-side of our regressions.

We address the potential reverse causality problem also formally by utilizing an instrumental variable approach. Specifically, we employ two variables in the bank fixed effects regression to instrument equity over total assets ratio. The instruments are the fraction of population over 65, and the capital income allowances in the respective country, where the main activity of a bank takes place. In places, where the fraction of people over 65 is large, one would expect a lower demand for equity. Similarly, capital allowances might increase leverage because of the collateral effect. Specifically, the ability to raise collateral (equity) on short notice due to a high capital allowance, would allow firms (and banks for our context) to increase their indebtedness. Similar instruments have been employed in the literature - for instance, by Berger and Bouwman (2009 and 2013) - to instrument bank leverage in identifying the impact of leverage on performance. We estimate the bank-fixed effect model with 2-stage least squares estimation technique. For the instrumental variable analysis, we use book value of equity over assets ratio (instead of market value of equity over assets), because market value of equity is not well identified by the country-level instruments. Table 5 presents the instrumental 2SLS results.

Table 5 about here.

The 2SLS estimation shows that our results are robust to reverse causation of wages to the determination of bank leverage. As we illustrate in table 5 panel (a) our first instrument fraction

of population above 65 significantly lowers bank's equity-to-total assets ratio. This result supports our intuition that with age the demand for holding equity is expected to go down. The second instrument as expected is negatively related to the equity-to-total assets ratio - albeit insignificant.

In panel (b) of table 5 we show that in the second stage of our 2SLS estimation, bank's leverage remains a significant determinant of average employee compensation and with a coefficient sign that is consistent with our previous findings. This result indicates that our baseline estimation results are robust to instrumenting bank's leverage.[7]

Finally, in table 5 (panel (c)) we also show that our instruments get reasonably close to the rule of thumb statistics for the F-test of exogenous instruments and the Hansen over-identifying restriction test confirms validity of our instruments. To sum up, the results that we present in table 5 indicate that the positive association between banks' capital and employee compensation is not likely to be driven by an endogeneity bias. If anything, our IV regression suggests that there is a serious downward bias in our benchmark results and the relationship between leverage and employee compensation is much stronger in size.

#### 4.3.3 Inclusion of Additional Controls

In this subsection, we test whether our key result is robust to the inclusion of various additional control variables, which can drive an omitted variable bias between bank leverage and employee compensation. Specifically, in different specifications of our baseline regression model with bank and year fixed effects, we include 5 additional control variables. We include Return on Average Equity (ROAE) as a proxy for profitability considered by the shareholders, bank's systemic size (assets/GDP) to control for possible too-big-to-fail or too-big-to-save status of the banks, liquidity as an alternative risk measure, deposits over total funding to capture heterogeneity in the funding structures, and finally, off-balance sheet items over total assets as an alternative measure of banks' non-traditional activities. Each of these variables are potential candidates for a potential omitted variable bias.

As we present in table 6, at columns (1)-(5), our key benchmark result - that bank's capital and average employee compensation are positively related - is robust to the inclusion of additional variables. Moreover, we find that systemically important banks and banks which use non-deposit finance to run their operations pay higher wages. This is another result consistent with our theoretical intuition: Non-deposit finance implies a higher probability of bank failure, which strengthens the human capital risk channel of leverage and dampens the positive coefficient estimates on the equity/assets ratio.

[7] An IV regression with market leverage provide similar results, the identification of the market equity is very weak. Thus we do not report that regression.

Table 6 about here.

#### 4.3.4 Alternative Sub-samples

In order to investigate whether our results are driven by the presence of some financial institutions, which are not directly related to the standard intermediation activities or by particular time-periods we re-run our two regression specifications for only (i) Bank Holding companies & Commercial Banks, (ii) for non-US banks, and (iii) 2007-2009 crises years. We present the results from this alternative sub-sample analysis in table 7.

Table 7 about here.

As the table 7 illustrates our key result in bank-fixed effect and pooled OLS regressions - that bank capital has a significant positive impact on average employee compensation - remains throughout alternative sub-sample specifications. Bank capital's positive effect on employee compensation is valid when we concentrate only on Non-US banks (actually we see that the effects are much stronger for the non-US sample), in Panel A, or Bank-Holding-Companies and Commercial Banks, in Panel B. In Panel C, we include a global financial crisis dummy for the period 2007-2009 to investigate the impact of bank capitalization on compensations during the 2007-2009 financial crisis, and use its interaction term with equity to capture any difference during this period. Bank capitalization remain positive and significant in both bank FE and pooled OLS regressions and the crisis interaction terms are also positive - suggesting that leverage-compensation relationship got stronger during the crisis, but only marginally significant in the pooled OLS regression.

### 4.4 Institutions and Capital-Wage Relationship

The theoretical foundations presented in chapter 2 implies that if borrowers have a lot of room to shirk - which would reduce the repayment rates to banks - banks would have higher incentives to monitor the loan applicants. Taking the case to an extreme, if there are no private benefit (incentives) associated with taking projects with low-likelihood of success, monitoring actions would not be undertaken by banks. No monitoring then would mean no monitoring-rent payments to bank employees, weakening the positive association between bank capital and employee compensation. In this section, we gauge the empirical validity of this theoretical linkage.

In economies, where institutions as well as regulatory and supervisory framework are strong, borrowers' repayment incentives are expected to be high. Tables 8a-8c present the key empirical results from our analysis. In table 8a we run panel regressions with bank fixed effects and pooled

OLS regressions with country fixed effects by splitting the sample into two based on legal origin, as "countries that have a English legal origin" and "countries that have a Non-English legal origin". The law and finance view of financial development, pioneered by La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1997, 1998, 1999 and 2000), argues that English legal origin provides the foundations for institutional development that enhances strong enforcement of property rights and contracts and becomes an important determinant of financial development. This line of research thereby suggests that countries with an English legal origin allow easier access to finance. As we present in table 8a, exploiting the cross-country variation in countries' legal origins shows that the positive association between bank-capital and employee compensation is statistically significant - at 5% level for the case of FE regression and at 1% level for the case of Pooled OLS - only for the sub-sample of the countries, which have a Non-English legal origin. The regression coefficient of bank-capital in neither fixed effect nor pooled OLS regressions are statistically significant for countries, which have English legal roots. This result supports our theoretical conjecture that in institutionally well-developed societies the impact of bank capital on employee compensations is weaker.

Table 8a about here.

The empirical results on legal origin that we present at table 8a serve to provide us with also a robustness check. The use of market value of equity as a measure of leverage might raise some endogeneity issues through the equity-based compensations that the CEOs (or other high ranked managers) receive. Specifically, if market value of equity in a bank rises, this might imply an expansion in equity-based compensation of managers. The data-set that we utilize to conduct our research does not allow us to separately observe managerial and non-managerial pay (or fixed and variable compensation).[8] However, the results in table 8a show that in our sample the strong impact of bank capital on employee compensations are driven by sub-sample countries, which do not have a English legal origin. Past research, such as Bryan et al. (2006), shows that the equity-based managerial compensations are not commonly observed in non-UK legal origin countries as much as they are practiced in UK legal origin countries. Therefore, our results are expected to be not driven by an endogeneity bias associated with the compensation-schemes of high-ranked managers.[9]

A recent European Banking Authority (EBA) report (2015) analyzes the renumeration practices in Eurozone countries and Norway regarding the high earners (defined as employees with higher

[8]Variable pay may also be important for non-executive employee compensation. See for example Change et al. (2015) for an analysis of non-executive employee stock options and corporate innovation in non-financial firms. They, however, do not include total employee compensation in their analysis.

[9]For a subsample of US banks we analyze CEO and Non-CEO compensations (unreported). We find CEO compensation responds to leverage -as suggested by the literature-, whereas Non-CEO compensation (as well as the full employee compensation including CEOs) is not significantly related to leverage. This provides some assurance showing executive compensation cannot drive the results for our analysis of an average employee -even in the US.

than 1 million Euro compensation), some of which are also identified as having a material on the institution's risk profile. The report provides important insights about our analysis. First of all, total personnel costs are driven by the fixed renumeration of not identified (and/or not high earner) staff. Variable renumeration for the unidentified staff in Eurozone is on average 17.48% of fixed compensation in 2013. Even though for identified (high earner) staff this ratio is much higher than 104.27% (specifically, 317%), absolute renumeration constitutes a small part of total staff renumaration, which turns out to be less than 10%. These recent statistics from the Eurozone provides relevance to our analysis of average employee compensation. Finally, it is crucial to note that English legal origin countries in the EBA report make the highest use of variable renumaration for high earners (the UK ranks first with 410% variable to fixed renumeration and Ireland ranks the third with 309%) as discussed before an observation, which reduces endogeneity concerns.

In table 8b we present empirical results with panel regressions, where we enrich our benchmark regressions with an interaction term between the lagged value of bank-capital and a spectrum of country-level time-varying variables that measure the level of institutional quality. The set of institutional quality measures that we consider in our analysis are Control of Corruption, Government Effectiveness, Regulatory Quality, Rule of Law, and Accountability. Fixed-effect estimation results in table 8b show that the interaction between institutional quality and bank-capital has a negative and significant coefficient estimate (varying between 1%-10% significance level) for every variable of institutional quality that we consider. Negative coefficient estimates associated with the interactive terms indicate that the positive effects of bank-capital on employee compensation dies out with the level of institutional development.

Table 8b about here.

Similar empirical patterns emerge in regression specifications, where we enrich the benchmark set-up with interactive terms between regulatory and supervisory framework and lagged values of bank-capital. In panel regression estimates of table 8c we use data on regulatory and supervisory framework on the independence of the supervisory authority from banks' legal actions, the percent of the 10 biggest banks rated by international rating agencies, the percent of the 10 biggest banks rated by domestic rating agencies, the private monitoring index, external ratings and creditor monitoring, and finally the external governance index. All those variables are capturing how influential external agents like supervisors, rating agencies, external audits are on the institutional environment in which the banks operate. In all regressions the coefficient estimate of the interactive term between bank-capital and the quality of regulatory framework turn out to be negative and statistically significant (varying between 1%-10% significance level).

Table 8c about here.

To summarize, the results on the interaction between institutions and employee compensation-leverage relationship suggest that institutional environment matters for the bank-level governance problems. Past research shows that institutions may not only shape the nature of dominant governance problems in different countries, but also influence the efficacy of firm-level governance solutions as, for instance, argued by Chahine et al. (2012). Stronger institutions - including regulatory and supervisory elements of external monitoring - mitigate the principal-agent problem in the bank and reduce the need for higher employee compensation to induce monitoring.

# 5 Conclusion

We investigated the empirical relationship between bank capital and employee compensation in the financial industry. In order to motivate our empirical analysis, we develop a 3-period model, with human capital risk and bank monitoring and highlight a theoretical mechanism that can account for the positive association between bank capital and employee compensation. Our theoretical argument suggests that extending long-term loans are more profitable for capitalized banks which aim to mobilize borrower monitoring by distributing information rents to their employees. Such financial institutions compensate their employees with high wage profiles, if bankruptcy (liquidation) induced human capital effects is negligible in the banking industry. Furthermore, the theoretical set-up also implies that the weaker the institutional quality of a country - which reduces the borrowers' loan repayment incentives - the stronger is the association between bank capital and employee compensations.

Building upon this theoretical set-up, we conduct a panel-data study to gauge how banks' capital structure and employee compensation are related. We show that well-capitalized - low leveraged - banks pay higher wages compared to their low-capitalized counterparts. The empirical results are robust to the inclusion of various bank and country level control variables, bank, country and year fixed effects and various measures of bank capital (leverage) definitions. We also employ an instrumental variable analysis to address reverse causality concerns. We support the theoretical foundation of our analysis by empirically showing that the positive effects of bank's capital on compensation levels is stronger in countries with weak institutional and regulatory and supervisory quality, confirming our theoretical conjectures.

Our empirical results carry high policy relevance. That the financial industry has increasingly become an attraction center for high human capital, with lucrative employee compensation schemes it offers, has been criticized by academics as well as policy makers over the course of the years that led to the global financial crises. Similarly, capitalization of banks has been encouraged especially after the crises years. Our results indicate a seemingly close relation between the two bank-level variables and a potential trade-off that the policy might need to take into account.

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**Table 1. Summary Statistics of the Key Data Items**

| | Observations | Mean | St. Dev. | Min | Max |
|---|---|---|---|---|---|
| ln(Per-Employee Expense) | 8882 | 10.933 | 0.526 | 8.922 | 12.311 |
| ln(Total Assets) | 8882 | 21.377 | 1.795 | 15.972 | 25.228 |
| Market Equity/Total Assets | 8874 | 0.118 | 0.088 | 0.004 | 0.873 |
| Book Equity/Total Assets | 8852 | 0.093 | 0.042 | 0.015 | 0.911 |
| Regulatory Capital Ratio | 7320 | 0.141 | 0.046 | 0.071 | 0.636 |
| # Employees | 8899 | 2832.943 | 14005.22 | 10 | 375000 |
| Net Interest Margin | 7320 | 0.141 | 0.046 | 0.071 | 0.636 |
| Volatility | 8879 | 209.889 | 1224.664 | 0 | 36891.84 |
| Market-to-Book | 8879 | 1.284 | 0.842 | 0.014 | 8.299 |
| Non-Interest Income/Gross Revenue | 8707 | 0.242 | 0.140 | 0.013 | 0.977 |
| NPL/Loans | 8628 | 0.031 | 0.044 | 0.001 | 0.310 |
| Return on Average Equity | 8879 | 0.066 | 0.136 | -0.569 | 0.501 |
| Asset/GDP (Systemic Size) | 8880 | 0.010 | 0.032 | 0.000 | 0.180 |
| Liquidity | 8881 | 0.088 | 0.093 | 0.006 | 0.869 |
| Off-balance sheet items/Total Assets | 8002 | 0.113 | 0.203 | 0 | 1.796 |
| Deposits/Total Funding | 8830 | 0.841 | 0.157 | 0.003 | 1 |
| Real GDP Per-Capita | 8882 | 38650.85 | 11736.85 | 349.51 | 77898.67 |
| Real GDP Per-Capita Growth | 8882 | 1.282 | 2.185 | -17.5453 | 14.9779 |
| Real GDP Aggregate | 8882 | 9798.992 | 5108.173 | 3.84 | 14231.600 |
| CPI Inflation | 8882 | 2.540 | 2.109 | -4.8633 | 28.1875 |
| Trade/GDP | 8882 | 36.636 | 28.232 | 18.7564 | 448.3057 |
| Unemployment Rate | 8882 | 6.409 | 2.534 | 0.3 | 31.4 |

We extract the bank-level variables from Bankscope and Datastream. We work with an unbalanced panel of of 1619 banks from 64 countries. The macro data is from WDI database. The reported moments are computed using the time period between 1995-2012.

**Table 1 (continued). Summary Statistics of the Key Data Items**

| | Observations | Mean | St. Dev. | Min | Max |
|---|---|---|---|---|---|
| English Legal origin | 8878 | 0.763 | 0.425 | 0 | 1 |
| Corruption | 8793 | 1.336 | 0.639 | -1.412 | 2.586 |
| Government effectiveness | 8793 | 1.453 | 0.516 | -1.189 | 2.357 |
| Regulatory Quality | 8793 | 1.344 | 0.487 | -1.608 | 2.162 |
| Rule of law | 8793 | 1.362 | 0.531 | -1.686 | 2.000 |
| Accountability | 8793 | 1.087 | 0.457 | -1.857 | 1.826 |
| Supervisory Authority-Bank Independence | 8163 | 0.927 | 0.261 | 0 | 1 |
| Rated Banks (International) | 7934 | 95.836 | 15.163 | 0 | 100 |
| Rated Banks (Domestic) | 6349 | 90.277 | 729.049 | 0 | 100 |
| Private Monitoring Index | 8137 | 9.429 | 1.120 | 4 | 11 |
| Creditor Monitoring | 7688 | 3.461 | 0.887 | 0 | 5 |
| External Governance Index | 1286 | 14.713 | 1.608 | 8 | 18 |

The data on institutional quality and regulatory and supervisory framework are from World Bank's World Governance Indicators and Bank Regulation and Supervision Surveys (Barth et al. (2013)), respectively. Following La Porta et al. (2008) we use *English legal origin* for the common law countries.

**Table 2. Bank Specialization**

| Category | Frequency | Percentage | Cumulative |
|---|---|---|---|
| Bank Holding & Holding Companies | 5,752 | 64.64 | 64.64 |
| Commercial Banks | 2,681 | 30.13 | 94.76 |
| Cooperative Banks | 102 | 1.15 | 95.91 |
| Finance Companies (Credit Card, Factoring) | 78 | 0.88 | 96.79 |
| Investment & Trust Corporations | 4 | 0.04 | 96.83 |
| Investment Banks | 53 | 0.6 | 97.43 |
| Islamic Banks | 23 | 0.26 | 97.69 |
| Private Banking & Asset Mgt Companies | 10 | 0.11 | 97.8 |
| Real Estate & Mortgage Banks | 39 | 0.44 | 98.24 |
| Savings Banks | 157 | 1.76 | 100 |
| Total | 8,899 | 100 | |

**Table 3. Baseline Estimation - Dependent Variable: ln(Per Employee Expense)**

| | Panel with Bank FE | P-OLS with Country FE |
|---|---|---|
| Market Equity/TA | 0.182** | 0.387** |
| | (0.036) | (0.011) |
| ln(Total Assets) | 0.116*** | 0.036*** |
| | (0.000) | (0.000) |
| Volatility | 0.000* | 0.000*** |
| | (0.047) | (0.000) |
| Net Interest Margin | 0.951** | -0.011 |
| | (0.043) | (0.986) |
| Market-to-Book | -0.007 | -0.029** |
| | (0.316) | (0.038) |
| Non-Interest income | 0.085* | 0.154*** |
| | (0.065) | (0.005) |
| NPL/Loans | -0.106 | -0.181 |
| | (0.446) | (0.281) |
| Real GDP Per-Capita Gr. | -0.010** | -0.011*** |
| | (0.017) | (0.004) |
| Real GDP Per-Capita | 0.000*** | 0.000*** |
| | (0.003) | (0.004) |
| Real GDP Aggregate | -0.000 | -0.000 |
| | (0.181) | (0.146) |
| CPI Inflation | 0.002 | 0.002 |
| | (0.678) | (0.624) |
| Trade/GDP | 0.002 | -0.001 |
| | (0.253) | (0.650) |
| Unemployment Rate | -0.008* | -0.006 |
| | (0.063) | (0.139) |
| Specialization FE | No | Yes |
| Year FE | Yes | Yes |
| Observations | 8882 | 8882 |
| # of Banks | 1619 | 1619 |
| R-sq | 0.477 | 0.767 |

Bank-level explanatory variables -including the variable of interest- is lagged one period. Robust p-values (standard errors clustered at bank level) are in parentheses; *** Significant at least 1 percent level, ** Significant at least 5 percent level, * Significant at least 10 percent level.

**Table 4. Robustness: Alternative Measures of Bank Leverage**

| | Book Equity/TA | | Regulatory Capital Ratio | |
|---|---|---|---|---|
| | Panel with Bank FE | P-OLS with Country FE | Panel with Bank FE | P-OLS with Country FE |
| Book Equity/TA | 0.317** | 0.595*** | | |
| | (0.046) | (0.003) | | |
| Regulatory Capital | | | 0.102 | 0.402** |
| | | | (0.399) | (0.015) |
| ln(Total Assets) | 0.119*** | 0.037*** | 0.109*** | 0.044*** |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| Volatility | 0.000** | 0.000*** | 0.000 | 0.000*** |
| | (0.048) | (0.000) | (0.127) | (0.001) |
| Net Interest Margin | 0.969** | -0.105 | 1.066** | 1.112 |
| | (0.038) | (0.862) | (0.046) | (0.122) |
| Market-to-Book | 0.007 | 0.001 | 0.008 | 0.007 |
| | (0.126) | (0.905) | (0.138) | (0.481) |
| Non-Interest income | 0.092** | 0.141*** | 0.052 | 0.147** |
| | (0.047) | (0.009) | (0.314) | (0.015) |
| NPL/Loans | -0.108 | -0.226 | -0.040 | -0.138 |
| | (0.429) | (0.187) | (0.773) | (0.429) |
| Specialization FE | No | Yes | No | Yes |
| Year FE | Yes | Yes | Yes | Yes |
| Observations | 8899 | 8899 | 7079 | 7079 |
| # of Banks | 1615 | | 1358 | |
| R-sq | 0.478 | 0.767 | 0.476 | 0.774 |

*Notes:* Bank-level explanatory variables -including the variable of interest- is lagged one period. Robust p-values (standard errors clustered at bank level) are in parentheses; *** Significant at least 1 percent level, ** Significant at least 5 percent level, * Significant at least 10 percent level.

**Table 5a. 2SLS Estimation: First-Stage**

| Instruments | Dependent Var.: Book Equity/TA |
|---|---|
| Fraction of Population over 65 | -0.004*** |
| | (0.000) |
| Capital Allowance | -0.014 |
| | (0.925) |
| Observations | 6753 |
| # of Banks | 1139 |

Robust p-values (standard errors clustered at bank level) are in parentheses; *** Significant at least 1 percent level, ** Significant at least 5 percent level, * Significant at least 10 percent level. The first stage regression includes all the control variables that we listed in our baseline regression - including bank and year fixed effects - in addition to the two instruments - fraction of population over 65 and capital allowance. We only report the coefficient estimates for our instruments.

**Table 5b. 2SLS Estimation: Second-Stage**

| | Dependent Var.: ln(Per Employee Expense) |
|---|---|
| Book Equity/TA | 11.428*** |
| | (0.000) |
| Observations | 6753 |
| # of Banks | 1139 |

Robust p-values (standard errors clustered at bank level) are in parentheses; *** Significant at least 1 percent level, ** Significant at least 5 percent level, * Significant at least 10 percent level. The second stage includes all the control variables - including bank and year fixed effects. We only report the estimate for our variable of interest.

**Table 5c. Over-identification and Exclusion Restriction Tests**

| | Statistics |
|---|---|
| Hansen (OIR) Test | 0.661 |
| F-Test of Excluded Instruments | 8.97 |

**Table 6. Robustness: Additional Control Variables**

| | ROAE | Systemic Size | Liquidity | $\frac{\text{Deposits}}{\text{Total Funding}}$ | $\frac{\text{Off Bal. Sh.}}{\text{Total Assets}}$ |
|---|---|---|---|---|---|
| Market Equity/TA | 0.172* | 0.185** | 0.187** | 0.196** | 0.186** |
| | (0.050) | (0.031) | (0.031) | (0.030) | (0.029) |
| ROAE | 0.005 | | | | |
| | (0.893) | | | | |
| Assets/GDP | | 1.037 | | | |
| | | (0.230) | | | |
| Liquidity | | | 0.086 | | |
| | | | (0.216) | | |
| $\frac{\text{Deposits}}{\text{Total Funding}}$ | | | | -0.085 | |
| | | | | (0.137) | |
| $\frac{\text{Off Bal. Sh.}}{\text{Total Assets}}$ | | | | | 0.035 |
| | | | | | (0.104) |
| ln(Total Assets) | 0.119*** | 0.112*** | 0.118*** | 0.119*** | 0.111*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Volatility | 0.000** | 0.000* | 0.000** | 0.000** | 0.000** |
| | (0.047) | (0.060) | (0.043) | (0.002) | (0.048) |
| Net Interest Margin | 0.924* | 0.981** | 0.978** | 0.979* | 1.189** |
| | (0.057) | (0.036) | (0.037) | (0.055) | (0.014) |
| Market-to-Book | -0.006 | -0.007 | -0.007 | -0.003 | -0.007 |
| | (0.379) | (0.304) | (0.312) | (0.628) | (0.287) |
| Non-Interest income | 0.087* | 0.089* | 0.084* | 0.105** | 0.085* |
| | (0.058) | (0.055) | (0.070) | (0.037) | (0.068) |
| NPL/Loans | -0.132 | -0.118 | -0.114 | 0.010 | -0.097 |
| | (0.344) | (0.381) | (0.415) | (0.942) | (0.483) |
| Bank FE | Yes | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes | Yes |
| Observations | 8880 | 8882 | 8881 | 7889 | 8828 |
| # of Banks | 1615 | 1615 | 1615 | 1465 | 1591 |
| R-sq | 0.478 | 0.477 | 0.477 | 0.503 | 0.479 |

Dependent variable is ln(Per employee expense). Bank-level explanatory variables -including the variable of interest- is lagged one period. All regressions include the set of country-level control variables that we included in our benchmark specification. See Table A1 for detailed descriptions of all variables. Robust p-values (standard errors clustered at bank level) are in parentheses; *** Significant at least 1 percent level, ** Significant at least 5 percent level, * Significant at least 10 percent level.

**Table 7. Robustness: Alternative samples and Global Financial Crisis**

| | **Non-US banks** | | **BHC and Commercial banks** | | **2007-2009 Crisis** | |
|---|---|---|---|---|---|---|
| | Bank FE | Country FE | Bank FE | Country FE | Bank FE | Country FE |
| Market Equity/TA | 0.306** | 0.668*** | 0.209** | 0.294** | 0.164* | 0.328** |
| | (0.033) | (0.004) | (0.019) | (0.041) | (0.061) | (0.026) |
| (Equity/TA) x Crisis | | | | | 0.068 | 0.209* |
| | | | | | (0.195) | (0.096) |
| Global Crisis | | | | | 0.119 | 0.396*** |
| | | | | | (0.355) | (0.000) |
| Specialization FE | No | Yes | No | Yes | No | Yes |
| Year FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 2455 | 2455 | 8418 | 8418 | 8882 | 8882 |
| # of Banks | 620 | 620 | 1471 | 1471 | 1615 | 1615 |
| R-sq | 0.530 | 0.917 | 0.492 | 0.765 | 0.477 | 0.767 |

*Notes:* Dependent variable is ln(Per employee expense). Regressions include the vector of bank-level and macro control variables. Bank-level explanatory variables -including the variable of interest- is lagged one period. See Table A1 for detailed descriptions of all variables. *Non-US banks* sample excludes U.S. banks from the regressions. *BHC and Commercial banks* sample only includes bank holding companies and commercial banks. *Global Crisis* is a dummy variable equal to 1 for the years 2007-2009. Robust p-values (standard errors clustered at bank level) are in parentheses; *** Significant at least 1 percent level, ** Significant at least 5 percent level, * Significant at least 10 percent level.

**Table 8a. Institutions: Legal Origin**

| | **English Legal Origin** | | **Non-English Legal Origin** | |
|---|---|---|---|---|
| | Panel with Bank FE | P-OLS with Country FE | Panel with Bank FE | P-OLS with Country FE |
| Market Equity/TA | 0.103 | 0.310 | 0.283** | 0.492*** |
| | (0.330) | (0.116) | (0.047) | (0.008) |
| ln(Total Assets) | 0.080*** | 0.035*** | 0.138*** | 0.052*** |
| | (0.000) | (0.000) | (0.001) | (0.000) |
| Volatility | 0.000 | 0.000*** | 0.000*** | 0.000*** |
| | (0.223) | (0.001) | (0.002) | (0.000) |
| Net Interest Margin | 1.403*** | 1.354 | 0.207 | -1.869** |
| | (0.006) | (0.108) | (0.859) | (0.020) |
| Market-to-Book | -0.009 | -0.028 | -0.012 | -0.035** |
| | (0.309) | (0.164) | (0.206) | (0.030) |
| Non-Interest income | 0.145** | 0.128* | 0.004 | 0.195** |
| | (0.013) | (0.059) | (0.950) | (0.018) |
| NPL/Loans | -0.509** | -0.265 | 0.048 | -0.214 |
| | (0.013) | (0.285) | (0.754) | (0.401) |
| Specialization FE | No | Yes | No | Yes |
| Year FE | Yes | Yes | Yes | Yes |
| Observations | 6775 | 6775 | 2103 | 2103 |
| # of Banks | 1145 | | 468 | |
| R-sq | 0.480 | 0.653 | 0.643 | 0.917 |

*Notes:* Dependent variable is ln(Per employee expense). Bank-level explanatory variables -including the variable of interest- is lagged one period. Regressions include the vector of macro control variables. See Table A1 for detailed descriptions of all variables. Robust p-values (standard errors clustered at bank level) are in parentheses; *** Significant at least 1 percent level, ** Significant at least 5 percent level, * Significant at least 10 percent level.

**Table 8b. Institutions: Institutional Quality and Leverage**

| | Corruption | Gov. Effectiveness | Regulatory Qual. | Rule of Law | Accountability |
|---|---|---|---|---|---|
| Market Equity/TA | 0.363*** | 0.426*** | 0.412** | 0.439*** | 0.276*** |
| | (0.002) | (0.002) | (0.011) | (0.006) | (0.009) |
| Institutions Variable | 0.013 | -0.083* | -0.008 | -0.140* | 0.168* |
| | (0.773) | (0.083) | (0.828) | (0.053) | (0.074) |
| Institutions x Market Value Equity/TA | -0.183*** | -0.219*** | -0.206** | -0.244** | -0.152** |
| | (0.004) | (0.005) | (0.046) | (0.017) | (0.022) |
| Bank FE | Yes | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes | Yes |
| Observations | 8793 | 8793 | 8793 | 8793 | 8793 |
| # of Banks | 1614 | 1614 | 1614 | 1614 | 1614 |
| R-sq | 0.474 | 0.476 | 0.474 | 0.476 | 0.476 |

*Notes:* Dependent variable is ln(Per employee expense). Regressions include the vector of bank-level and macro control variables. Bank-level explanatory variables -including the variable of interest- is lagged one period. See Table A1 for detailed descriptions of all variables. Robust p-values (standard errors clustered at bank level) are in parentheses; *** Significant at least 1 percent level, ** Significant at least 5 percent level, * Significant at least 10 percent level.

**Table 8c. Regulation/Supervision and Leverage**

| | Sup. B. Ind | % Big B. Rated Int. | % Big B.Rated Dom. | Pri. Monit. | Credit Monit. | Ext. Gov. Ind. |
|---|---|---|---|---|---|---|
| Market Equity/TA | 0.461*** | 0.661*** | 0.451*** | 0.472** | 0.266* | 1.780** |
| | (0.000) | (0.000) | (0.001) | (0.025) | (0.053) | (0.045) |
| Regulation | 0.116*** | 0.003*** | 0.002*** | 0.001 | 0.036 | 0.013 |
| | (0.001) | (0.000) | (-0.007) | (-0.005) | (0.558) | (0.210) |
| Regulation x Market Equity/TA | -0.431*** | -0.007*** | -0.004*** | -0.041* | -0.074** | -0.108* |
| | (0.000) | (0.000) | (0.001) | (0.081) | (0.038) | (0.068) |
| Bank FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 8163 | 7934 | 6349 | 8137 | 7688 | 1286 |
| # of Banks | 1575 | 1520 | 1421 | 1570 | 1486 | 439 |
| R-sq | 0.498 | 0.488 | 0.363 | 0.488 | 0.493 | 0.603 |

*Notes:* Dependent variable is ln(Per employee expense). *Sup. B. Ind* is a dummy variable capturing supervisory authorities' indepencendence from banks' legal actions. *% Big B. Rated Int. (Dom.)* is the percentage of the top ten banks rated by international (domestic) rating agencies. *Pri. Monit.* is an indicator capturing private monitoring of firms, whereas *Credit Monit.* is an indicator capturing credit monitoring by rating agencies and creditors. *Ext. Gov. Ind.* is an indicator capturing various external governance practices. Regressions include the vector of bank-level and macro control variables. Bank-level explanatory variables -including the variable of interest- is lagged one period. See Table A1 for detailed descriptions of all variables. Robust p-values (standard errors clustered at bank level) are in parentheses; *** Significant at least 1 percent level, ** Significant at least 5 percent level, * Significant at least 10 percent level.

**Table A1. Variable definitions and data sources**

| Variable | Description | Source |
|---|---|---|
| ln(Per employee expense) | Log of personnel expense in US dollars over total number of employees. It includes wages and salaries, social security costs, pension expenses and other personnel costs, including the expensing of staff stock options. | Bankscope |
| ln(Total assets) | Log of total assets in US dollars | Bankscope |
| Market Equity/TA | Ratio of market value of equity to book value of total assets | Datastream and Bankscope |
| Book Equity/TA | Ratio of book value of equity to book value of total assets | Bankscope |
| Regulatory Capital | Ratio of book value of equity over risk-weighted assets | Bankscope |
| # of Employees | Number of employees | Bankscope |
| Net Interest Margin | Net interest margin of the bank | Bankscope |
| Volatility | Standard deviation of daily market values - calculated annually given that the bank has data for at least 100 days in that year. | Datastream and Bankscope |
| Market to Book | Ratio of market value to book value of equity | Datastream and Bankscope |
| Non-interest Income | Ratio of non-interest income to gross revenues | Bankscope |
| NPL/Loans | Ratio of non-performing loans to total loans | Bankscope |
| ROAE | Return on Average Equity | Bankscope |
| Assets/GDP | Bank total assets divided by GDP | Bankscope and WDI |
| Liquidity | Ratio of liquid assets (cash, government bonds, short-term claims on other banks and where appropriate the trading portfolio) to total assets | Bankscope |
| Off-balance sheet | Ratio of off-balance sheet items over total assets | Bankscope |
| Deposit funding | Ratio of deposits over bank's total funding | Bankscope |
| GDP per capita | Real GDP per capita in constant 2005 US dollars | WDI |
| GDP per capita growth | Real GDP per capita growth in percentages | WDI |
| GDP | Real GDP in constant 2005 US dollars | WDI |
| Inflation | CPI inflation in percentages | WDI |
| Trade over GDP | Exports plus imports over GDP | WDI |
| Unemployment rate | Rate of unemployment in percentages | WDI |
| English legal origin | Dummy variable that equals 1 in country uses common law, and zero otherwise | La Porta et al. (2008) |
| Corruption | Indicator capturing perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests | WGI |
| Government effectiveness | Indicator capturing perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies | WGI |

**Table A1 (continued). Variable definitions and data sources**

| Variable | Description | Source |
|---|---|---|
| Regulatory quality | Indicator capturing perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. | WGI |
| Rule of Law | Indicator capturing perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. | WGI |
| Accountability | Indicator capturing perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media. | WGI |
| Sup Aut-Bank Ind | Dummy variable that equals 1 if the supervisory authority is protected by the legal system from the banking industry, and zero otherwise. | Barth et al. (2013) |
| Rated banks (Int/Dom) | The percentage of the top ten banks that are rated by (international/domestic) rating agencies. | Barth et al. (2013) |
| Priv Monitoring Index | Indicator capturing measures whether there are incentives/ability for the private monitoring of firms, with higher values indicating more private monitoring. | Barth et al. (2013) |
| Creditor Monitoring | Indicator capturing the evaluations by external rating agencies and incentives for creditors of the bank to monitor bank performance, with higher values indicating better credit monitoring. | Barth et al. (2013) |
| Ext Governance Index | Indicator capturing the strength of external audits, the transparency of bank financial statement practices and the type of accounting practices and creditor monitoring, with higher values indicating better external governance. | Barth et al. (2013) |