Bank Bonus Pay as a Risk Sharing Contract

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Abstract

We show that banker bonuses cannot be understood exclusively as incentive contracts, but also incorporate a significant risk sharing dimension between bank shareholders and bank employees. This contrasts with the conventional view whereby diversified shareholders fully insure risk averse employees. However, financial frictions imply that shareholder value is concave in a bank's cash reserves—making shareholders effectively risk averse. The optimal contract between shareholders and employees then involves some degree of risk sharing. Using extensive payroll data on 1.26 million bank employee years in the Austrian, German, and Swiss banking sectors, we show that the structure of bonus pay within and across banks is compatible with an economically significant risk sharing motive, but difficult to rationalize based on incentive theories of bonus pay only.

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1 Introduction

Bankers bonuses have been strongly criticized after the 2008–2009 global financial crisis as a source of excessive risk taking.[1] As a consequence, various new regulations seek to curtail these banker bonuses.[2] The public debate and the academic literature have mostly focused on the incentive role of bankers' bonus pay. This paper highlights an entirely different role for bank bonuses—namely their contribution to optimal risk sharing between the shareholders and the employees of a bank. The conventional view sees little scope for risk sharing between risk averse employees and diversified equity owners. The latter should assume the earning risk short of any incentive motive (Jensen and Meckling, 1976). We show that this perspective is incomplete in terms of financial theory and at odds with important patterns in the empirical pay structure.

Financial frictions with respect to external finance can make external bank recapitalization relatively costly in times of bank distress and increase the value of internal cash available through bonus cuts. Thus, the shareholder value function becomes a concave function of the bank's cash reserves—making shareholders effectively risk averse (Froot et al., 1993; Froot and Stein, 1998). The optimal contract between shareholders and employees then involves some degree of risk sharing. Variable bonus pay contingent on bank earnings enables such risk sharing. As labor expenses account for, on average, half of banks' total overhead costs and about one third of their gross income, risk sharing on the wage bill has the potential to significantly improve bank resilience in times of costly external financing.[3]

Our empirical analysis provides strong support for this risk sharing motive of banker bonus pay. We analyze comprehensive payroll data on the variable (bonus) and fixed (base) compensation of

[1] For example, US Treasury Secretary Geithner argued in his testimony to Congress on June 6, 2009: "I think that although many things caused this crisis, what happened to compensation and the incentives in creative risk taking did contribute in some institutions to the vulnerability that we saw in this financial crisis."

[2] The European Parliament proposed new EU-wide legislation on bank bonuses in 2013; in the U.S. executive pay was reformed in the Say-on-Pay rule included in the 2010 Dodd-Frank Act; and for the UK debate see http://www.nortonrosefulbright.com/knowledge/technical-resources/the-uk-corporate-governance-portal/executive-pay. At the international level, the G20 has established the Financial Stability Board (FSB) which proposes principles for sound compensation practices.

[3] These numbers are estimated based on total employee remuneration including pension obligations in Austrian, German, and Swiss banks over the years 2003 to 2010.

1.26 million employee-year observations in 324 Austrian, German and Swiss banks for the period 2003–2010.[4] Unlike most previous empirical work with its focus on top executives, we can observe bonus pay across all hierarchy levels below the executive level and across all bank divisions.

We uncover some surprising results. First, bonus pay features economically significant cross-divisional earning sensitivity. For example, the bonus pay of employees in the loan business divisions, i.e. retail banking and corporate loans, is sensitive to the performance of the trading business divisions, i.e. investment banking and treasury/capital markets, and vice versa. Even employees in support functions like accounting or IT receive higher bonuses in times when traders and loan officers generate higher revenues. Such cross-divisional bonus sensitivity cannot be explained by incentive contracts, but is predicted by our risk sharing hypothesis.

Second, the 2008-2010 crisis which triggered a general bank-wide contraction of bonus pay independently of the performance of any particular bank division. For example, also employees in support functions and junior employees, who had no control over the crisis exposure of their employer, saw their bonuses cut in half during the crisis. Even new recruits earned lower bonuses in their first year if hired after 2007, which suggests that low bonuses in the crisis were not simply deferred punishment for low pre-crisis performance. Instead, the evidence supports economically significant risk sharing between shareholders and *all* bank employees during the crisis which is implemented through bonus pay.

Third, we show that the option to cut bonuses indeed reduces operating leverage and enhances the resilience of banks. We find that banks with higher pre-crisis bonus pay (lower operating leverage) were able to reduce their labor expenses more aggressively during the crisis than other banks. Consistent with the idea of risk sharing, banks were more likely to exercise this option and to cut labor expenses if they experienced a larger drop in profitability at the onset of the crisis.

Forth, banks with higher earning risk (proxied by the employment share in trading or the share of non-interest income) paid systematically higher bonuses in all divisions, including bank support functions. This observation is again consistent with risk sharing. A flexible wage model in which time-varying reservation wages determine bonus changes cannot explain this result as employees in identical occupation but in different banks should have similar outside employment options.

Our work is related to the vast literature on employee compensation in banks. Philippon and

[4]Matching the payroll data with Bankscope data reduces the data set to only 82 banks—including all large banks.

Reshef (2012) document a substantial increase in the compensation of US bankers over the last twenty years. Relative to their peers in other sectors, bankers earn a positive wage premium (Oyer 2008; Kaplan and Rauh 2010). Célérier and Vallée (2017) attribute this wage premium to higher returns to talent in finance. Yet, Swedish administrative data, which include detailed cognitive and non-cognitive test scores as well as performance in high-school and university, provide no evidence for any increased skill concentration in the financial profession (Böhm *et al.*, 2018).

Glode and Lowery (2016) develop a model that can explain the historical increase in finance wages with an increasing employment share of traders. Studying a cross-section of countries, Boustanifar *et al.* (2016) show empirical evidence that the increase in finance sector wages is largely driven by financial deregulation and concentrated in trading-related activities, which also come with more earnings risk. Our evidence is consistent with this historic perspective: More earnings risk under refinancing frictions make risk sharing through bonus pay a more desirable contract.

Various papers study the relative size of fixed and variable compensation in the financial industry. In this literature, variable compensation is often interpreted as performance pay designed to incentivize effort (e.g., Kampkötter, 2015; Axelson and Bond, 2015; Cheng *et al.*, 2015). The incentive perspective suggests that bonus pay should not be tied to factors outside the employee's control as this only makes compensation riskier without inducing more individual effort (Holmström, 1979). By contrast, the risk sharing motive of bonus pay predicts that employee compensation is sensitive to earning shocks outside his control and originating in other bank divisions.

Our model is related to Thanassoulis (2012) who studies optimal bonus pay in a model with competition and risk sharing on the wage bill. Our empirical findings are consistent with Simintzi *et al.* (2015) who show that stronger employment protection and, hence, higher operating leverage crowd out financial leverage.[5] We show that even labor-intensive firms with costly external financing can operate with high financial leverage if they use variable bonus pay to reduce operating leverage.

[5]Berk et al. (2010) show formally that entrenched employees face large human costs of bankruptcy and, therefore, require larger wages in firms with high financial leverage. Caggese and Cuñat (2013) show that financially constrained firms make more extensive use of fixed-term contracts which can be terminated in the case of financial distress.

Several papers discuss managerial compensation in the context of agency problems (e.g., Bertrand and Mullainathan, 2001; Bebchuk and Fried, 2003). In this literature, bonus pay is not the outcome of optimal contracting, but a consequence of rent seeking by entrenched executives. But even extremely high levels of compensation for board level executive generally amount to only a small share of total labor cost. Our paper focuses on employees below the executive level and explains bonus variation even for employees with low tenure, i.e. for employees who are unlikely to be entrenched.

Finally, our work is related to the literature on risk management in firms. Froot et al. (1993) and Froot and Stein (1998) predict that financially constrained firms are effectively risk averse and should hedge more. We show consistent evidence focusing on risk sharing on the wage bill. A second generation of papers in this literature can help explain why firms would prefer to share risk with employees rather than to use financial derivatives to hedge. Rampini and Viswanathan (2010, 2013) show in a dynamic model that *financial* hedging can be too expensive if subject to the same financial constraints as financing policy.[6]

The rest of the paper is organized as follows. Section 2 presents a simple model of banks with financial frictions: Banks incur a cost if they need to recapitalize in a situation of financial distress. We show that the optimal contract between shareholders and employees involves some degree of risk sharing. The remunerations of the employees of all divisions are positively correlated with the performance of each of these divisions, and with the overall performance of the bank. These results naturally extend to a fully dynamic model, which we develop in the Internet Appendix. Section 3 presents the data. Section 4 discusses the institutional background. Section 5 develops our empirical results and Section 6 concludes.

[6]For example, if financiers and hedging counterparties both require collateral, there exists a trade-off between financial risk management and financing policy. Consistent with higher opportunity costs of financial hedging in constrained firms, Rampini et al. (2016) show that banks' net worth is positively related to their use of interest rate derivatives.

2 Theory

2.1 Baseline Two-Period Model without Frictions

The following section outlines the optimal risk-sharing contract between shareholders and employees in a simple two period model. The dynamic extension to our baseline model is provided in the Internet Appendix. There are two categories of employees indexed by $k = 1, 2$ with identical utility function

$$U(c) = \frac{c^{1-\gamma}}{1-\gamma}. \tag{1}$$

At date $t = 0$, and after investment decisions, the bank disposes of an amount x_0 of cash to allocate between wages w_0^k, $k = 1, 2$, dividends δ_0, and cash reserves m , such that

$$w_0^1 + w_0^2 + \delta_0 + m = x_0. \tag{2}$$

We denote by e the (stochastic) bank earnings at date 1. Assuming that cash reserves are not remunerated, the terminal (date $t = 1$) budget constraint is

$$\delta_1(x) + w_1^1(x) + w_1^2(x) = m + e \equiv x, \tag{3}$$

where cash resources x at date 1 are allocated to dividends $\delta_1(x)$ and wages $w_1^k(x)$.

The objective of the bank is to maximize a weighted sum of shareholder value, i.e. the expected present value of dividends, and the expected discounted utilities of the two categories of employees

$$V(x_0) = \delta_0 + \frac{1}{1+r}E[\delta_1(x)] + \sum_k \alpha^k \left[U(w_0^k) + \frac{1}{1+r}E\{U(w_1^k(x))\}\right],$$

where α^k is the weight given to the utility of employees of category k.

The bank maximizes this expression under constraints (2) and (3), with one constraint for each value of x. When $\delta_0 > 0$, the problem can be simplified by solving for δ_0 in constraint (2). For convenience we denote by $\lambda(x)f(e)/(1+r)$ the Lagrange multiplier associated with constraint

(3) at $x = e+m$, where $f(e)$ is the density of e. The Lagrangian of the simplified problem becomes

$$L = x_0 - m + \sum_{k=1,2} \alpha^k [U(w_0^k) - w_0^k] + \\ + \frac{1}{1+r} E \left\{ \delta_1(x) + \sum_{k=1,2} \alpha^k U(w_1^k(x)) - \lambda(x)[\delta_1(x) - m - \sum_{k=1,2} \alpha^k w_1^k(x) - e] \right\}.$$

Frictionless bank recapitalization corresponds to the assumption that shareholders can commit at date $t = 0$ to inject new capital at date $t = 1$ at no additional costs, which implies that $\delta_1(x)$ can be negative. Equating to zero the derivative of L with respect to $\delta_1(x)$ implies that $\lambda(x)$ is constant and equal to 1. Then a differentiation with respect to wages at dates $t = 0$ and $t = 1$ implies that these wages are also constant and independent of time and bank earnings

$$w_0^k = w_1^k(x) = U'^{-1}(1/\alpha^k). \tag{4}$$

Under frictionless recapitalization, the risk neutral shareholders fully insure (risk averse) employees. This corresponds to the benchmark result highlighted by Jensen and Meckling (1976) in the absence of any incentive dimension to employee remuneration. In the two period model, all earnings are distributed and the bank holds no cash reserves ($m = 0$) because cash reserves have an opportunity cost $r > 0$.

2.2 Extension to Costly Recapitalization

Whenever the cash resources x of a bank are low, its recapitalization can be costly. Outside investors may doubt the solvency of the bank and provide new equity capital only at a discount relative to its nominal value. In the dynamic model extension in the Internet Appendix, we model costly recapitalization as a value loss $c\delta_1(x) < 0$ ($c > 0$) associated with any effective cash injection of $\delta_1(x) < 0$. In the two period model, we simply assume that shareholders cannot commit to inject cash at date 1 to pay the employees. Hence, dividends must always be non negative and this amounts to the additional constraint that $\delta_1(x) \geq 0$.

Maximization of the Lagrangian produces two different cases. In the case of high bank earnings, total compensation is (again) maximal at $w_1^k(x) = w_0^k$ with $\lambda(x) = 1$. Total wage payments are

$\overline{w} = \Sigma_k w_0^k$. Dividends payments are (strictly) positive with $\delta_1(x) = x - \overline{w} > 0$. However, in the case of low bank earnings in period 1, dividends payments are suspended ($\delta_1(x) = 0$) and the remaining cash resources $x = m+e$ are devoted to a diminished total compensation $w_1(x) = x < \overline{w}$. The marginal shadow value of cash follows as $\lambda(x) = U'(x)/U'(\overline{w}) > 1$. Equating the derivative of L with respect to m to zero implicitly defines optimal bank cash reserves

$$(1 + r) = E\left[\lambda(x)\right] = \frac{E[max\left\{U'(\overline{w}), U'(m + e)\right\}]}{U'(\overline{w})}. \tag{5}$$

Next, we assume that (gross) bank earnings can be written as $e = e_{\max} - \sigma\varepsilon$, where losses are represented by the random variable $\varepsilon \in [0, 1]$, which has the unit interval as its support and $\sigma > 0$ measures earnings risk. The total compensation $w_1(x) \in [\underline{w}, \overline{w}]$ of employees can then be decomposed into a fixed and variable component as

$$w_1(x) = min(x, \overline{w}) = \underline{w} + \min(x - \underline{w}, \overline{w} - \underline{w}), \tag{6}$$

where $\underline{w} = m + e_{max} - \sigma$ is the total wage bill in the worst possible scenario where earnings are $e = e_{max} - \sigma$, whereas $\min(x - \underline{w}, \overline{w} - \underline{w})$ denotes total bonus pay contingent on bank earnings. Base wage $\underline{w}$ is implicitly defined by:

$$(1 + r) = \frac{E[max\left\{U'(\overline{w}), U'(\underline{w} + \sigma(1 - \epsilon))\right\}]}{U'(\overline{w})}. \tag{7}$$

Figure 1 provides a graphical illustration of the wage and dividend function, respectively.

For our empirical analysis, it is useful to define the bonus share of banker compensation as

$$Bonus\ Share = \min\left(\frac{e}{\underline{w}}, \frac{\overline{w} - \underline{w}}{\underline{w}}\right). \tag{8}$$

We note that due to our assumption of CRRA utility, the wages paid to each category of employees are proportional to the total wage bill with

$$w_1^k(x) = \frac{\overline{w^k}}{\overline{w}^1 + \overline{w}^2} w(x). \tag{9}$$

The following two theorems summarize our main results:

Theorem 1: Bonus Pay Across Bank Divisions

Under costly bank recapitalization, optimal contracting between bank shareholders and employees implies that the bonus share of employees in each division increases with total bank earnings.

Proof: Follows directly from Eq.(9).

Theorem 2: Bonus Pay Across Banks

Optimal contracting under costly recapitalization implies that the bonus share of employee compensation increases in (i) the bank earnings e, and (ii) the bank earnings risk σ.

Proof: Part (i) follows trivially from Eq. (8). For (ii), differentiating (7) with respect to σ implies that

$$0 = E\left\{1_{e<\overline{w}-\underline{w}} \times U''(m+e)\left[\frac{d\underline{w}}{d\sigma} + (1-\varepsilon)\right]\right\}. \tag{10}$$

Since $U(.)$ is concave and $\varepsilon \leq 1$, we find

$$\frac{d\underline{w}}{d\sigma} = -\frac{E[1_{e<\overline{w}-\underline{w}} \times U''(m+e)(1-\varepsilon)]}{E[1_{e<\overline{w}-\underline{w}} \times U''(m+e)]} < 0, \tag{11}$$

which implies the desired result.

2.3 Testable Model Implications

In this section we discuss three testable model implications driven from Theorems 1 and 2. First, banks are typically structured into several divisions and various operational divisions (like retail banking, corporate banking, or investment banking) contribute independently to total bank earnings. Moreover, labor costs are generated both in operating and service divisions (human resources, IT, logistical services, etc.). Bank accounting typically reports earnings from its loan business as interest income generated by the retail and corporate banking divisions and trading income generated by the treasury management/capital market or investment banking division.

Total bank earnings are the sum of both earnings sources and other earnings, that is[7]

$$e = e_{Loan\ Business} + e_{Trading\ Activity} + e_{Other}. \tag{12}$$

Our model predicts the following relationship between bank earnings and average divisional bonus share:

Implication 1: Bonus Pay Across Bank Divisions

Optimal risk sharing across bank divisions implies that (i) the bonus share in trading divisions, (ii) the bonus share in interest earning divisions, and (iii) the bonus share in service divisions all covary positively with both interest and trading income.

Institutionally, risk sharing across bank divisions is organized through so-called bonus pools which are determined at the bank level and are a function of the total bank earnings. This aggregate bonus pool is then allocated top-down to divisions and smaller organizational units. Service divisions also participate in the bonus allocation even if their pay package has no incentive component as performance of service divisions is difficult to evaluate. They nevertheless contribute to bank level income risk sharing.

During the 2007-2009 financial crisis, many banks in Austria, Germany and Switzerland faced large reductions in their gross income and soaring loan loss provisions depicted in Figure 2. At the same time, collapsing equity prices for bank stocks made external equity financing relatively costly to incumbent shareholders as shown in Figure 3. Our model of employee risk sharing implies reduced bonuses across all bank functions and bank employees.

Implication 2: Bonus Share Reduction in the 2007-8 Banking Crisis

Under income losses and rising costs of external equity during the financial crisis, banks reduce their bonus share for (i) employees in operational bank functions even after controlling for performance, (ii) employees without influence on the risk exposure of the bank, i.e., employees in bank support functions and at the bottom of the employment hierarchy, and (iii) new employees without legacy responsibilities.

[7]Banks further generate income from fees and commissions which we ignore because it cannot be clearly traced to one operational division. In unreported regressions, we find that our empirical findings are robust to controlling for fee and commission income, which itself is weakly correlated with average bonus pay in trading, loan, and service divisions.

A reduction in bonus pay in a bank's operating units under low operating performance is certainly compatible with both the incentive-based motive and risk-sharing-based motive of bonus pay. Lower variable pay in operational units (where employees have accumulated industry-specific human capital) can also be motivated by worsening outside employment options as highlighted by Oyer (2004). However, evidence for lower bonuses in bank support functions and for new bank employees are better explained by our earnings risk sharing motive.

Third, banks with a higher bonus share are able to reduce their labor costs significantly under negative income shocks and adverse external funding conditions. The financial crisis can again provide evidence that this labor cost reduction option was available during the crisis to firms with a high average (pre-crisis) bonus share.

Implication 3: Labor Cost Reductions by Bonus Share

Average banker pay and bank-wide labor costs both decrease during the crisis proportional to the average pre-crisis bonus share and are larger if bank losses are bigger.

Finally, higher earnings risk provides a larger scope for risk sharing. Before the crisis, employees in any given occupation should thus earn higher bonus shares in investment banks with large trading floors than in commercial banks which generate most of their income from conservative lending.[8]

Implication 4: Bonus Share and Bank Earnings Risk

Conditional on their profession, employees earn higher bonus shares in riskier investment banks, i.e. in banks with large trading floors and high non-interest income.

Implication 4 is not easily explained by efficiency wage models that focus on the labor market determination of banker pay. In particular, time-varying reservation wages alone cannot explain why employees in identical occupations (i.e., employees with identical outside employment options) have higher bonus shares in riskier banks.

[8]Fahlenbrach et al. (2012) show strong persistence in banks' risk culture or business models, in particular, with respect to their performance sensitivity to crises.

3 Data

3.1 Compensation Data

This paper draws on a large payroll data set from the financial service sectors of Austria, Germany, and Switzerland, which is documented in detail in Efing *et al.* (2015). Information on individual compensation contracts were collected by the international pay consultancy firm Willis Towers Watson and is directly sourced from the banks' payroll records. The data undergo several quality checks by the pay consultants and bank representatives. In particular, every data submission is reviewed and validated by survey analysts and compensation consultants, processed by special software for data anomalies, and then double-checked by the banks' and the consultancy's pay compensation specialist.

The data sample used in this study ranges from 2003 to 2010 and includes more than 1.26 million employee-year observations from payroll records of 324 Austrian, German, and Swiss banks. Banks have to report data from at least 80% of all employees below executive level. The bank sample is representative and accounts for a large fraction of bank assets in the three countries. However, we dispose of accounting data only for an unbalanced subsample of the 82 larger banks. For example, in 2008, we only observe 5 Austrian, 35 German, and 13 Swiss banks with both matched compensation and accounting data. Yet, these 53 banks alone account for approximately 26%, 83%, and 87% of total bank assets in Austria, Germany, and Switzerland, respectively.

An important feature of the data set is its comparability across banks, functions, hierarchical levels and countries. The pay consultant uses a standardized and internationally consistent method to define a broad number of specific job positions in the financial services industry. Based on this consistent methodology, each job position is uniquely assigned to a specific function, functional area and hierarchical level. This enables us to compare the fixed and variable components of compensation across specific functional areas or employee groups within a bank or across banks.

Pay information includes the fixed annual *Base Salary* as well as the end-of-the-year *Bonus Pay* of each employee. We define as *Total Pay* the sum of these two pay components and as *Bonus Share* the ratio of *Bonus Pay* to *Base Salary*. The latter variable captures the relative size of the variable pay component. Equity-based compensation is not included in our data, but such compensation is extremely rare among non-executive employees in the countries we consider.

The information on individual employees includes the employee age, employment tenure, bonus eligibility, bank hierarchy level (ranging from 1 to 7), the specific job position, and the assignment to one of eight bank divisions: Logistical Services (D1), Headquarter (HQ) Services (D2), Retail Banking (D3), Corporate Banking (D4), Private Banking (D5), Asset Management (D6), Investment Banking (D7), and Treasury Management/Capital Markets (D8). Logistical Services (D1) include support functions like IT, communications, and customer support whereas Headquarter Services (D2) include, for example, accounting, human resources, and marketing. To match the bank division with the available accounting data, we aggregate Logistical Services and HQ Services to Internal Services; Retail Banking and Corporate Banking to Loan Business; and Investment Banking and Treasury/Capital Markets to Trading Business. Interest income and trading income then represent the two performance measure of the Loan Business and Trading Business divisions, respectively.

The data do exclude board level employees. A second shortcoming is the "unstructured nature" of the panel, which does not track employees through time. Individual employees are assigned a new identifier each year even if sampled repeatedly. We subject the raw data to only minor modifications: We discard extremely low compensation levels with a base salary below €24,000 as these positions correspond to interns or trainees on short-term contracts. We also ignore data outliers by winsorizing the 10 smallest and largest observations for *Base Salary* and *Bonus Pay*.

Table 1, Panel A, reports summary statistics for the individual-level compensation sample based on more than 1.26 million employee-year observations pooled across the three countries. *Total Pay* amounts to an average of €70,759, with a standard deviation of roughly €49,384. Ten percent of all banking employees earn more that €110,000 in *Total Pay*, which can reach up to €3 million for employees just below the executive board level. The average Bonus Pay per bank employee is €10,696 with a median of €3,873. The median *Bonus Share* is therefore low at only 7.7%, but increases in the level of *Base Salary*. Only for 10% of all employees does the variable component of pay amounts to more than 30% of their total compensation. Panel B provides the breakdown of the *Average Bonus Share* by bank division and employee group. We find the lowest *Average Bonus Share* in Logistical Services and HQ Services with 7.6% and 13.5%, respectively. By contrast, the variable pay component reaches and average of 43.1% and 41.2% in the Investment Banking and Treasury/Capital Markets divisions, respectively.

3.2 Bank Data

We complement the bank compensation data with bank balance sheet data from Bankscope (Bureau van Dijk).[9] The overlapping coverage comprises 82 banks for which we have compensation data and accounting data for at least one year in the period 2003–2010. The total matched sample consists of 342 bank years, but some income items are available only for a smaller subsample. The median bank has an asset size of €35.5 billion, of which 71% are deposits on the liability side and 37% are loans on the asset side. The median return on assets is only 1% for all bank-years. The median bank has only 4.4% equity relative to total assets.

We define the *Return on Loans* as the ratio of (gross) interest income and change in loan loss provisions (LLP) to loans; its median is 10% in the full sample. The *Return on Trading* is defined as the ratio of the trading income to non-loan assets on a firm's balance sheet. The median return here is zero, but 2.6% for the bank-year with the best performance. The low average *Return on Trading* of only 0.2% reflects a standardization of the return by non-loan assets which generally overstates the capital used to generate trading profits. Hence, the magnitude of any regression coefficients involving the *Returns on Trading* needs to be interpreted with caution. Unfortunately, we do not dispose of any better measure to scale trading profits as the public financial reporting of many banks is opaque and incomplete.

4 Institutional Background

German, Austrian, and Swiss banks share certain institutional features of their bonus culture. This is confirmed by survey evidence on 36 bonus plans from 25 different banks conducted in 2013 (Kampkötter and Sliwka, 2018). Within the banking sector, a top-down decision process for allocating individual bonuses, so-called bonus pools, is predominant. Such a *modus operandi* is fully compatible with a centralized sharing of bank-wide earnings risk.

Of the surveyed banks, 64% allocated bonuses though bonus pools. The total annual bonus pool is determined at the board level and the allocated funds are cascaded down to the divisional level and smaller organizational units. The survey shows that bank earnings at the top level are the dominant criterion for the calculation of these bonus pools, with operating revenue as major

[9] Data from Bankscope and from Willis Towers Watson are deflated with the 2010 price level in Germany.

performance metrics used to measure bank success. The bonus pools are assigned to supervisors in the respective operational units (typically also depending on the unit's financial performance), who then have to allocate these pools to subordinates according to some combination of subjective and objective performance assessment. The institutional practice of bonus pools is also widespread in global banking outside the three countries examined in this paper. A survey by the consultancy Mercer (2013) in North America, Europe, and Emerging Markets concluded that "*the top-down pool approach is predominant in the banking industry*".

Two related types of bonus allocation systems are the so-called "additive bonus system" and "multiplicative bonus system". In additive systems, the individual bonus usually depends on a combination of individual performance, the performance of the employee's organizational unit or a team and on the earnings of the entire bank. In multiplicative bonus systems, the supervisor first assesses the performance of her subordinates, and this performance evaluation is then multiplied by a certain factor, which depends on the profitability of the whole bank and the specific unit. Around 40% of the surveyed banks use either the additive or the multiplicative bonus system in one of their plans.

Almost all of the surveyed bonus plans include individual performance assessments, which are based on qualitative or discretionary assessments (all plans) and objective performance indicators (86%). The survey evidence also reveals that the structure of bonus plans remained very stable during the time period 2004–2013. Overall, the prevalence of top-down planning of bonus pools lends credibility to the employee risk sharing motive of bonus pay. At the same time, such a risk sharing motive is not incompatible with differentiated merit-based allocations at the individual level: it only defines its scope.

5 Evidence on Employee Risk Sharing

The empirical analysis mirrors the model implications highlighted in Section 2.3. First, we provide direct evidence on risk sharing across bank divisions in Section 5.1. Second, we document in Section 5.2 the decline of bonus pay during the 2008-10 financial crisis across all employee groups, including employees in service divisions, junior employees, and new recruits. Third, we show in Section 5.3 the relationship between pre-crisis average bonus share in 2007 and the percentage

labor cost reduction during the crisis. In section 5.4, we study the nexus between bank earnings risk and bankers pay.

5.1 Risk Sharing Across Bank Divisions

The universal bank model prevalent in Austria, Germany and Switzerland implies that banks combine different operating activities under the same roof. The traditional loan business is often complemented by trading activities in financial markets and annual accounting profits are reported separately for both activities. An incentive based model of bonus pay predicts that the variable component of an employee's pay should covary with the operating performance of the division she/he is working in, but not with the operating performance of other bank divisions. More generally, high bonuses should be paid to reward individual performance and not factors outside the employee's control.

By contrast, our risk sharing hypothesis of bank bonus pay implies that, under costly external refinancing, all employees share some of the risk of lower bank-wide earnings through bonus pay reductions. The risk sharing at the bank level implies that a higher operating performance in one division has repercussions for the bonus pay in an unrelated division. For example, higher trading profits imply a higher bonus share not only for those working in treasury management/capital market (D8) and investment banking (D7), but also spill over into a larger bonus share for those employees working in the loan business (D3 and D4) or in internal service divisions (D1 and D2). In the extreme case of complete risk sharing we predict that the performance sensitivity of bonus pay is identical across divisions and with respect to any earnings source.

Table 2 provides evidence for such risk sharing across bank divisions. We define the *Return on Trading* as the ratio of trading profits to the non-loan assets (or total assets minus loans) and the *Return on Loans* as the ratio of net interest income and changes in loan loss provisions to loan assets. The dependent variable is the *Average Bonus Share* of all employees engaged in trading activity in Columns (1) and (4), all employees involved in the loan business divisions in Columns (2) and (5), and all employees working in internal services in Columns (3) and (6). We also control for a variety of bank characteristics such as loan to asset ratio (*Loans/Assets*), the deposit to asset ratio (*Deposits/Assets*), the (book) equity share of assets (*Equity/Assets*), bank size (*Log Assets*) and in Columns (4)-(6) by a financial *Crisis Dummy* marking the three years

2008-2010. All regressions in Table 2 include bank fixed effects to account for bank heterogeneity in the level of incentive pay in any of the bank divisions.

Column (1) shows that employees in the trading divisions (D7 and D8) enjoy bonus pay strongly correlated not only with *Return on Trading*, but also with *Return on Loans*. Variations by one standard deviation in trading returns change the *Average Bonus Share* by 7 percentage points ($= 14.008 \times 0.005$), whereas a one standard deviation change in loan returns moves the *Average Bonus Share* by 22 percentage points ($= 1.369 \times 0.160$). The comparison seems to suggest that even in the capital market division, bonus pay depends more on the performance variation in the loan business than in trading operations. This higher bonus sensitivity to net interest income can be explained by the greater importance of this source of bank earnings for the overall bank performance of most banks. But it could also reflect the fact that standardization of trading profits by non-loan assets introduces considerable measurement error which biases the bonus sensitivity to trading performance downwards.

We explore the bonus share variation for employees in the loan business in Column (2). Again, operating performance in both the trading division and the loan business matters for the bonus share. In particular, even loan officers benefit considerably from a better operating performance in trading as indicated by the statistically significant coefficient of 2.438. Their bonus sensitivity to trading outcomes is still 17.4% ($= 2.438/14.008$) of that of employees working directly in the trading divisions.

The *Average Bonus Share* of employees in internal services covaries with the operating performance in both Trading Activity and the Loan Business as shown in Column (3). Their bonus share sensitivity to trading profits is slightly lower that of employees in the Loan Business with a coefficient of 2.312. And employees in Headquarter Services (D1) and Logistical Services (D2) benefit also from better loan business performance similar to those in the trading division. The sensitivity of bonus pay in the service divisions to both types of operating income provides direct evidence for our risk sharing hypothesis formulated as Theorem 1 and Implication 1.

Inclusion of the *Crisis Dummy* in Columns (4)-(6) generally attenuates the estimated performance sensitivity. This is not surprising as this dummy captures crisis-related underperformance common to all banks. In particular, the performance in trading divisions appears highly correlated across banks and, hence, the coefficients of the *Return on Trading* become statistically insignifi-

cant. Evidently, the crisis shock to trading income is largely exogenous to the individual bank—a stylized fact which we will exploit for identification in the next section.

5.2 Crisis-Related Bonus Share Reductions by Employee Group

The 2008-10 financial crisis represents a common negative shock to banking sectors in Germany, Austria, and Switzerland. Losses accumulated due to exposure to both the US subprime crisis and to the European sovereign debt crisis as shown in Figure 2. Changes to loan loss provisions peek at the end of 2008 and the average net trading income profits reach a loss of €300 million. Even banks with stable earnings during the crisis were affected by the spike in economic uncertainty and worsening external funding conditions. Figure 3 depicts the sharp drop of bank equity prices for German banks in the second half of 2007 (Panel A) along with a general increase in credit default swap rates (Panel B). The risk sharing hypothesis predicts that banks should respond to the crisis with bonus cuts for all employees independently of their individual performance. Moreover, the bonuses of employees in service divisions, junior employees, and new recruits should decline even though these employee groups carry little or no responsibility for the crisis exposure of their employers.

Table 3 documents the dynamics of the bonus share for various employee groups before and during the crisis. Columns (1) and (2) report regressions for the *Average Bonus Share* of employees in the trading business; Columns (3) and (4) for those in the loan business; and Columns (5) and (6) focus on the *Average Bonus Share* of employees in internal services. We also report similar regression results for junior employees in the two lowest hierarchy levels in Columns (7) and (8); and new employees recruited less than a year ago in Columns (9) and (10). The first regression for each group [Columns (1), (3), (5), (7) and (9)] includes only year fixed effects and bank fixed effects (not reported). The reference year is 2007 so that each year dummy measures the *Average Bonus Share* shortfall relative to 2007 for each employee group. Figure 4 plots these year fixed effects showing a gradual increase of bonus shares during boom years and a strong decline after 2007 in all different employee groups.

For example, employees in the trading business benefit from an *Average Bonus Share* equal to 70% of total pay at the end of 2007. This share of bonus pay declines by 36 percentage points at the end of 2008, by 35 percentage points at the end of 2009, and drops even further at the

end of 2010 by a total of 53 percentage points relative to 2007 (Column (1)). In principle, these large bonus cuts in trading divisions are consistent with both the risk sharing as well as the performance-pay theory. Yet, when we explicitly control for the income generated by traders in Column (2), the year fixed effects remain negative and highly significant for all crisis years which seems consistent only with risk sharing.[10] Our observations for employees in the loan business seem to corroborate this interpretation. Again, we observe a strong drop in the *Average Bonus Share* between 2007 and 2010, which remains negative and significant after controlling for income generated in the loan business.[11]

To interpret the crisis effect on bonus shares in operating divisions as evidence for risk sharing, we need to assume that *Return on Trading* and *Return on Loans* are appropriate performance measures and that functional relationships are indeed linear. The analysis of service employees in columns (5) and (6) does not rely on these assumptions. Specifically, there is little reason to believe that performance in accounting, IT, HR, etc. is pro-cyclical or that employees in these divisions are directly responsible for the crisis exposure of their employer. Hence, the strong bonus share decline in service divisions by seven percentage points until 2010 (approximately 50% relative to bonus shares in 2007) is best explained by the risk sharing hypothesis. Similarly, bonus cuts during the crisis are hard to justify as performance pay in the case of junior employees who are rarely material risk takers as defined in the Principles for Sound Compensation Practices of the Financial Stability Board (FSB).[12] Finally, bonus share declines are also hard to explain as deferred punishment for low pre-crisis performance as even new recruits are granted a 16% lower bonus share in 2010 than in 2007 (Column (9)).[13]

Overall, the evidence suggests that banks respond to worsening sector-wide profitability, spiking economic uncertainty, and tightening of external funding conditions with a bank-wide suspension of bonuses—irrespective of employees' individual performance or contribution to their employers' crisis exposure.

[10]Note that missing Bankscope data for control variables reduces the bank sample to 72 banks and also loses year 2003 in column (2).

[11]The peak bonus share of loan officers in 2007 equals 23%.

[12]The FSB defines material risk takers as employees with "the potential to expose the firm to significant risk" (Financial Stability Board 2017, p.24). The FSB explicitly mentions sufficient seniority as one characteristic of material risk takers. We call employees "junior" if they are employed at the lowest two hierarchy levels. At the peak in 2007, their *Average Bonus Share* equals 10%.

[13]The *Average Bonus Share* of new recruits equals 24% in 2007.

5.3 Ex-Ante Bonus Share and Labor Cost Reduction in the Crisis

The risk sharing hypothesis of bonus pay views a higher bonus share as an option to reduce labor costs in times of high external funding costs and funding needs. It is therefore instructive to explore to what extent this option was exercised to effectively reduce labor costs. Banks with a larger *Average Bonus Share* at the outset of the crisis in 2007 should also be those that reduce the bonus share and thereby labor costs most dramatically.

Table 4 shows cross-sectional regressions for the percentage labor cost change from 2007 to 2008 for various salary measures. The dependent variable is the percentage change in the *Average Bonus Pay* of all bank employees in Column (1), the *Average Base Pay* in Column (2), the *Average Total Pay* (=*Bonus*+*Base*) in Column (3), and the *Bank-wide Labor Expenses* (sourced from Bankscope) in Column (4).[14] The specifications in Columns (1) to (4) use the pre-crisis *Average Bonus Share in 2007* as the regressor of interest. Columns (5) and (6) also include the interaction term of the *Average Bonus Share in 2007* and the percentage *Income Change* from 2007 to 2008 as an additional regressor. The bank income definition here includes the sum of interest income, trading income, and net changes in loan loss provisions. As control variables we include the same balance sheet variables already used in Tables 2 and 3.

The regression result in Column (3) shows that banks with a 10 percentage points higher *Average Bonus Share* before the crisis are able to reduce the average total pay per employee by approximately 4% in 2008. The *Bank-wide Labor Expenses* in Column (4) decrease by (only) 2.2% for every increase of the pre-crisis bank bonus share by 10 percentage points. This difference in cost sensitivity is mostly accounted for by fixed social security charges (paid by the employer) and related to the base salary.

A higher *Average Bonus Share* prior to the crisis, therefore, reduces the downward rigidity in labor costs, i.e. the operating leverage, during the crisis. As expected, the *Average Base Pay* in Column (2) cannot be compressed and stays constant. This is in line with results by Knoppik & Beissinger (2003) and Bauer et al. (2007) who show that the degree of downward real and nominal wage rigidity is substantial in Germany. The extent of wage rigidity depends on macroeconomic factors such as collective bargaining, labor market conditions or inflation. In a recent survey

[14] *Bank-wide Labor Expenses* are not computed as the average labor cost per employee but as the total wage bill of the bank comprising, for example, fixed base salaries and bonuses but also pension obligations.

among European firms, Du Caju et al. (2015) further show that only 2% of firms reported that they had cut nominal base wages even when faced by negative economic shocks, with institutional restrictions being named as one of the main reasons.

Figure 5 provides a graphical illustration of the regression results. The four Panels plot the percentage change from 2007 to 2008 of the various pay measures as functions of the pre-crisis (log) *Average Bonus Share in 2007*.

Finally, the statistically significant interaction term in Columns (5) and (6) of Table 4 shows that the labor cost reduction is more pronounced for the same change in bank income for banks with a higher pre-crisis *Average Bonus Share* in 2007. In other words, banks that experience a larger drop in income in 2008 are more likely to exercise the option to reduce labor expenses.

5.4 Earnings Risk and Bonus Share Variation

Banks vary in their business model and earnings risk. Trading and investment banking income count as the most volatile sources of bank revenue and should therefore expand the scope for risk sharing between shareholders and employees in line with Theorem 3 and Implication 4.

We measure two proxies of bank earnings risk, namely a bank's *Employment Share of Trading* and the *Non-Interest Income Share in 2003*. Both variables arguably capture bank risk better than any empirical measure of earnings volatility subject to a short sample and potential issues of earnings management. In Table 5, we regress the *Average Bonus Share* in 2007 of bank employees in the Trading Business, Column (1)-(2), the Loan Business, Columns (3)-(4), and Internal Services, Columns (5)-(6), on both proxies of earnings risk, respectively. Across all three bank divisions, we find that a higher earnings risk implies a higher pre-crisis bonus share. The cross-sectional dependence on earnings risk is largest in the Trading Business, but still economically strong even in Internal Services. In other words: human resource or accounting employees earn larger bonuses if they work in a bank with a larger share of trading business and (risky) non-interest income. This latter finding is difficult to reconcile with any flexible wage model, where bonuses reflect outside employment opportunities.

6 Conclusion

New payroll data on 1.26 million employee-year observations in Austria, Germany and Switzerland allow for the first time a comprehensive analysis of the composition of bonus pay in the banking sector of these three countries. The structure of bonus pay we discover is at odds with an (exclusively) incentive-based interpretation of bonus pay which dominates both the policy debate and the academic literature. In particular, we find that (i) bonus pay is widespread before the crisis through all hierarchy levels and divisions — including service divisions without any discernible direct contribution to operational performance; (ii) bonus pay in all bank divisions is sensitive not only to the financial performance of the own division, but also to the performance of operationally unrelated bank divisions; and (iii) the financial crisis triggered a considerable bank-wide reduction in bonus pay even after controlling for divisional performance.

In the light of these stylized facts, we propose a new and complementary interpretation of banker bonuses as a risk sharing contract between shareholders and employees. Central to our argument is the observation that full insurance of bank employees by diversified shareholders against earning risk emerges as the optimal contract only in the knife-edge case when equity refinancing is frictionless. In a world of costly bank recapitalization (in the case of bank distress), the Jensen-Meckling (1976) benchmark of optimal earning risk allocation to shareholders only does not apply: We show that the value function of the shareholders becomes concave and therefore predicts some degree of optimal risk sharing between employees and shareholders. In other terms: bonus pay is mechanism to reduce operating leverage, limits the recourse to costly recapitalization, and thus procures financial benefits which can be shared between employees and shareholders. From a regulatory perspective, a very restrictive policy on bonus pay can jeopardize such risk sharing benefits and effectively impose a higher operating leverage on banks.

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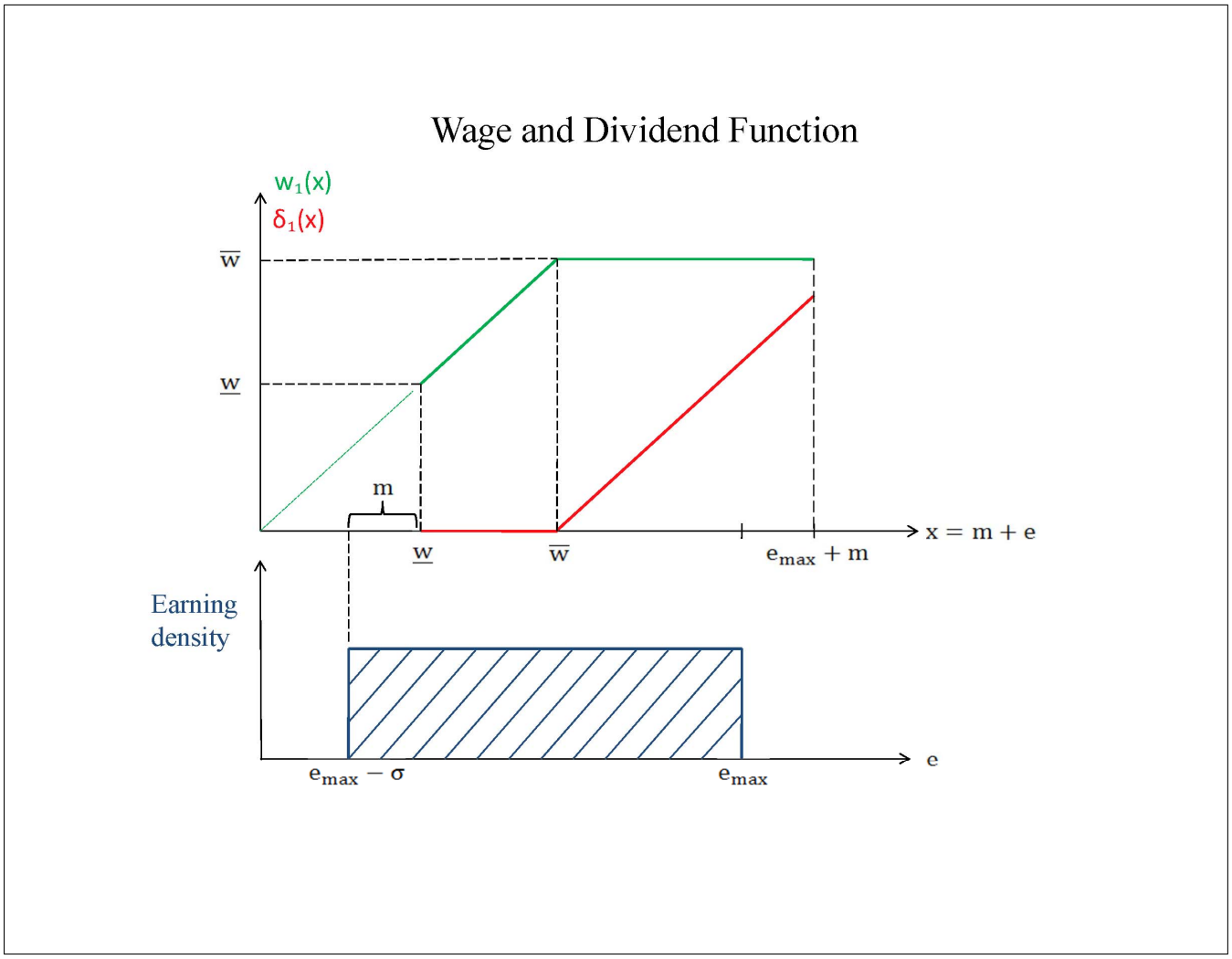

Figure 1: For the static model with a single employee type, we illustrate the uniform distribution of bank earnings over the interval $[e_{\max} - \sigma, e_{\max}]$, as well as the wage and dividend functions $w_1(x)$ and $\delta_1(x)$, respectively. Both functions depend on the state variable $x = m + e$, where m are the bank's cash reserves and e the stochastic bank earnings.

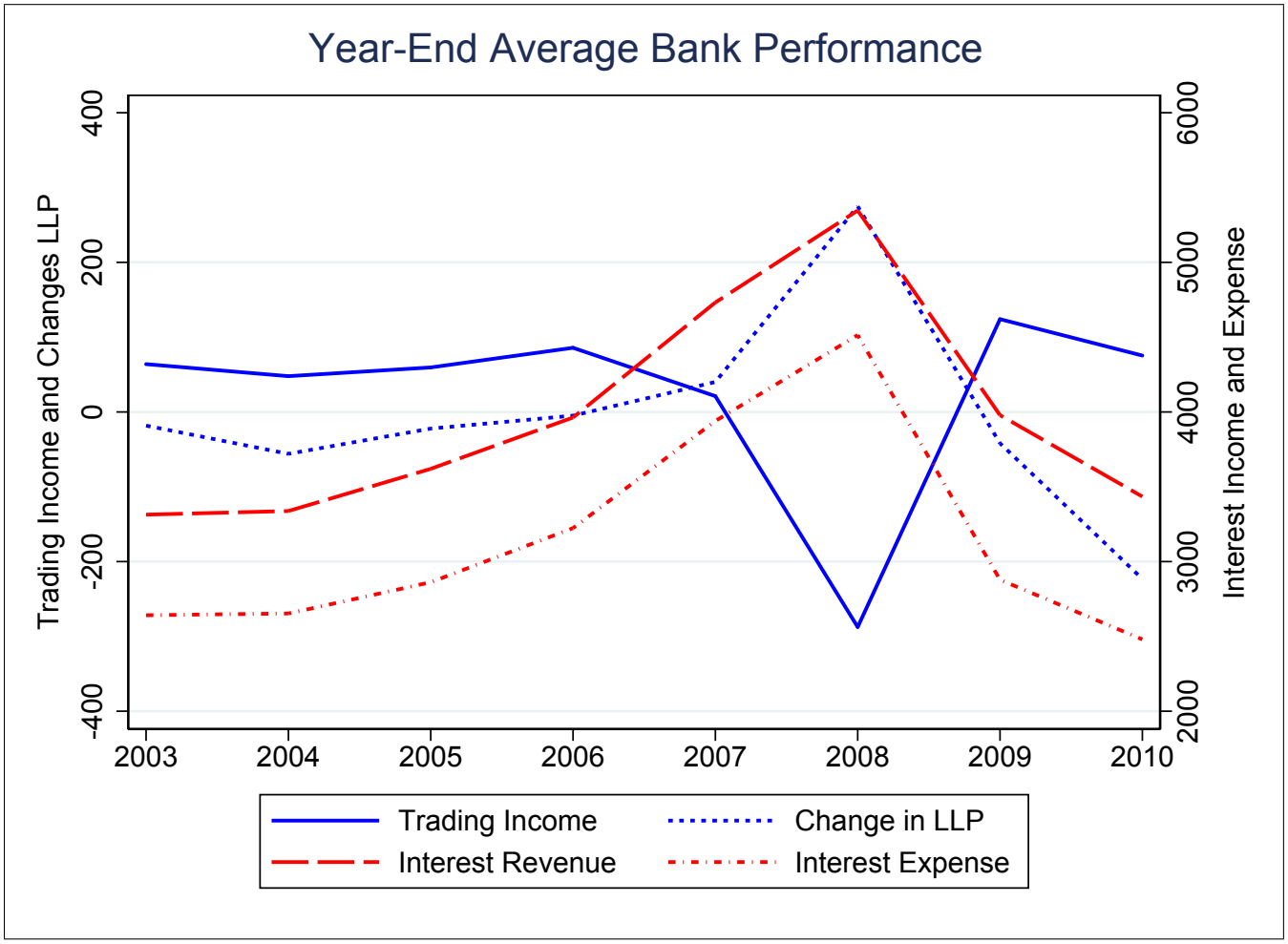

Figure 2: We show the evolution of different performance measures averaged across banks in Austria, Germany, and Switzerland. The sample is restricted to banks with data throughout all years 2003 to 2010.

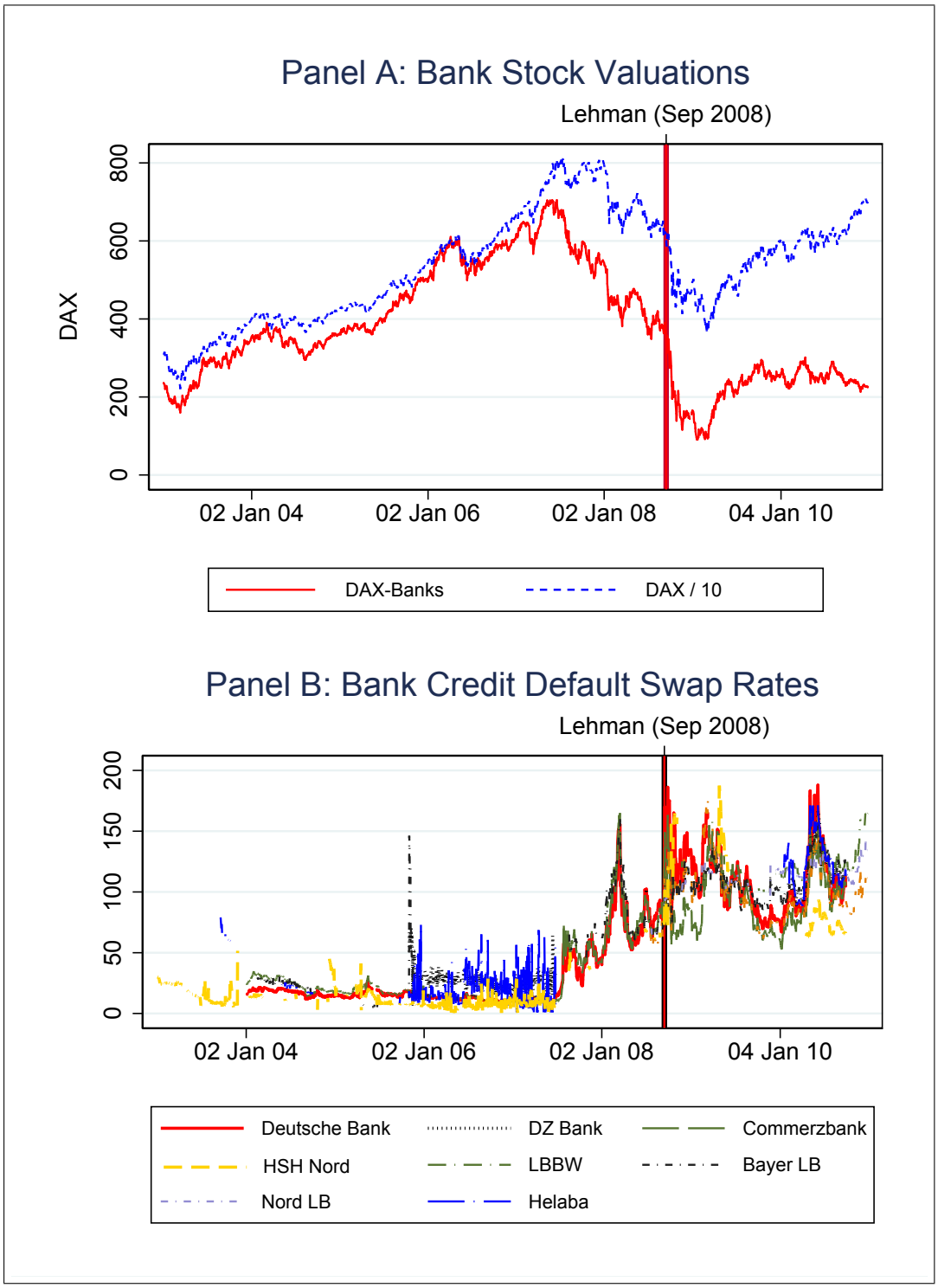

Figure 3: Panel A shows the average stock price of banks in the stock index (DAX-Banks) relative to the index of all German Stocks (DAX) (scaled by 10^{-1}). Panel B reports the spreads of credit default swaps (in basis points) for the eight German banks with five-year single-name CDS contracts.

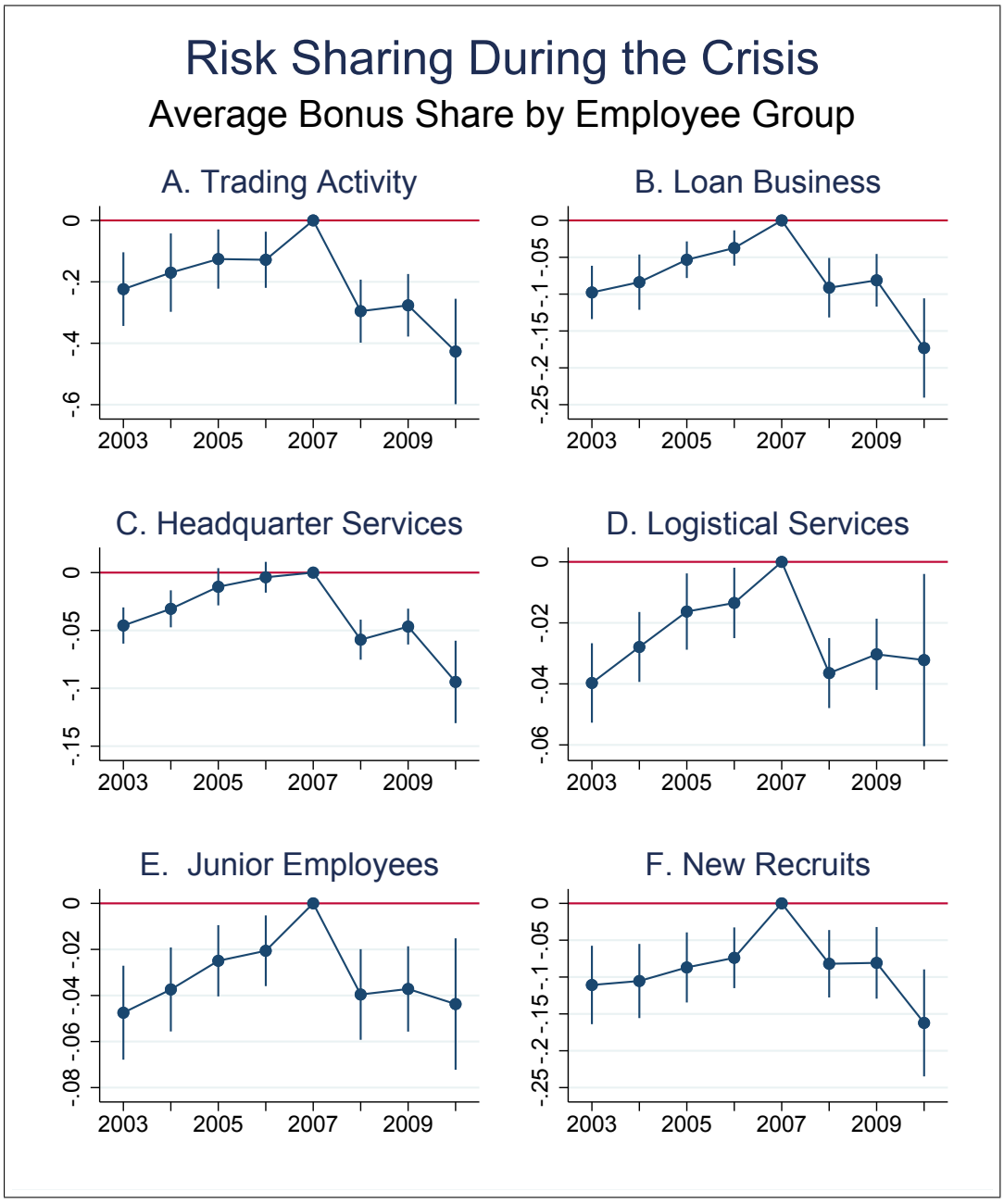

Figure 4: We show the effect of the 2007-9 financial crisis on the *Average Bonus Share* in a given employee group. Panel A shows the crisis effect for bank employees in Trading Activity (Panel A). Panels B to F show similar figures for employees in Loan Business (Panel B); in Headquarter Services (Panel C); and in Logistical Services (Panel D). Junior Employees (Panel E) are all employees working at the two lowest hierarchy levels and New Recruits (Panel F) are all employees hired at most one year earlier. The year fixed effects are estimated in panel regressions with additional bank fixed effects. We report robust standard errors (clustered by bank) and draw confidence intervals at the 5% level.

Figure 5: The percentage labor cost change in the first crisis year is plotted against the pre-crisis *Log Average Bonus Share* measured in Austrian, German, and Swiss banks in 2007. The percentage labor cost changes are depicted for the *Average Bonus* of a bank's employees in Panel A, their *Average Base Salary* in Panel B, their *Average Total Pay* (= Bonus + Base) in Panel C, and total *Bank-Wide Labor Expenses* reported by Bankscope in Panel D. Only residual variation not explained by differences in banks' *Loans/Assets* , *Deposits/Assets*, (Book) *Equity/Assets*, and *Log Assets* is plotted. The confidence intervals of a fitted regression lines are drawn for the 5% level.

Table 1: Summary Statistics

Panel A reports summary statistics at the employee-year level drawn from payroll records of 324 Austrian, German, and Swiss banks over the period 2003-2010. *Total Pay* is the sum of the annual fixed *Base Salary* and the year-end *Bonus Pay* (in EUR). The *Bonus Share* is defined as the ratio of *Bonus Pay* to *Base Salary*. Panel B reports summary statistics at the employee group-year level of 82 Austrian, German and Swiss banks reported in Bankscope over the period 2003-2010. The *Average Bonus Share* is calculated as the equally weighted average of the *Bonus Share* for all employees in the respective group or bank division. We distinguish eight functional bank divisions (D1-D8). We aggregate Logistical Services and HQ Services to Internal Services, Retail Banking and Corporate Banking to Loan Business and Investment Banking and Treasury Management/Capital Markets to Trading Business. The group of junior employees comprises all employees at the two lowest hierarchy levels. Newly recruited employees are defined as employees that arrived at most one year before the start of the current reporting year. The bank-year statistics in Panel C are sourced from Bankscope. The *Return on Loans* is defined as the (gross) interest income and changes in loan loss provisions (LLP) standardized by loans; *Returns to Trading* is calculated as the trading income standardized by non-loan assets (assets minus loans).

		Obs. (1)	Mean (2)	STD (3)	Min (4)	10th (5)	50th (6)	90th (7)	Max (8)
Panel A: Employee-year statistics									
Total Pay		1,261,693	70,759	49,384	24,000	38,751	59,196	110,849	3,065,640
Base Salary		1,262,994	60,014	23,639	24,000	37,068	54,648	89,195	485,757
Bonus Pay		1,269,208	10,696	33,120	0	0	3,873	23,478	2,662,500
Bonus Share		1,262,145	0.133	0.248	0	0	0.077	0.302	20.475
Panel B: Bank-year statistics by employee group									
Average Bonus Share									
Logistical Services	D1	268	0.076	0.054	0.000	0.007	0.068	0.150	0.324
HQ Services	D2	271	0.135	0.098	0.000	0.022	0.125	0.255	0.856
Retail Banking	D3	166	0.095	0.090	0.000	0.003	0.072	0.192	0.509
Corp. Banking	D4	192	0.199	0.164	0.000	0.021	0.185	0.380	1.139
Private Banking	D5	169	0.204	0.151	0.000	0.025	0.185	0.408	0.978
Asset Mgmt.	D6	162	0.257	0.201	0.000	0.043	0.227	0.486	1.174
Invest. Banking	D7	186	0.431	0.488	0.000	0.021	0.286	1.031	3.169
Treasury/Markets	D8	230	0.412	0.400	0.000	0.020	0.291	0.937	2.246
Internal Services	D1+D2	273	0.106	0.068	0.000	0.024	0.095	0.194	0.449
Loan Business	D3+D4	226	0.142	0.126	0.000	0.008	0.108	0.317	0.745
Trading Business	D7+D8	237	0.394	0.356	0.000	0.062	0.310	0.899	2.142
All juniors		260	0.057	0.050	0.000	0.000	0.052	0.105	0.408
All new recruits		263	0.119	0.125	0.000	0.021	0.090	0.239	0.929
Average Base Salary									
Internal Services	D1+D2	273	63,722	11,680	43,935	50,179	62,203	79,771	104,248
Loan Business	D3+D4	226	68,537	20,594	37,127	47,695	61,891	97,246	130,600
Trading Activity	D7+D8	237	90,660	22,619	50,019	66,785	88,438	119,483	175,692
All juniors		260	45,697	7,509	28,984	37,537	44,624	57,455	68,084
All new recruits		263	66,289	17,633	39,688	46,548	64,891	90,596	127,657
Panel C: Bank-year statistics									
Return on Assets		275	0.011	0.008	−0.010	0.002	0.010	0.021	0.046
Return on Loans		273	0.158	0.160	0.026	0.051	0.100	0.337	0.822
Return on Trading		305	0.002	0.005	−0.009	−0.001	0.000	0.010	0.026
Loans/Assets		336	0.392	0.237	0.028	0.070	0.367	0.746	0.911
Deposits/Assets		342	0.684	0.204	0.135	0.401	0.710	0.910	0.950
Equity/Assets		342	0.069	0.073	0.011	0.018	0.044	0.144	0.478
Assets (in EUR million)		342	92,411	118,027	701	1,974	35,450	313,943	378,271
Log Assets		342	10.189	1.859	6.553	7.588	10.476	12.657	12.843

Table 2: Risk Sharing Across Bank Divisions

We compute the *Average Bonus Share* for all employees in a particular employee group and bank-year. The *Avg. Bonus Share* in a particular employee group is then regressed on the *Return on Trading* and on the *Return on Loans*. We define *Return on Trading* as trading income standardized by non-loan asset (total assets minus loans) and the *Return on Loans* as interest income and changes in loan loss provisions standardized by total loans. In all columns, we control for *Loans/Assets*, *Deposits/Assets*, *(Book) Equity/Assets*, *Log Assets*, and bank fixed effects. In Columns (4) to (6), we also include a *Crisis Dummy* which equals one for the crisis years 2008 to 2010 and zero otherwise. We regroup under (i) Trading Business all employees in Investment Banking (D7), and Treasury Management/Capital Markets (D8); (ii) Loan Business all employees in Retail Banking (D3), and Corporate Banking (D4), and (iii) Internal Services all employees in Headquarter Services (D1) and Logistical Services (D2). The sample contains bank year-observations for the years 2003 to 2010. Robust standard errors (reported in parentheses) are clustered by bank. Significance at the 10%, 5%, and 1% level is indicated by *, **, ***, respectively.

Dep. variable:	*Average Bonus Share* (by Employee Group)					
Divisions:	Trading Business D7+D8	Loan Business D3+D4	Internal Services D1+D2	Trading Activity D7+D8	Loan Business D3+D4	Internal Services D1+D2
	(1)	(2)	(3)	(4)	(5)	(6)
Return on Trading	14.008**	2.438*	2.312**	7.914	0.900	1.284
	(6.895)	(1.401)	(0.976)	(7.311)	(1.309)	(0.913)
Return on Loans	1.369***	0.414***	0.148***	1.056***	0.340**	0.083**
	(0.280)	(0.119)	(0.036)	(0.280)	(0.132)	(0.041)
Controls:						
Loans/Assets	0.080	−0.110	0.052	0.025	−0.129	0.036
	(0.321)	(0.110)	(0.046)	(0.303)	(0.113)	(0.049)
Deposits/Assets	0.434*	0.090	0.070**	0.188	0.039	0.025
	(0.238)	(0.064)	(0.034)	(0.235)	(0.067)	(0.037)
Equity/Assets	1.458	0.488	0.465**	1.361	0.447	0.428**
	(1.220)	(0.399)	(0.200)	(1.211)	(0.389)	(0.195)
Log Assets	0.020	−0.061	0.020	0.103	−0.039	0.039*
	(0.120)	(0.054)	(0.018)	(0.131)	(0.063)	(0.021)
Crisis Dummy (2008-10)				−0.168***	−0.041**	−0.033***
				(0.051)	(0.019)	(0.009)
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.24	0.20	0.13	0.30	0.24	0.22
Number of banks	72	66	82	72	66	82
Observations	237	226	273	237	226	273

Table 3: Bonus Share Dynamics by Employee Group

We compute the *Average Bonus Share* for all employees in a particular employee group and bank-year. The *Average Bonus Share* in a particular employee group is then regressed on year fixed effects in Columns (1), (3), (5), (7), and (9), where 2007 is chosen as the reference year. In Columns (2), (4), (6), (8), and (10) we include the same bank level covariates as in Table 2. All columns control for bank fixed effects. The dependent variable in Columns (1) and (2) consists of the *Average Bonus Share* for all employees in the Trading Business (Investment Banking and Treasury Management/Capital Markets); in Columns (3) and (4) we consider the *Average Bonus Share* in the Loan Business (Retail Banking and Corporate Banking); and in Columns (5) and (6), we use the *Average Bonus Share* in Headquarter Services (human resources, accounting, etc.) and in Logistical Services (IT, customer service, etc.). In Columns (7) and (8), we consider the *Average Bonus Share* of junior employees (employed at the lowest two hierarchy levels); and in Columns (9) and (10), we use the *Average Bonus Share* of new recruits (hired at most one year before the reporting year). The sample contains bank year-observations for the years 2003 to 2010. Robust standard errors (reported in parentheses) are clustered by bank. Significance at the 10%, 5%, and 1% level is indicated by *, **, ***, respectively.

Dep. var.:	*Average Bonus Share* (by Employee Group)									
Divisions:	Trading Business D7+D8		Loan Business D3+D4		Internal Services D1+D2		Junior Employees hierarchy level ≤ 2		New Recruits tenure ≤ 1	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
2003	-0.261^{***}		-0.099^{***}		-0.048^{***}		-0.047^{***}		-0.111^{***}	
	(0.072)		(0.024)		(0.008)		(0.010)		(0.027)	
2004	-0.247^{***}	-0.065	-0.089^{***}	-0.046^{*}	-0.037^{***}	-0.020^{*}	-0.037^{***}	-0.012	-0.105^{***}	-0.035
	(0.068)	(0.084)	(0.025)	(0.024)	(0.007)	(0.011)	(0.009)	(0.009)	(0.026)	(0.021)
2005	-0.155^{***}	-0.005	-0.052^{***}	-0.028	-0.018^{**}	-0.010	-0.025^{***}	-0.009	-0.087^{***}	-0.029
	(0.059)	(0.054)	(0.020)	(0.022)	(0.008)	(0.011)	(0.008)	(0.008)	(0.024)	(0.019)
2006	-0.206^{***}	-0.127^{*}	-0.054^{**}	-0.031	-0.014^{*}	-0.002	-0.021^{***}	0.000	-0.074^{***}	-0.021
	(0.065)	(0.076)	(0.023)	(0.025)	(0.007)	(0.011)	(0.008)	(0.009)	(0.021)	(0.019)
2007	Reference year									
2008	-0.359^{***}	-0.247^{***}	-0.111^{***}	-0.081^{***}	-0.050^{***}	-0.048^{***}	-0.040^{***}	-0.025^{***}	-0.082^{***}	-0.050^{*}
	(0.071)	(0.081)	(0.027)	(0.027)	(0.008)	(0.012)	(0.010)	(0.009)	(0.023)	(0.026)
2009	-0.354^{***}	-0.152^{**}	-0.083^{***}	-0.032	-0.040^{***}	-0.026^{**}	-0.037^{***}	-0.004	-0.081^{***}	-0.006
	(0.072)	(0.067)	(0.024)	(0.020)	(0.007)	(0.011)	(0.009)	(0.007)	(0.025)	(0.027)
2010	-0.531^{***}	-0.241^{***}	-0.149^{***}	-0.087^{**}	-0.070^{***}	-0.044^{**}	-0.044^{***}	-0.010	-0.162^{***}	-0.045^{*}
	(0.112)	(0.086)	(0.042)	(0.035)	(0.017)	(0.018)	(0.014)	(0.012)	(0.037)	(0.024)
Return on Trading		6.793		0.333		0.794		0.367		-2.562
		(7.648)		(1.525)		(0.879)		(0.578)		(2.317)
Return on Loans		1.073^{***}		0.344^{***}		0.091^{**}		0.175^{**}		0.343^{*}
		(0.268)		(0.123)		(0.038)		(0.079)		(0.179)
Controls	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.26	0.34	0.19	0.30	0.21	0.26	0.13	0.26	0.14	0.21
Banks	183	72	173	66	320	82	298	78	292	78
Obs.	465	237	439	226	726	273	684	260	671	263

Table 4: Labor Cost Reduction in the Crisis and Pre-Crisis Bonus Pay

We compute the percentage change of a given bank's labor expenses between 2007 and 2008. The *Percentage Labor Cost Change 2007 to 2008* is then regressed on the *Average Bonus Share in 2007* which is computed as the average *Bonus Share* across all employees in a given bank in 2007. The *Percentage Labor Cost Change 2007 to 2008* is reported for the (i) *Average Bonus Pay* of bank employees in Column (1), (ii) the *Average Base Pay* in Column (2), (iii) the *Average Total Pay* (= Bonus + Base) in Column (3), and (iv) the *Bank-Wide Average Pay* per employee (from Bankscope) in Column (4). In all columns, we control for *Loans/Assets*, *Deposits/Assets*, *(Book) Equity/Assets*, and *Log Assets*—all measured in 2007. Columns (5) and (6) add the interaction term with the percentage change of total bank income (plus changes in loan provisions) from 2007 to 2008. Robust standard errors are reported in parentheses. Significance at the 10%, 5%, and 1% level is indicated by *, **, ***, respectively.

	Percentage Labor Cost Change 2007 to 2008					
	Average Bonus Pay (1)	*Average Base Pay* (2)	*Average Total Pay* (3)	*Bank-Wide Labor Expenses* (4)	*Average Total Pay* (5)	*Bank-Wide Labor Expenses* (6)
Avg. Bonus Share in 2007	−43.662**	−4.498	−40.543***	−22.436***	−45.785***	−31.029***
	(18.022)	(3.530)	(5.490)	(6.726)	(6.018)	(7.125)
Avg. Bonus Share in 2007					0.139*	0.449***
× *Income Change* (%)					(0.075)	(0.129)
Income Change (%)					0.000	−0.086**
					(0.014)	(0.033)
Controls measured in 2007:						
Loans/Assets	−27.832	−1.008	−1.424	12.375	−7.809	16.129
	(29.801)	(5.538)	(9.764)	(8.082)	(11.401)	(14.012)
Deposits/Assets	41.414	−6.665	14.293	21.056**	1.815	24.490*
	(42.745)	(7.514)	(13.455)	(9.959)	(11.150)	(12.951)
Equity/Assets	164.434*	−3.758	62.004**	−3.335	15.899	87.173
	(85.866)	(14.539)	(30.222)	(29.796)	(55.369)	(98.742)
Log Assets	−0.589	0.449	0.535	−3.893***	0.717	−3.252**
	(3.874)	(0.769)	(1.078)	(1.258)	(1.125)	(1.330)
R^2	0.16	0.09	0.57	0.29	0.63	0.41
Observations	46	46	46	50	35	39

Table 5: Bank Heterogeneity and Pre-Crisis Bonus Pay

We compute the *Average Bonus Share* for all employees in a particular employee group in the last year before the crisis. The *Avg. Bonus Share in 2007* in a particular employee group is then regressed on *Employment Share of Trading* and *Non-Interest Income Share in 2003*. We define *Employment Share of Trading* as as the relative number of employee observations in Investment Banking (D7) and Treasury Management/Capital Markets (D8). The *Non-Interest Income Share in 2003* is defined as non-interest income divided by total gross income in 2003. In all columns, we control for *Loans/Assets*, *Deposits/Assets*, *(Book) Equity/Assets*, and *Log Assets*—all measured in 2003. We regroup under (i) Trading Business all employees in Investment Banking (D7), and Treasury Management/Capital Markets (D8); (ii) Loan Business all employees in Retail Banking (D3), and Corporate Banking (D4), and (iii) Internal Services all employees in Headquarter Services (D1) and Logistical Services (D2). Robust standard errors are reported in parentheses. Significance at the 10%, 5%, and 1% level is indicated by *, **, ***, respectively.

Dependent variable:	*Average Bonus Share* in 2007 (by Employee Group)					
Divisions:	Trading Business D7+D8		Loan Business D3+D4		Internal Services D1+D2	
	(1)	(2)	(3)	(4)	(5)	(6)
Employment Share of Trading	2.233***		0.688***		0.258**	
	(0.638)		(0.173)		(0.096)	
Non-Interest Income Share in 2003		1.237***		0.315**		0.152***
		(0.351)		(0.116)		(0.046)
Controls measured in 2003:						
Loans / Assets	0.054	1.116**	-0.328**	-0.178	-0.077*	0.047
	(0.326)	(0.420)	(0.128)	(0.165)	(0.043)	(0.050)
Deposits / Assets	0.161	-0.253	0.150	0.034	0.052	0.005
	(0.369)	(0.409)	(0.145)	(0.170)	(0.061)	(0.053)
Equity / Assets	1.368	-0.014	1.111	0.767	0.625**	0.447
	(1.323)	(1.230)	(0.706)	(0.728)	(0.258)	(0.278)
Log(Assets)	-0.038	-0.022	-0.005	0.006	0.006	0.009
	(0.050)	(0.048)	(0.015)	(0.016)	(0.007)	(0.007)
R^2	0.53	0.41	0.52	0.41	0.34	0.30
Observations	48	48	42	42	50	50