Universidad de Navarra

Facultad de Ciencias Económicas y Empresariales

Working Paper nº 04/12

Executive Compensation and Systemic Risk: The Role of Non-Interest Income and Wholesale Funding

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Working Paper No.04/12
October 2012

ABSTRACT

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Abstract:

This paper analyzes whether the excessive overreliance on non-interest income and wholesale funding, which occurred in the banking industry during the last two decades and led to increases in systemic risk, could arise from the desire of bank managers to increase their variable compensation. Using a sample of U.S. bank holding companies during 1995 to 2010, our results show that non-interest income is positively associated to a larger proportion of variable compensation. Also, while exercised options are more sensitive to income trading activities, bonuses tend to be related to the revenues originated from investment banking and venture capital activities. Similarly, a greater reliance on short-term wholesale funding positively associates with higher levels of variable compensation and bonuses. After the financial crisis, variable compensation and bonuses increased with non-interest income, but decreased with the use of short-term wholesale funding.

Keywords: Non-interest income; executive compensation; financial crisis; wholesale funding.
JEL Classification: C30; G01; G20.

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1 Introduction

The banking industry underwent a deep transformation process during the last two decades. On the asset side, the change in the nature of the financial intermediation business originated as a consequence of the intense competition in the sector. According to the Federal Reserve, the average Net Interest Margin (hereafter, NIM) of all U.S. banks reached a peak of 4.90% in the first quarter of 1993, declining progressively up to a minimum of 3.15% in late 2008. The average non-interest income to assets ratio over this period steadily grew, showing the basic reaction of banks to this market trend. Banks diversify a great proportion of their traditional business activity (mostly based on deposits and business lending) and engage in other income-generating practices. Deregulatory changes such as the Gramm–Leach–Bliley Act in 1999 make it possible for U.S. Bank Holding Companies to generate new revenues in the form of fees, commissions, and direct income from trading, securitization, and other investment activities. Major trends on the liabilities side shift bank incentives to rely on short-term wholesale funding, rather than traditional bonds and core demand deposits.

It may be thought that diversifying operations across different activities reduces risk, and that net income may be more stable. However, the extant research shows that non-lending revenues increase the individual exposure to the market and contributes to increasing the vulnerability of the financial system. Not only is non-lending banking activity a more volatile source of income (Stiroh and Rumble (2006); DeYoung and Roland (2001)), but it could also be a source of systemic risk to the sector (Brunnermeier *et al*. (2012)).

Furthermore, if the non-interest activities are financed through an unstable source of funds, the higher the non-traditional activity, the higher the liquidity exposure. In fact, the excessive overreliance on unstable wholesale funding makes banks more vulnerable to liquidity shocks in money markets. This proved to be a major driver in amplifying and transmitting the idiosyncratic shocks initiated in the U.S. real estate sector to a global scale during the recent financial crisis, generating large externalities to the real economy.

An open question, therefore, concerns why bank managers enthusiastically engage in activities that may not be optimal from an individual risk-return perspective and, furthermore, increase the overall fragility of the financial system. While wholesale markets seem to provide an unlimited source of fast and cheap funding that banks use to expand their balance sheets, non-interest activities largely increase banking profitability, all together granting constant dividends and substantial bonus payments in the sector. A likely explanation is that bank managers may have imprudently over-relied on non-interest income sources and whole-sale funding owing to personal objectives, leading their firms (and the whole sector) to an inappropriate level of risk-taking. In spite of the considerable attention this moral hazard problem attracts, the empirical relation between managerial compensation and abnormal risk-taking, sourced in income-generating activities and funding strategies, must still be formally analyzed.[1] This is the main motivation for the current study.

In this paper, we address whether cross-sectional differences in executive variable compensation in the U.S. banking industry in the period 1995-2010 can be empirically related to firm-specific drivers of individual and systemic importance in the sector. Our sample includes pre- and post-crisis periods, which allow us to distinguish the effects of the economic turmoil. More specifically, we analyze the relative importance of non-traditional banking activities on the balance sheet, measured by the relative level of non-interest income and its main components, such as trading activity, investment banking and venture capital revenues. We study the roles of different sources of bank funding in the leverage ratio, with a special focus on short-term wholesale funding. These variables are largely related to individual market and liquidity risk exposures, respectively, and are major determinants of systemic risk in the financial industry. Our empirical analysis, conducted in a cross-sectional regression analysis with multi-way cluster on annual data from 163 banks, totals over 1,325 observations in a panel-data sample.

[1] Before the financial crisis, large bonuses in the financial sector were often viewed as a sign of good financial health and profitability in the sector. During the crisis, profits declined and the largest U.S. banks collectively received billions in bail out money; however, they still had to pay a surprisingly large amount of bonuses to their top executives because of inappropriate links between earnings and compensation, which raised critical voices.

The main results from this analysis can be summarized as follows. First, we find that, after controlling for firm performance, growth opportunities, and other relevant firm-specific and macroeconomic characteristics, a greater reliance on activities that generate non-interest income positively associates with a larger proportion of variable compensation. This is consistent with the moral hazard hypothesis and suggests bank managers may have consented to undertake pro-cyclical investments, increasing both the risk of the firm and the contribution to the system risk, expecting to achieve greater payment. We observe major differences across the different components of variable compensation in executive payments in relation to banks' activities. While exercised options are more sensitive to income trading activities, bonuses tend to be related to the revenues originated in fees and commissions from investment banking activity and capital growth from venture capital investments.[2] Similarly, a greater reliance on short-term wholesale funding, mainly used to finance balance sheet expansion, positively associates with higher levels of variable compensation, which is consistent with the main predictions of the moral hazard hypothesis. This evidence suggests that fast-growing firms are able to pay greater variable compensation, but at the cost of increasing the liquidity risk exposures of the firm and causing larger systemic externalities.

There exists a vast literature in corporate finance and financial accounting related to incentive compensation in the context of asymmetric information, mainly framed in principal-agency theory; see, among others, Jensen and Meckling (1976), Mirrlees (1976, 1997), Holmström (1979) and Fama and Jensen (1983). According to this setting, compensation packages are mainly designed to align the objectives of managers with the central interest of shareholders (maximize the value of their stocks), attempting to minimize the agency costs arising from the separation between control and property.

Because total executive compensation ties to stock value, and banks are characteristically highly leveraged institutions, bank managers are provided with

[2] A possible rationale for this finding is that, while stock options tend to be exercised during upturn market conditions, bonus payments are related to the revenues originated in fees and commissions from investment banking activity, and capital growth from venture capital activities. Venture capital activities involve the providing of funds, whether in the form of loans or equity, and technical and management assistance, when needed and requested, to start-up high-risk companies specializing in new technologies, ideas, products, or processes.

powerful incentives to take imprudent risk, aiming to maximize their personal wealth (Hentschel and Smith (1997); Morgan (2002); Fahlenbrach and Stulz (2010)). As Prendergast (2002) shows, a positive relationship exists between incentive compensation and risk. Several factors encourage risk-taking in this context, all of which stem from a moral hazard problem.[3]

We build on the existing theoretical literature and seek to explain how variable pay changes with risk. In the canonical agency model, there is a negative trade-off between incentives and risk, as outlined in the benchmark model of Prendergast (1999). A risk neutral principal contracting with a risk averse agent will set a bonus equal to $(1+rc\,\sigma^2)^{-1}$. This long-standing result shows a negative relationship between risk (σ^2) and incentives (b). However, as Prendergast (2002) documents, the empirical verdict on this negative relationship is far from conclusive, and in fact, the relationship may be positive.

We adopt the Holmstrom-Milgrom (1991) multitasking framework to argue that external variations in the market place have driven both increases in systemic risk, as well as increases in variable compensation. Thus, in this sense, the systemic risk is endogenous and a function of other factors in the economy, such as the availability of wholesale funding and the productivity of non-interest activities (like proprietary trading). These secular changes in the technological landscape for banks have increased the productivity of non-interest activities. Consequently, managers have shifted their efforts into such activities. This raises variable pay, but also drives increases in systemic risk. Our simplified model provides the core theoretical guidance for our hypotheses.

Under the moral hazard hypothesis, we expect a positive relationship between variable compensation and variables related to risk. The relative level of non-interest income reflects market risk exposures, with a large ratio being indicative of weakness in core business and over-reliance on risky activities (Stiroh (2004); Song and Thakor (2007)). Because of the declining profitability of core activities prior to the crisis, bank managers

[3] Stocks can be seen as a call option on the total firm's value, so bank managers have incentives to increase the level of underlying risk to increase the value of the option and, hence, the expected value of their accrued payments. Compensation arrangements include stock options, which enable executives to realize the upside benefits of risk taking, while limiting the down-side costs, thereby promoting risk-taking. Additionally, compensation packages include bonus plans that reward short-term profitability without regard for the risk involved, which encourages risk-taking.

had incentives to engage in non-interest activities and increase their variable compensation, even at the cost of a greater risk exposure. In addition, there are further reasons to expect a positive relationship between variable compensation and non-interest income. The relative degree of non-interest income is related to the degree of business complexity in the asset mix, and even to the degree of liquidity of the assets held by the organization; the literature on corporate finance reveals both characteristics as potential drivers of agency problems. As the firm grows in complexity, bank managers are more likely to use their discretionary ability in their own profit. In complex organizations, it is easier to conceal misaligned actions and deceive the organization's internal control functions. Similarly, asset liquidity enables opportunities for bank managers to act on self-interest (Myers and Rajan (1998)) because they provide greater flexibility. Consequently, bank managers have incentives to choose liquid, non-traditional banking operations, such as trading income activities, to achieve personal objectives. At the same time, illiquid alternatives (e.g., venture capital investments) may be a less efficient vehicle for these purposes. Smith and Watts (1992) argue that the firm's asset mix influences the compensation policies.

The remainder of the paper is organized as follows. Section 2 presents the theory and hypothesis. Section 3 introduces the data and presents conventional descriptive statistics. Section 4 discusses the main empirical findings. Section 5 summarizes and concludes. An appendix collects the main sources of data used in the paper.

2 Theory and Main Hypothesis

To fix ideas, we propose a simple model of compensation and production based on the Holmstrom-Milgrom (1991) multitask model. Suppose a bank hires a manager to provide costly effort to run the bank. The bank cannot monitor the manager's effort, and therefore there is a moral hazard problem. Instead, the effort stochastically increases output, which is the value of the firm represented by the stock price x. Since the bank cannot compensate on effort, it compensates on x.

The manager has two types of effort. The first type, e_1, is effort relating to lending. This includes finding new borrowers, screening quality, pricing loans, servicing loans, and managing credit risk. On the balance sheet, this effort shows up as interest income, as it

relates to all income generated from interest bearing activities such as lending. The other type of effort, e_2, refers to all non-interest bearing activities. This includes investment banking, venture capital, proprietary trading, off-balance sheet financing, and many of the other activities made possible by the Financial Services Modernization Act of 1999, in which investment banks and commercial banks are allowed to merge. On the balance sheet, income from these activities is captured in the non-interest income account. Suppose the manager exerts effort e_i at a private cost $C(e_i) = 0.5c_ie_i^2$. There is an information problem in the firm, in that the manager knows e_i but the bank does not. The cost of effort parameter c_i tracks the elasticity of labor supply, as managers with lower parameter c_i are able to supply more effort to the bank. The share price for the bank is given by:

$$x = k_1e_1 + k_2e_2 + \varepsilon$$

where k_i is the marginal productivity of activity e_i. For lending activities, k_1 refers to all market or technological factors influencing the productivity of lending, such as the pool of borrowers attracted to the bank, the ability to accurately price the loan, productivity of servicing, and so on. For non-lending activities, k_2 includes all market and technology factors that affect e_2, such as information technology of computerized trading models for proprietary trading, laws and regulation around off-balance sheet financing, efficiency and productivity of asset-backed securitization, and so on. The noise term ε refers to residual uncertainty in the model. Let ε follow a symmetric distribution g with mean 0 and variance σ^2. The value of the bank is reflected in its stock price x.

The bank cannot observe effort so it instead offers a contract (s, b) contingent on the stock price x. The manager's wage is therefore:

$$w = s + bx$$

where s is his salary and b is his bonus.

Observe that his salary is his fixed compensation, whereas his bonus determines his variable compensation. This contract is linear in output, which is without loss of

generality since the manager is risk neutral. The timing of the game is as follows: the bank offers a contract (s,b); the manager accepts or rejects the contract; if he accepts the contract, he exerts costly effort e_i; Nature reveals uncertainty ε; the share price x is formed; and the bank pays the manager $w = s+bx$.

The manager will select effort to maximize his compensation net of his cost of effort. The manager does not know the realization of x at the time of his effort choice, and therefore he chooses e_i to maximize his expected payoffs:

$$Ew - C(e_1) - C(e_2)$$

The first order conditions from the manager's problem yields his incentive constraint:

$$e_i = bk_i/c_i$$

Observe that equilibrium effort e_i* increases in his bonus b and his marginal productivity k_i, and decreases in his cost of effort c_i. As the bank increases the bonus, this increases the manager's incentive to provide effort, and similarly with increases in his marginal productivity of effort k_i. The variable compensation paid to the manager is a total variable compensation relative to his total compensation. This is given by:

$$\mathrm{V} = bEx/(s+bEx)$$

Some straightforward algebra shows that V is increasing in k_i. Intuitively, increasing the marginal productivity of effort raises the manager's variable pay, and therefore also his variable pay relative to his total pay (since k_i does not affect the fixed component s). This comparative static will drive our empirical hypothesis. Changes in k_i will drive changes in variable compensation V.

Figure 1 shows the decrease of US Banks' NIM from 1994. López-Espinosa *et al.* (2011) show a common pattern for developed countries, with a significant decrease of NIMs before the financial crisis. Given this significant decrease of NIM, bank managers engage in non-interest activities, allowed by the repeal of provisions in the Glass–Steagall Act by the Gramm–Leach–Bliley Act in 1999, in order to obtain certain levels

of earnings, thus generating high levels of dividends and compensation. Consequently, our first hypothesis follows.

[Insert Figure 1 around here]

Hypothesis 1 Everything else equal, variable compensation positively relates to the relative level of non-interest income.

The relative level of non-interest income is a proxy for the productivity of non-interest activities k_i. We interpret Figure 1 as a secular decline in the productivity of lending activities from 1994 (therefore a fall in k_1), and a parallel rise in the productivity of non-lending income (a rise in k_2). Given these changes in k_i, the manager will choose his effort in response according to his incentive constraint. Our conjecture is that the rise in k_2 exceeds the fall in k_1, and therefore the net effect is to increase variable compensation, leading to Hypothesis 1.

Regarding the funding strategies, we can generally expect a positive relationship between variable compensation and the relative leverage of the bank, under the moral hazard hypothesis. While large debt holdings give rise to greater credit risk, the short-term wholesale funding ratio proves a major determinant of liquidity risk in the firm (López-Espinosa *et al*. (2012)). Liquidity refers to the possibility of the bank failing to obtain funding to attend short-term payments and exposes the firm to default on the costs involved. A large short-term wholesale ratio not only implies a greater dependence of unstable funding and vulnerability to a market liquidity crunch, but also implies a greater maturity mismatch. Furthermore, it increases the counterparty risk in the system and the possibility of fire sales, thereby affecting systemic risk. Our second testable hypothesis follows.

Hypothesis 2 Everything else equal, variable compensation positively relates to the level of short-term wholesale funding.

The level of short-term wholesale funding affects the efficiency of the manager's actions e_i, and in particular e_2. The banks dramatically increased their use of wholesale funding in order to provide a cheap and reliable source for their liabilities. This

wholesale funding, such as commercial paper, repos, and other short-term instruments, made it very easy for banks to fund their liabilities, and therefore fund the operations of the bank, both interest and non-interest activities. These activities especially supported much of the securitization machine for asset such as mortgages, which drove most of the profits of the broker-dealers since 1994. Thus, we interpret this increase in wholesale funding to reflect increases in the productivity of managerial effort, k_2, as our main comparative statistics show that as k_2 rises, so does variable compensation, V.

Both non-interest income and short-term wholesale funding are major drivers of systemic risk in the banking industry. For instance, López-Espinosa *et al*. (2012) show short-term wholesale funding as the main driver of systemic risk in a sample of international and large-scale banks, in which size and leverage do not play major roles after accounting for this variable. Similarly, Brunnermeier *et al*. (2012) show the relationship between non-interest activities and systemic risk. This consideration is important because, consistent with the moral hazard hypothesis, managerial stock holdings and/or greater use of stock options are more likely to be used in institutions deemed "too big to fail" by regulators, as discussed by Houston and James (1995).

3 Data and methodology

The data used in this paper are obtained from different sources for the period 1995 to 2010[4]. We gathered quarterly accounting data for U.S. Bank Holding Companies (BHCs) from the Federal Reserve Bank of Chicago Bank Regulatory Database, which contains accounting data from the required regulatory forms filed for supervising purposes by regulated depository financial institutions. We collect balance sheet and income statement data for all listed BHCs in the database. In addition, we use market data from the CRSP database and macro data from the Federal Reserve Bank of St. Louis FRED database. The Appendix provides a list of the specific variables we use, which we describe below, and the database codes.

[4] Capital ratios are available from 1996Q1, so analyses with regulatory capital data are done on a slightly smaller sample. The results using Tier I as a control variable remain the same and are available upon request.

Our first hypothesis posits that, before the crisis, bank managers engaged in non-interest activities to increase their variable compensation, given the decrease of NIM of U.S. banks from 1994: if bank managers follow this strategy systematically we should observe a positive relationship between the variable compensation of bank managers and the non-interest income to net interest income ratio, after controlling for other potential drivers.

Our second hypothesis postulates that, before the crisis, bank managers used short-term wholesale funding to expand bank balance sheets to obtain higher compensation. Therefore, we should observe a positive relationship between the variable compensation of bank managers and the proportion of short-term wholesale funding.

In order to test these hypotheses, the firm-specific sensitivity of these compensation arrangement structures should be taken into account. Smith and Watts (1992) raise the so-called contracting hypothesis, arguing that compensation packages reflect differences in the firm's investment opportunity and the nature of a firm's assets. Other factors, such as the effect of size, share performance, firm performance, monitoring manager costs, manager discretion, or regulatory environment, are also key determinants of the structure of compensation in practice; see John and John (1993); Houston and James (1995); John, Saunders and Senbet (2000); Prendergast (2002); among others. We control for a number of bank-specific variables, such as the level of profitability, the credit exposure, the investment and growth opportunities, the size, the annual return of the bank, and a macroeconomic variable, the federal funds rate, to control for the cost of funds in the banking system.

Our baseline model to test these hypotheses follows:

$$\begin{aligned} VARCOMP_{it} = \alpha + \beta_1 TNIINII_{it} + \beta_2 DTA_{it} + \beta_3 NITA_{it} + \beta_4 OBSEXPTA_{it} + \beta_5 BTM_{it} \\ + \beta_6 SIZE_{it} + \beta_7 RET_{it} + \beta_8 FFR_t + u_{it} \end{aligned} \quad (1)$$

where u_{it} is an error term, $VARCOMP_{it}$ is the variable compensation for all Board members of bank *i* at year *t*, computed as the difference between total compensation (including salary and other annual payments, bonuses, restricted stock grants, value of

options exercised, LTIP payouts and any other compensation) and salary. We focus on variable compensation instead of individual components of the compensation packages, since significant temporary differences among banks exist. Also, Kole (1993) shows that focusing on individual components of the compensation package elicits misleading inferences concerning the overall relationship between pay and performance.

The description of the independent variables is as follows:

- $TNIINII_{it}$ is the total non-interest income to net interest income ratio, accounting for the level of non-traditional activities of the bank *i* at year *t*.
-DTA_{it}: Total debt to total assets ratio of bank *i* at year *t*. Total debt is computed as the difference between total assets and equity and captures a firm's leverage.
-$NITA_{it}$ is the net income to total assets ratio (ROA), a control for the level of profitability of the bank *i* at year *t*.
-$OBSEXPTA_{it}$ is the off-balance sheet exposure to total assets ratio of bank *i* at year *t*. It accounts for the level of current credit exposure across all off-balance sheet derivative contracts.
-BTM_{it} is the book-to-market ratio of bank *i* at year *t*, a usual control variable that captures growth opportunities of the bank.
-$SIZE_{it}$ is the logarithm of the market value of bank *i* at year *t*.
-RET_{it} is the annual return of bank *i* at year *t*, controlling for the financial performance of the bank.
-FFR_t is the effective federal funds rate at year *t*, computed as an annual average; this proxies the cost of funds.

The coefficient related to the $\mathrm{TNIINII}_{it}$ variable allows us to test the first hypothesis. In order to test the second hypothesis, we decompose the DTA_{it} variable into the sum of $DWWSFTA_{it}$ (total debt excluding short-term wholesale funding to total assets) and $WSFTA_{it}$ (short-term wholesale funding to total assets) ratios. The former is a proxy for stable funding, while the latter is a proxy for interconnectivity among financial institutions and exposures to liquidity risk, a variable strongly related to systemic risk. This provides our second model to be tested:

$$VARCOMP_{it} = \alpha + \beta_1 TNIINII_{it} + \beta_2 DWWSFTA_{it} + \beta_3 WSFTA_{it} + \gamma' Controls_{it} + u_{it} \quad (2)$$

The total non-interest income to net interest income ratio ($TNIINII_{it}$ variable), which accounts for the level of non-traditional activities of the bank, decomposes into the sum of $TINII_{it}$, the trading income to net interest income ratio, a measure of the trading activity of the bank, and $IBVCNII_{it}$, the investment banking advisory/ brokerage underwriting fees and commissions[5] and venture capital revenue[6] to net interest income ratio, accounting for the level of investment banking and venture capital activities of the bank. In order to check the importance of these two main components of total non-interest income on variable compensation, we estimate a third model, which follows:

$$VARCOMP_{it} = \alpha + \beta_1 TNIINII_{it} + \beta_2 TINII_{it} + \beta_3 IBVCNII + \beta_4 DTA_{it} + \gamma' Controls_{it} + u_{it} \quad (3)$$

Finally, we consider a fourth model, in which we decompose both the total non-interest income and the total debt into the components mentioned. In this way, we could test whether the assets side of the balance sheet drives the effect, whether this results from the liabilities side, or whether such results from a combination of both effects. Thus, the four models are as follows:

$$\begin{aligned} VARCOMP_{it} = \alpha &+ \beta_1 TNIINII_{it} + \beta_2 TINII_{it} + \beta_3 IBVCNII + \beta_3 DWWSFTA_{it} + \\ &+ \beta_4 WSFTA_{it} + \gamma' Controls_{it} + u_{it} \end{aligned} \quad (4)$$

The four models are estimated using two additional dependent variables, which represent two components of variable compensation. This structure enables us to gain more insight and, because there could be a different effect of the two main variables of interest, helps us consider whether compensation is equity-based or not. The first dependent variable, $BONUS_{it}$, represents the total amount of bonus received over total compensation for all Board members of bank *i* at year *t*. The second variable,

[5] Available in Bank Regulatory database until 2006.

[6] In general, venture capital activities involve the provision of funds, whether in the form of loans or equity, and technical and management assistance, when needed and requested, to start-up or high-risk companies specializing in new technologies, ideas, products, or processes. The primary objective of these investments is capital growth. This variable includes as venture capital revenue market value adjustments: interest, dividends, gains, and losses (including impairment losses) on venture capital investments (loans and securities). It also includes the bank's proportionate share of the income or loss before extraordinary items and other adjustments from its investments in equity method investees who are principally engaged in venture capital activities.

$OPTIONSEX_{it}$, represents the value realized on options exercised over total compensation for all Board members of bank *i* at year *t*. Additionally, in order to analyze effects the financial crisis has on the hypotheses proposed, we run the regressions again, but include the interaction of a financial crisis dummy variable with our variables of interest. This dummy, CD_t, takes value 1 if the year is equal to or superior than 2007.

All equations are estimated through pooled time-series cross-sectional regressions with two-way cluster-robust standard errors, accounting for bank and time periods as clusters (Petersen (2009); Gow, Ormazabal and Taylor (2010); Cameron, Gelbach and Miller (2011); Thompson (2011)). The distinctive characteristic of multi-way clustered errors in the pooled regression setting allows us to carry out statistical inference, which is robust by design to simultaneous dependences of unknown form in both the cross-sectional and time-series dimensions of the panel. Regression errors are assumed to be independent, but not identically distributed across a number of clusters and can have fairly general patterns of within-cluster correlation and heteroskedasticity. Results from alternative panel data methods lead to similar qualitative conclusions and are available upon request.

Table 1 shows some descriptive statistics regarding variable compensation of bank managers. During the total period, variable components represent a high proportion of total compensation, with a mean figure of around 63.2 percent. Bonus compensation represents a 28.64 percent over-variable compensation, while options exercised account to a 31.96 percent over-variable compensation. Before the crisis period (defined here up through the year 2006), all figures relating to variable compensation, bonus and options exercised, are higher, representing mean values of 66.5, 22.4 and 23.0 percent over total compensation, respectively; however, after the crisis period, these three figures decrease up to 52.8, 4.4 and 11.4 percent, respectively, over total compensation. This means that before the crisis, the proportion of bonus over variable compensation (33.68 percent) proved similar to that of options exercised (34.59 percent). However, during the crisis period, the percentage of bonus and options exercised over variable compensation decreased up to an 8.33 and a 21.71 percent, respectively. That is, the relative importance of bonus was much smaller than that of options exercised.

[Insert Table 1 around here]

Table 2 shows the same descriptive statistics but for the independent variables in the analysis. Our first variable of interest, total non-interest income, represents a high proportion over net interest income (74.3 percent), showing how banks increasingly change the nature of their business, due to a decreasing profitability of the core business. Trading income, investment banking, and venture capital income represent, respectively, a 7.7 and a 7.1 percent over net interest income. Our second variable of interest, wholesale funding, represents 11.6 percent over total assets, and 12.75 percent over total debt. Net income over total assets reaches a mean value of 1 percent during the whole period. Off-balance sheet exposure accounts for 0.6 percent over total assets, which does not seem to be a high figure. The mean book-to-market ratio is 0.619, while the mean size of banks, in logarithm terms, is 14.834. The annual mean return is around 15 percent, while the mean annual federal funds rate is around 3.60 percent.

[Insert Table 2 around here]

Table 3 shows the correlations between the variables in the analysis. The two variables of interest, total non-interest income over net interest income and wholesale funding, positively correlate with the variables considering compensation. This lines up with the hypotheses proposed, but the empirical analyses will show whether these relationships are significant or not.

[Insert Table 3 around here]

4 Results

Table 4 presents the results of the estimation of the four models for variable compensation. As expected, TNIINII positively relates to variable compensation, so that the diversification of activities entails higher compensation to managers, albeit the risk derived from the higher instability of non-interest income increase. This provides evidence for Hypothesis 1. When decomposing total non-interest income into the two components in Models III and IV, the results show the similar impact magnitude of IBVCNII on compensation to that of TNIINII. However, the impact of TINII is almost

six times higher than that of the other two variables. Thus, managers obtain more compensation through activities related to trading income than through any other component of non-interest income.[7] Regarding Hypothesis 2, wholesale funding shows a positive impact on variable compensation, providing evidence in favor of this hypothesis. In fact, all variables relating to leverage show a positive impact on variable compensation. In this way, it seems bank managers may have been increasing the exposure to systemic risk to achieve higher variable compensation. Regarding the control variables, only SIZE and NITA show a significant impact on variable compensation, being that their coefficients are positive, so that as size and the level of profitability increase, variable compensation also increases.

[Insert Table 4 around here]

Table 5 includes the results of the models when considering the effect of the financial crisis. The effect of TNIINII on variable compensation before the crisis is rather similar to that of the whole period. However, during the crisis, only in one of the two models where this variable is included is the coefficient positive and significant at 5 percent. Before the crisis, both TINII and IBVCNII have a similar impacts on variable compensation to during the whole period. During the crisis, the variable compensation increases, due to income derived from trading activities, since revenues from investment banking and venture capital activities do not have an impact on variable compensation. The effect of wholesale funding before the financial crisis is similar to during the whole period, but during the crisis, increases in wholesale funding do not have a significant impact on variable compensation of bank managers. The same result applies when considering the total debt or the total debt without wholesale funding.

[Insert Table 5 around here]

[7] It should be taken into account that TINII and IBVCNII represent only around a 19.92 percent of TNIINII (see Table 2). Thus, one may argue that the remaining components of TNIINII could also be important drivers of variable compensation. We have run all the regressions again including a third variable that accounts for the remaining components of TNIINII. The results show that this variable is not significant and the impact of TINII and IBVCNII remain unaltered, so results are robust to this consideration. Brunnermeier *et al*. (2012) show that the remaining components of TNIINII do not have an impact on systemic risk, and we add to the literature by showing that these components also do not have an impact on bank manager's compensation.

The estimations regarding bank managers' bonuses are shown in Tables 6 and 7. Total non-interest income continues to have a positive and significant impact, so bank managers receive more bonuses related to these activities. Interestingly, only the activities derived from investment banking and venture capital have a positive and significant impact on bonuses received, since trading income is not significant. Increases in wholesale funding (as well as in total leverage or total leverage without wholesale funding) increase the bonuses bank managers receive. Regarding the control variables, we find that as profitability, off-balance sheet exposures, and the annual return increase, so do the bonuses received. The result regarding returns is also found in Livne, Markarian and Milne (2011), who show cash bonuses are positively related to returns.

[Insert Table 6 around here]

If we analyze the results distinguishing the effects between and during the financial crisis, Table 7 provides more insights. During the crisis, bonuses increase considerably with the activities related to investment banking and venture capital. Regarding the evidence of the variables related to debt, the evidence is similar to that of total variable compensation. During the crisis, increases in any of the three variables lead to lower bonuses.

[Insert Table 7 around here]

Table 8 shows the result regarding the estimations for options exercised. For this component of compensation, only the variable related to trading income is significant. This extends the results of Brewer, Hunter and Jackson (2004), who show that non-traditional, non-interest income positively relates to equity based compensation. We find only a component of total non-interest income drives this result. As opposed to bonus compensation, in which investment banking and venture capital activities are the drivers, in the case of options exercised, we find trading income raises this type of compensation. A possible rationale for this finding is that while stock options tend to be exercised during upturn market conditions, bonus payments relate more to the revenues originated in fees and commissions from investment banking activity and capital growth from venture capital activities. Venture capital activities involve providing funds,

whether in the form of loans or equity, and technical and management assistance, when needed and requested to start-up high-risk companies specializing in new technologies, ideas, products, or processes. Regarding the results related to debt, we find debt leads to increases in options exercised. Wholesale funding is significant in just one of the two models in which it is included, and the magnitude of the impact is smaller than the one found in variable compensation and bonuses. Only three of the control variables turn out to be significant in this case: size, net income, and off-balance sheet exposure.

[Insert Table 8 around here]

Table 9 shows the results for options exercised and distinguishes the periods before and during the financial crisis. Before the financial crisis, the results are rather similar to those for the whole period. During the financial crisis, we find trading income is no longer significant, so it does not lead to increases in options exercised. Regarding the variables related to debt, debt without wholesale funding is the only one that is significant with a negative coefficient, implying that increases in debt (except that of wholesale funding) reduce the options exercised by bank managers.

[Insert Table 9 around here]

5 Conclusions

Prior to the financial crisis, and after Gramm-Leach-Bliley Act in 1999, banks increasingly engaged in activities that increased the bank's exposure to risk and even led to increases in systemic risk. A clear example of these activities is that banks have increasingly earned a higher proportion of their earnings from non-interest income activities. They have also expanded their balance sheets through short-term wholesale funding, which provides a source of fast and cheap funding. Bearing this in mind, the aim of this paper is to analyze whether bank managers could have imprudently over-relied on non-interest income sources and wholesale funding in order to increase their variable compensation. In order to test these two hypotheses, the sample is based on U.S. Bank Holding Companies, with annual data from 1995 to 2010.

The main results from this analysis can be summarized as follows. First, we find that after controlling for firm performance, growth opportunities and other relevant firm-specific and macroeconomic characteristics, a greater reliance on activities that generate non-interest income positively associates to a larger proportion of variable compensation. This is consistent with the moral hazard hypothesis and suggests bank managers consented to undertake pro-cyclical investments that increase both the risk of the firm and the contribution to the system risk, expecting to achieve greater variable payments. We observe major differences across the different components of variable compensation in executive payments in relation to banks' activities. While exercised options are more sensitive to income trading activities, bonuses are related to the revenues originated in fees and commissions from investment banking activity and capital growth from venture capital investments. Similarly, a greater reliance on short-term wholesale funding, mainly used to finance balance sheet expansions, positively associates with higher levels of variable compensation, consistent with the main predictions of the moral hazard hypothesis. This evidence suggests fast-growing firms are able to pay greater variable compensation, yet at the cost of increasing the liquidity risk exposures of the bank and causing larger systemic externalities.

This analysis is particularly relevant for regulatory considerations. As recently as June 2010, the Federal Reserve, in cooperation with other federal agencies, issued a final guidance designed to help ensure that incentive compensation arrangements in the

banking industry do not encourage imprudent risk taking. Among the different proposals included, it encourages risk-adjusted compensation arrangements, which, to be fully effective, "*…should take account of the full range of risks, including credit, market, liquidity, operational, legal, compliance, and reputational risks*." Our paper provides formal support to these claims, showing that different sources of individual uncertainty, mainly related to market, operational and liquidity risks, are empirically related to variable compensation. In addition, international regulators require capital surcharges to so-called Systemically Important Financial Institutions aiming to prevent, or at least mitigate, episodes of financial contagion. According to our analysis, major drivers of systemic importance relate to variable compensation payments. International regulators may reinforce local initiatives to control compensation practices.

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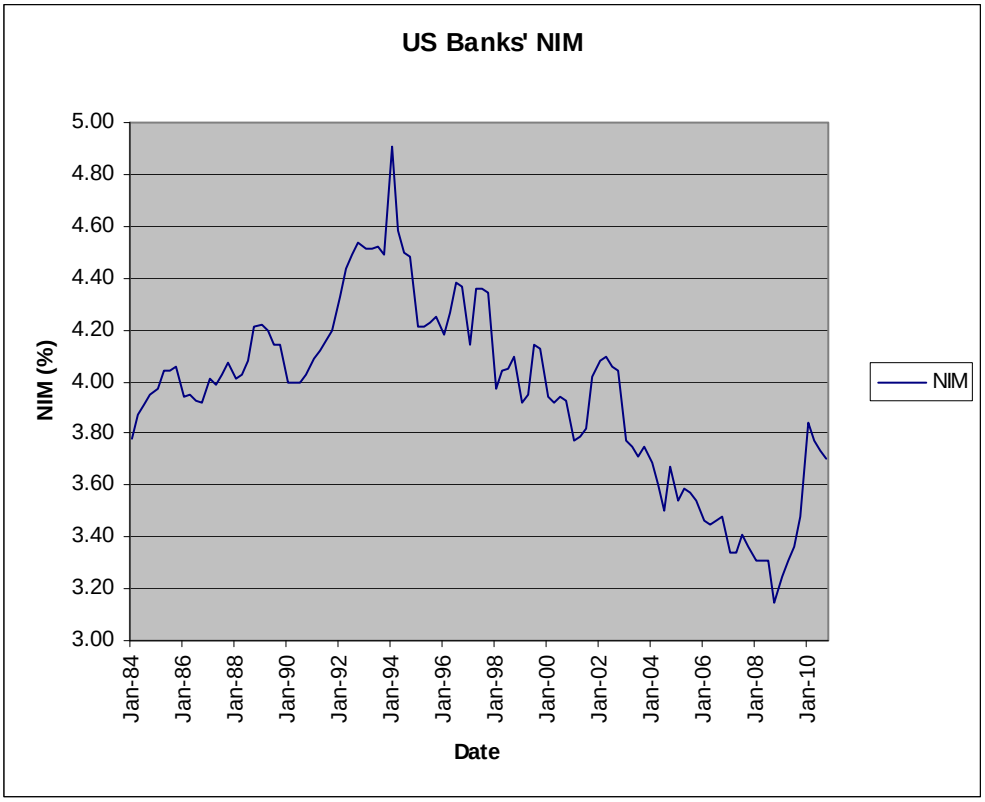
Appendix: Accounting, Compensation, Market and Macro Data.

Accounting, executive compensation, and market data come from Bank Regulatory (Federal Reserve Bank of Chicago), Standard&Poor's Execucomp and CRSP database respectively.

Variables	Database	Codes
Equity	Bank Regulatory	BHCK3210
Net Income	Bank Regulatory	BHCK4340
Net Interest Income	Bank Regulatory	BHCK4074
Total Assets	Bank Regulatory	BHCK2170
Total Non-interest Income	Bank Regulatory	BHCK4079
Trading Income	Bank Regulatory	BHCKA220+BHCKB493+ BHCK8560+BHCK8561
Investment banking advisory/ brokerage underwriting fees and commissions and venture capital revenue	Bank Regulatory	BHCKB490 (until 2006) +BHCKB491
Off-balance sheet exposure	Bank Regulatory	BHCK8764
Short-term wholesale funding	Bank Regulatory	BHCK2309+ BHCK3353+ BHCK2332+ BHDMA243
Bonus	Standard&Poor's Execucomp	BONUS
Options exercised	Standard&Poor's Execucomp	OPT_EXER_VAL
Salary	Standard&Poor's Execucomp	SALARY
Total compensation	Standard&Poor's Execucomp	TDC2
Stock Price	CRSP	Prc
Cumulative factor to adjust prices	CRSP	Cfacpr
Cumulative factor to adjust shares/vol	CRSP	Cfacshr
Shares outstanding	CRSP	Shrout
Return with dividends	CRSP	Ret
Market capitalization	CRSP	(prc/cfacpr)*(shrout*cfacshr)
Effective federal funds rate	Federal Reserve Bank of St. Louis	

Figures

Figure 1. Net Interest Margin of U.S. Banks.



Source: Federal Reserve Bank of St. Louis FRED.

Tables

Table 1. Descriptive statistics of compensation

Variable	#Obs.	Mean	25%	Median	75%	Std. Dev.
Total Period						
VARCOMP	1,325	0.632	0.490	0.655	0.808	0.213
Bonus	1,325	0.181	0.034	0.171	0.277	0.155
Options exercised	1,289	0.202	0.014	0.138	0.311	0.215
Pre-crisis period						
VARCOMP	1,007	0.665	0.531	0.690	0.821	0.193
Bonus	1,007	0.224	0.116	0.212	0.314	0.147
Options exercised	971	0.230	0.046	0.182	0.352	0.216
Post-crisis period						
VARCOMP	318	0.528	0.351	0.533	0.717	0.240
Bonus	318	0.044	0	0	0.047	0.085
Options exercised	318	0.114	0	0.019	0.156	0.188

Descriptive statistics of the following variables: VARCOMP: variable compensation over total compensation; Bonus: total amount of bonus received over total compensation; Options exercised: value realized on options exercised over total compensation. All variables are measured in annual terms. Compensation refers to the total amount for all Board members.

Table 2. Descriptive statistics of explanatory variables

Variable	#Obs.	Mean	25%	Median	75%	Std. Dev.
Bank variables						
TNIINII	1,325	0.743	0.294	0.456	0.719	1.226
TINII	1,325	0.077	0.004	0.020	0.053	0.221
IBVCINII	1,325	0.071	0	0	0.012	0.896
DTA	1,325	0.910	0.899	0.913	0.925	0.028
DWWSFTA	1,325	0.794	0.757	0.803	0.846	0.078
WSFTA	1,325	0.116	0.059	0.103	0.156	0.080
NITA	1,325	0.010	0.009	0.012	0.014	0.009
OBSEXPTA	1,325	0.006	1.52E-6	0.001	0.004	0.020
BTM	1,325	0.619	0.374	0.488	0.652	0.531
SIZE	1,325	14.834	13.713	14.592	15.869	1.528
RET	1,325	0.150	-0.065	0.129	0.355	0.355
Macroeconomic variable						
FFR	1,325	0.036	1.670	4.960	5.350	2.044

Descriptive statistics of the following variables: TNIINII: total non-interest income over net interest income; TINII: trading income over net interest income; IBVCINII: investment banking and venture capital income over net interest income; DTA: total debt deflated by bank's total assets; DWWSFTA: total debt without short-term wholesale funding deflated by total assets; WSFTA: short-term wholesale funding over total assets; NITA: net income to total assets; OBSEXPTA: off-balance sheet exposure to total assets; BTM: book-to-market; SIZE: logarithm of bank's market value; RET: annual bank's return; FFR: federal funds rate. All variables are measured in annual terms.

Table 3. Correlation matrix

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	1.00													
2	**0.21**	1.00												
3	**0.50**	**-0.10**	1.00											
4	**0.24**	**0.11**	0.02	1.00										
5	**0.27**	**0.12**	**0.13**	**0.35**	1.00									
6	0.04	0.04	-0.03	**0.80**	0.03	1.00								
7	**0.10**	**0.23**	**0.07**	**-0.37**	-0.02	**-0.56**	1.00							
8	**0.31**	**0.07**	-0.00	**0.10**	**0.09**	0.01	0.05	1.00						
9	**0.20**	**0.15**	**0.06**	**0.14**	**0.26**	**-0.06**	**0.27**	**0.16**	1.00					
10	**0.31**	**0.23**	**0.29**	**0.22**	**0.17**	**0.18**	**-0.17**	-0.04	-0.05	1.00				
11	**0.30**	**0.21**	-0.02	**0.26**	**0.39**	0.02	**0.17**	**0.45**	**0.34**	**-0.07**	1.00			
12	**-0.28**	**-0.27**	**-0.28**	**-0.10**	**-0.10**	-0.03	**-0.16**	**0.10**	-0.04	**-0.74**	0.04	1.00		
13	**0.64**	**0.18**	**0.21**	**0.29**	**0.25**	**0.08**	-0.03	**0.56**	**0.26**	**0.27**	**0.41**	**-0.22**	1.00	
14	**0.13**	**0.29**	**0.12**	-0.00	0.02	-0.03	**0.10**	**-0.07**	-0.04	**0.35**	-0.02	**-0.45**	0.05	1.00
15	**0.10**	**0.17**	**0.10**	-0.03	-0.04	-0.05	**0.20**	**-0.10**	**0.08**	**0.28**	0.01	**-0.33**	0.04	**0.21**

Correlations among the variables included in the empirical analysis. (1) Variable compensation over total compensation; (2) Bonus: total amount of bonus received over total compensation; (3) Options exercised: value realized on options exercised over total compensation; (4) TNIINII: total non-interest income over net interest income; (5) TINII: trading income over net interest income; (6) IBVCINII: investment banking and venture capital income over net interest income; (7) DTA: total debt deflated by bank's total assets; (8) DWWSFTA: total debt without short-term wholesale funding over total assets; (9) WSFTA: short-term wholesale funding over total assets; (10) NITA: net income to total assets; (11) OBSEXPTA: off-balance sheet exposure to total assets; (12) BTM: book-to-market; (13) SIZE: logarithm of bank's market value; (14) RET: annual bank's return; (15) FFR: federal fund rate. All variables are measured in annual terms. Compensation refers to the total amount for all Board members.
Values in bold are significant at the 5 percent level.

Table 4. Estimation of variable compensation

Variable	M. I	M. II	M. III	M. IV
$Constant_{it}$	-1.756	-1.786	-1.795	-1.842
	(0.00)	(0.00)	(0.00)	(0.00)
$TNIINII_{it}$	0.017	0.018		
	(0.00)	(0.00)		
$TINII_{it}$			0.094	0.098
			(0.00)	(0.00)
$IBVCNII_{it}$			0.016	0.017
			(0.03)	(0.02)
DTA_{it}	1.300		1.326	
	(0.00)		(0.00)	
$DWWSFTA_{it}$		1.331		1.375
		(0.00)		(0.00)
$WSFTA_{it}$		1.294		1.317
		(0.00)		(0.00)
$NITA_{it}$	3.476	3.454	3.179	3.132
	(0.01)	(0.01)	(0.01)	(0.01)
$OBSEXPTA_{it}$	0.351	0.378	0.154	0.188
	(0.16)	(0.16)	(0.61)	(0.55)
BTM_{it}	-0.001	-0.001	-0.002	-0.002
	(0.96)	(0.96)	(0.94)	(0.94)
$SIZE_{it}$	0.078	0.078	0.079	0.080
	(0.00)	(0.00)	(0.00)	(0.00)
RET_{it}	0.018	0.018	0.019	0.018
	(0.52)	(0.54)	(0.50)	(0.53)
FFR_t	-1.2E-4	-4E-5	5.3E-4	6.7E-4
	(0.98)	(0.99)	(0.93)	(0.91)
R2 adjusted	0.46	0.46	0.46	0.46
Number observations	1,325	1,325	1,325	1,325

Pooled regression time-series with robust errors computed on double cluster (bank and year). Dependent variable $VARCOMP_{it}$: variable compensation over total compensation (for all Board members). $TNIINII_{it}$: total non-interest income over net interest income; TINII: trading income over net interest income; IBVCINII: investment banking and venture capital income over net interest income; DTA_{it}: total debt deflated by bank's total assets; $DWWSFTA_{it}$: total debt without short-term wholesale funding over total assets; $WSFTA_{it}$: short-term wholesale funding over total assets; $NITA_{it}$: net income to total assets; $OBSEXPTA_{it}$: off-balance sheet exposure to total assets; BTM_{it}: book-to-market; $SIZE_{it}$: logarithm of bank's market value; RET_{it}: annual bank's return; FFR_t: federal fund rate. All variables are measured in annual terms. Robust *p*-values in brackets.

Table 5. Estimation of variable compensation distinguishing the crisis period

Variable	M. I	M. II	M. III	M. IV
$Constant_{it}$	-1.516	-1.745	-1.572	-1.762
	(0.00)	(0.00)	(0.00)	(0.00)
$TNIINII_{it}$	0.014	0.017		
	(0.01)	(0.00)		
CD_t*$TNIINII_{it}$	0.029	0.553		
	(0.14)	(0.04)		
$TINII_{it}$			0.077	0.085
			(0.00)	(0.00)
CD_t*$TINII_{it}$			0.160	0.175
			(0.00)	(0.01)
$IBVCNII_{it}$			0.013	0.016
			(0.04)	(0.02)
CD_t*$IBVCNII_{it}$			0.515	0.382
			(0.07)	(0.23)
DTA_{it}	1.090		1.129	
	(0.00)		(0.00)	
CD_t*DTA_{it}	-0.077		-0.062	
	(0.09)		(0.06)	
$DWWSFTA_{it}$		1.316		1.299
		(0.00)		(0.00)
CD_t*$DWWSFTA_{it}$		-0.674		-0.002
		(0.04)		(0.22)
$WSFTA_{it}$		1.287		1.269
		(0.00)		(0.00)
CD_t*$WSFTA_{it}$		-0.382		-0.171
		(0.06)		(0.20)
$NITA_{it}$	3.038	3.402	2.777	2.958
	(0.01)	(0.00)	(0.01)	(0.01)
$OBSEXPTA_{it}$	0.408	0.354	0.227	0.208
	(0.07)	(0.19)	(0.40)	(0.48)
BTM_{it}	0.007	0.006	0.007	0.003
	(0.79)	(0.82)	(0.79)	(0.91)
$SIZE_{it}$	0.076	0.077	0.078	0.080
	(0.00)	(0.00)	(0.00)	(0.00)
RET_{it}	0.007	0.010	0.008	0.012
	(0.80)	(0.73)	(0.77)	(0.69)
FFR_t	-0.003	-0.002	-0.002	-4E-4
	(0.62)	(0.76)	(0.68)	(0.94)
R2 adjusted	0.47	0.46	0.47	0.46
Number observations	1,325	1,325	1,325	1,325

Pooled regression time-series with robust errors computed on double cluster (bank and year). Dependent variable $VARCOMP_{it}$: variable compensation over total compensation (for all Board members). $TNIINII_{it}$: total non-interest income over net interest income; CD_t: crisis dummy variable (1 if year equal or superior than 2007); CD_t*$TNIINII_{it}$: interaction between CD and TNIINII; $TINII_{it}$: trading income over net interest income; CD_t*$TINII_{it}$: interaction between CD and TINII; $IBVCINII_{it}$: investment banking and venture capital income over net interest income; CD_t*$IBVCINII_{it}$: interaction between CD and IBVCINII; DTA_{it}: total debt deflated by bank's total assets; CD_t*DTA_{it}: interaction between CD and DTA; $DWWSFTA_{it}$: total debt without short-term wholesale funding over total assets; CD_t*$DWWSFTA_{it}$: interaction between CD and DWWSFTA; $WSFTA_{it}$: short-term wholesale funding over total assets; CD_t*$WSFTA_{it}$: interaction between CD and WSFTA; $NITA_{it}$: net income to total assets; $OBSEXPTA_{it}$: off-balance sheet exposure to total assets; BTM_{it}: book-to-market; $SIZE_{it}$: logarithm of bank's market value; RET_{it}: annual bank's return; FFR_t: federal fund rate. All variables are measured in annual terms. Robust *p*-values in brackets.

Table 6. Estimation of bonus

Variable	M. I	M. II	M. III	M. IV
$Constant_{it}$	-1.313	-1.282	-1.686	-1.654
	(0.00)	(0.00)	(0.00)	(0.00)
$TNIINII_{it}$	0.016	0.016		
	(0.03)	(0.04)		
$TINII_{it}$			0.016	0.014
			(0.57)	(0.64)
$IBVCNII_{it}$			0.034	0.033
			(0.00)	(0.00)
DTA_{it}	1.492		1.876	
	(0.00)		(0.00)	
$DWWSFTA_{it}$		1.459		1.842
		(0.00)		(0.00)
$WSFTA_{it}$		1.498		1.882
		(0.00)		(0.00)
$NITA_{it}$	3.099	3.122	3.280	3.312
	(0.01)	(0.00)	(0.01)	(0.01)
$OBSEXPTA_{it}$	1.026	0.998	1.045	1.022
	(0.07)	(0.08)	(0.05)	(0.05)
BTM_{it}	0.009	0.009	0.014	0.014
	(0.51)	(0.51)	(0.28)	(0.27)
$SIZE_{it}$	0.004	0.003	0.006	0.005
	(0.46)	(0.51)	(0.25)	(0.30)
RET_{it}	0.088	0.089	0.088	0.089
	(0.00)	(0.00)	(0.00)	(0.00)
FFR_t	0.003	0.003	0.003	0.002
	(0.72)	(0.73)	(0.75)	(0.76)
R2 adjusted	0.21	0.21	0.22	0.22
Number observations	1,325	1,325	1,325	1,325

Pooled regression time-series with robust errors computed on double cluster (bank and year). Dependent variable $Bonus_{it}$: total amount of bonus received over total compensation (for all Board members). $TNIINII_{it}$: total non-interest income over net interest income; TINII: trading income over net interest income; IBVCINII: investment banking and venture capital income over net interest income; DTA_{it}: total debt deflated by bank's total assets; $DWWSFTA_{it}$: total debt without short-term wholesale funding over total assets; $WSFTA_{it}$: short-term wholesale funding over total assets; $NITA_{it}$: net income to total assets; $OBSEXPTA_{it}$: off-balance sheet exposure to total assets; BTM_{it}: book-to-market; $SIZE_{it}$: logarithm of bank's market value; RET_{it}: annual bank's return; FFR_t: federal fund rate. All variables are measured in annual terms. Robust *p*-values in brackets.

Table 7. Estimation of bonus distinguishing the crisis period

Variable	M. I	M. II	M. III	M. IV
$Constant_{it}$	-0.857	-1.156	-0.963	-1.654
	(0.00)	(0.00)	(0.00)	(0.00)
$TNIINII_{it}$	0.013	0.017		
	(0.02)	(0.01)		
CD_t*$TNIINII_{it}$	-0.049	0.656		
	(0.00)	(0.00)		
$TINII_{it}$			-0.006	-0.006
			(0.79)	(0.79)
CD_t*$TINII_{it}$			-0.071	0.183
			(0.20)	(0.01)
$IBVCNII_{it}$			0.021	0.026
			(0.00)	(0.00)
CD_t*$IBVCNII_{it}$			1.122	0.960
			(0.00)	(0.00)
DTA_{it}	1.077		1.208	
	(0.00)		(0.00)	
CD_t*DTA_{it}	-0.143		-0.175	
	(0.00)		(0.00)	
$DWWSFTA_{it}$		1.356		1.504
		(0.00)		(0.00)
CD_t*$DWWSFTA_{it}$		-0.915		-0.137
		(0.00)		(0.00)
$WSFTA_{it}$		1.400		1.593
		(0.00)		(0.00)
CD_t*$WSFTA_{it}$		-0.732		-0.521
		(0.00)		(0.00)
$NITA_{it}$	1.807	2.399	2.006	2.457
	(0.06)	(0.01)	(0.06)	(0.01)
$OBSEXPTA_{it}$	1.237	1.099	1.330	1.240
	(0.03)	(0.07)	(0.01)	(0.02)
BTM_{it}	0.033	0.030	0.037	0.031
	(0.01)	(0.02)	(0.01)	(0.02)
$SIZE_{it}$	0.003	0.005	0.003	0.007
	(0.48)	(0.37)	(0.55)	(0.16)
RET_{it}	0.057	0.062	0.056	0.063
	(0.00)	(0.00)	(0.00)	(0.00)
FFR_t	-0.006	-0.004	-0.006	-0.003
	(0.19)	(0.43)	(0.16)	(0.49)
R2 adjusted	0.33	0.31	0.33	0.31
Number observations	1,325	1,325	1,325	1,325

Pooled regression time-series with robust errors computed on double cluster (bank and year). Dependent variable $Bonus_{it}$: total amount of bonus received over total compensation (for all Board members). $TNIINII_{it}$: total non-interest income over net interest income; CD_t: crisis dummy variable (1 if year equal or superior than 2007); CD_t*$TNIINII_{it}$: interaction between CD and TNIINII; $TINII_{it}$: trading income over net interest income; CD_t*$TINII_{it}$: interaction between CD and TINII; $IBVCINII_{it}$: investment banking and venture capital income over net interest income; CD_t*$IBVCINII_{it}$: interaction between CD and IBVCINII; DTA_{it}: total debt deflated by bank's total assets; CD_t*DTA_{it}: interaction between CD and DTA; $DWWSFTA_{it}$: total debt without short-term wholesale funding over total assets; CD_t*$DWWSFTA_{it}$: interaction between CD and DWWSFTA; $WSFTA_{it}$: short-term wholesale funding over total assets; CD_t*$WSFTA_{it}$: interaction between CD and WSFTA; $NITA_{it}$: net income to total assets; $OBSEXPTA_{it}$: off-balance sheet exposure to total assets; BTM_{it}: book-to-market; $SIZE_{it}$: logarithm of bank's market value; RET_{it}: annual bank's return; FFR_t: federal fund rate. All variables are measured in annual terms. Robust *p*-values in brackets.

Table 8. Estimation of options exercised

Variable	M. I	M. II	M. III	M. IV
$Constant_{it}$	-0.860	-0.795	-0.819	-0.795
	(0.02)	(0.05)	(0.07)	(0.10)
$TNIINII_{it}$	-0.004	-0.005		
	(0.66)	(0.60)		
$TINII_{it}$			0.100	0.098
			(0.03)	(0.03)
$IBVCNII_{it}$			-0.006	-0.006
			(0.58)	(0.57)
DTA_{it}	0.739		0.706	
	(0.05)		(0.12)	
$DWWSFTA_{it}$		0.668		0.680
		(0.10)		(0.16)
$WSFTA_{it}$		0.751		0.710
		(0.04)		(0.12)
$NITA_{it}$	4.277	4.321	3.676	3.698
	(0.00)	(0.00)	(0.00)	(0.00)
$OBSEXPTA_{it}$	-0.933	-0.995	-1.408	-1.426
	(0.11)	(0.09)	(0.01)	(0.01)
BTM_{it}	-0.040	-0.040	-0.041	-0.041
	(0.22)	(0.22)	(0.20)	(0.20)
$SIZE_{it}$	0.026	0.025	0.025	0.024
	(0.00)	(0.00)	(0.00)	(0.00)
RET_{it}	-0.012	-0.011	-0.011	-0.010
	(0.78)	(0.80)	(0.80)	(0.81)
FFR_t	-6.4E-4	-8.2E-4	4.5E-4	3.7E-4
	(0.94)	(0.92)	(0.96)	(0.96)
R2 adjusted	0.12	0.12	0.13	0.13
Number observations	1,289	1,289	1,289	1,289

Pooled regression time-series with robust errors computed on double cluster (bank and year). Dependent variable Options $exercised_{it}$: value realized on options exercised over total compensation (for all Board members). $TNIINII_{it}$: total non-interest income over net interest income; TINII: trading income over net interest income; IBVCINII: investment banking and venture capital income over net interest income; DTA_{it}: total debt deflated by bank's total assets; $DWWSFTA_{it}$: total debt without short-term wholesale funding over total assets; $WSFTA_{it}$: short-term wholesale funding over total assets; $NITA_{it}$: net income to total assets; $OBSEXPTA_{it}$: off-balance sheet exposure to total assets; BTM_{it}: book-to-market; $SIZE_{it}$: logarithm of bank's market value; RET_{it}: annual bank's return; FFR_t: federal fund rate. All variables are measured in annual terms. Robust *p*-values in brackets.

Table 9. Estimation of options exercised distinguishing the crisis period

Variable	M. I	M. II	M. III	M. IV
$Constant_{it}$	-0.774	-0.780	-0.644	-0.771
	(0.05)	(0.06)	(0.14)	(0.12)
$TNIINII_{it}$	-0.004	-0.004		
	(0.67)	(0.69)		
CD_t*$TNIINII_{it}$	-0.032	0.020		
	(0.12)	(0.91)		
$TINII_{it}$			0.098	0.097
			(0.04)	(0.03)
CD_t*$TINII_{it}$			-0.077	0.052
			(0.54)	(0.68)
$IBVCNII_{it}$			-0.009	-0.008
			(0.36)	(0.49)
CD_t*$IBVCNII_{it}$			-0.433	-0.451
			(0.43)	(0.43)
DTA_{it}	0.658		0.541	
	(0.09)		(0.22)	
CD_t*DTA_{it}	-0.026		-0.040	
	(0.47)		(0.28)	
$DWWSFTA_{it}$		0.652		0.645
		(0.12)		(0.18)
CD_t*$DWWSFTA_{it}$		-0.075		-0.066
		(0.74)		(0.01)
$WSFTA_{it}$		0.725		0.651
		(0.05)		(0.13)
CD_t*$WSFTA_{it}$		-0.089		-0.008
		(0.63)		(0.95)
$NITA_{it}$	3.944	4.079	3.380	3.478
	(0.01)	(0.00)	(0.01)	(0.01)
$OBSEXPTA_{it}$	-0.869	-0.940	-1.322	-1.325
	(0.12)	(0.09)	(0.01)	(0.01)
BTM_{it}	-0.034	-0.035	-0.036	-0.038
	(0.27)	(0.26)	(0.23)	(0.23)
$SIZE_{it}$	0.026	0.026	0.024	0.026
	(0.00)	(0.00)	(0.00)	(0.00)
RET_{it}	-0.020	-0.018	-0.002	-0.017
	(0.66)	(0.70)	(0.82)	(0.71)
FFR_t	-0.003	-0.003	-0.002	-0.001
	(0.65)	(0.71)	(0.82)	(0.84)
R2 adjusted	0.13	0.13	0.14	0.14
Number observations	1,289	1,289	1,289	1,289

Pooled regression time-series with robust errors computed on double cluster (bank and year). Dependent variable Options $exercised_{it}$: value realized on options exercised over total compensation (for all Board members). $TNIINII_{it}$: total non-interest income over net interest income; CD_t: crisis dummy variable (1 if year equal or superior than 2007); CD_t*$TNIINII_{it}$: interaction between CD and TNIINII; $TINII_{it}$: trading income over net interest income; CD_t*$TINII_{it}$: interaction between CD and TINII; $IBVCINII_{it}$: investment banking and venture capital income over net interest income; CD_t*$IBVCINII_{it}$: interaction between CD and IBVCINII; DTA_{it}: total debt deflated by bank's total assets; CD_t*DTA_{it}: interaction between CD and DTA; $DWWSFTA_{it}$: total debt without short-term wholesale funding over total assets; CD_t*$DWWSFTA_{it}$: interaction between CD and DWWSFTA; $WSFTA_{it}$: short-term wholesale funding over total assets; CD_t*$WSFTA_{it}$: interaction between CD and WSFTA; $NITA_{it}$: net income to total assets; $OBSEXPTA_{it}$: off-balance sheet exposure to total assets; BTM_{it}: book-to-market; $SIZE_{it}$: logarithm of bank's market value; RET_{it}: annual bank's return; FFR_t: federal fund rate. All variables are measured in annual terms. Robust *p*-values in brackets.