Effectiveness and (In)Efficiencies of Compensation Regulation: Evidence from the EU Banker Bonus Cap*

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Abstract

We investigate the (unintended) effects of bank executive compensation regulation. Capping the share of variable compensation did not induce an executive director exodus from EU banking because banks raised fixed compensation sufficiently to retain executives. However, risk-adjusted bank performance deteriorated, consistent with reduced incentives to exert effort and insurance effects associated with fixed compensation components. We also find that banks with directors that are more affected by the bonus cap exhibit more systemic as well as systematic risk. This result casts doubts on the effectiveness of the policy to achieve its aim to enhance financial stability.

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1 Introduction

In April 2013, the European Parliament voted in favor of capping the share of bonus payments in compensation packages of bank executives in the European Union (EU). Many members of parliament considered this decision a hallmark victory over the fierce opposition by lobby groups and stakeholders (e.g., Britain's finance minister) that would bring about a regime shift in the risk-taking attitudes and mind-sets of bank executives after the Great Recession of 2007-2008 (The Economist, 2013).

But did this stark regulatory policy intrusion achieve its objective to tame excessive risk-taking? Or did limiting bankers' variable-to-fixed compensation ratios inflict equally undesirable collateral damage – for example, in terms of adverse attrition of the most talented human capital? After all, the high levels of pay in the finance industry, which disgruntled the public in the aftermath of the financial crisis, were necessary to attract and retain the most skilled human capital (Philippon and Reshef, 2012; Murphy, 2013a,b). An erosion of talent pools in banking may do more harm than good to stabilize an inherently complex industry. At the same time, especially large variable compensation components in the (leveraged) banking industry invites risk-shifting behavior. DeYoung, Peng, and Yan (2013) provide evidence that incentive-based compensation components were used intensively in the United States after past banking deregulation. Pre-crisis compensation practices in banks contributed to excessive risk-taking in selected banking markets (Efing, Hau, Kampkötter, and Steinbrecher, 2015). Compensation packages with large fixed components may, in turn, increase systemic risk through an insurance effect for risk-averse bankers (Carlson and Lazrak, 2010) and increased operating leverage (Efing, Hau, Kampkötter, and Rochet, 2018). Overall, our understanding of both intended and unintended consequences of this regulatory shock in European banking remains limited.

Our empirical findings suggest that the policy did not generate unintended collateral damage to banks' human capital, but also failed to achieve its main objectives: to reduce risk-taking and to enhance financial system resilience. Regarding the former issue, the concerns voiced by industry representatives that the most talented managers would leave an inherently complex industry did not materialize. Banks simply indemnified their CEO and non-CEO executives sufficiently when adjusting compensation packages to comply with the new regulation. However, the risk-adjusted performance of the average EU bank suffered from the regulation and risk profiles deteriorated for any of the main stakeholders of banks: equity owners, creditors, and the general public. In particular the result that banks affected by the bonus cap exhibit a hike of systemic risk relative to banks that

were not affected raises concerns about the effectiveness of the EU bonus cap to foster system stability.

This paper provides a firmer comprehension of the consequences of limiting incentive pay in banking and makes contributions in three steps. First, we test for the adverse attrition of human capital from the banking industry due to the regulatory shock to compensation – in other words the unintended consequences of this regulation on banks' executive directors. To this end, we collected data from CEOs and non-CEO executives for a sample of EU banks from 2010 to 2016. To the best of our knowledge, we are the first to collect information on fixed compensation and *maximum achievable* (rather than *granted* or *realized*) variable compensation. The quantity regulated by the EU bonus cap is indeed the maximum variable-to-fixed compensation ratio, for which the limit is set at 100%. Under certain conditions, banks can increase this threshold up to 250%. Our data set allows us to precisely identify executive directors whose maximum variable-to-fixed compensation ratio exceeded 250% and were therefore not compliant with the EU cap as of 2013. These executive directors constitute our treatment group. Executive directors with compliant contracts as of 2013 form our control group. By differentiating between plausibly forced and voluntary director turnover in a difference-in-differences framework, we provide evidence of the absence of (excessive) collateral damage in terms of increased likelihood of high-performing executives leaving banks after the regulatory shock. We also document that executives' dismissals may become more likely and more sensitive to bank performance. Whereas failing to find evidence of increased voluntary director turnover following the cap may stem from a lack of statistical power due to limited sample size, our analysis still provides insights on the lack of a dramatic impairment of EU banks' ability to retain their best executives.

Second, we test whether and how banks implemented the regulation. Our metric for the maximum variable-to-fixed compensation ratio is a truly forward-looking measure of incentives in the contracts of both CEO and non-CEO executives in EU banks. It allows us to show that the absence of human capital attrition is attributable to the practice of a timely adjustment of treated directors' compensation structure to comply with the cap. Banks do so through a combination of increased fixed compensation and a decreased maximum variable compensation. We interpret this pattern as a form of indemnification that banks offer to executives to buffer the regulatory shock. Taking the perspective of a risk-neutral treated executive director, we consistently illustrate that his/her expected compensation did not change significantly around the EU cap. Banks only changed the face value of variable compensation, rather than the underlying

key performance indicators or pay-for-performance sensitivities of variable compensation. This allows us to more confidently impute the bank-level effects of the EU bonus cap to changes in the maximum variable compensation-to-fixed compensation ratio, and not to other (confounding) adjustments in compensation practices.

Finally, we test whether the banks' indemnification response to the regulation helped to achieve the intended objective of the bonus cap: Freixas and Rochet (2013) suggest that these measures are meant to temper banks' tendency toward excessive risk-taking. We look at EU banks' performance to assess whether their risk-return achievements changed after the regulatory shock. Contrary to the common narrative about performance compensation – often perceived to be akin to risk-taking incentives –, treated banks exhibit a significant increase in risk-taking following the cap, which is accompanied by a decrease in risk-adjusted performance. Increased risk-taking manifests itself through different risk dimensions, ranging from those of direct relevance to shareholders (stock return volatility and beta) and creditors (CDS spreads) to systemic risk (SRISK% and LRMES), the primary concern for policy-makers interested in the stability of the financial system as a whole. Such a risk-taking pattern may arise in a setting in which bankers reduce effort in managing their banks' assets due to lower incentivization (Martinez-Miera and Repullo, 2017). Hence, lower levels of variable pay might be associated with an increase of bank riskiness. This pattern can also be rationalized by theories featuring a risk-averse manager, who becomes more tolerant to risk because of the insurance effect provided by higher fixed compensation (see, e.g., Carlson and Lazrak, 2010).

A fundamental problem in the literature on executive compensation is the endogenous nature of pay (Edmans, Gabaix, and Jenter, 2017). Although the EU bonus cap constitutes a shock to the contracting environment in which banks and their executives operate, its exogenous nature is unclear. In our sample, treated executive directors are indeed inherently different from nontreated executive directors. We provide several tests aimed at mitigating this issue. Most notably, we find no evidence that the parallel trends assumption is violated, meaning that differences across the two groups of directors are to a large extent time invariant and accounted for by including fixed effects in our difference-in-differences specifications. We are then able to confirm our findings using an alternative control sample based on top executives at large US banks, who are by definition not affected by the EU bonus cap. The mostly large, internationally active treated EU banks arguably share more hard-to-observe features, such as risk exposures, business models, and below-executive-level compensation practices, with this alternative control group of US peers compared to nontreated EU banks. Moreover, our results appear not

to be driven by banks' exposure to the European debt crisis. Yet, we cannot exclude the possibility that treated directors self-select into treatment. The results should therefore be interpreted as suggestive evidence rather than clear-cut causal effects of a shock to compensation structure. Despite this limitation, our results are relevant in that they measure observational differences due a change in regulatory compensation introduced in the wake of the recent financial crisis.

This paper relates to the literature on executive compensation in banks and its consequences for financial stability. In the aftermath of the subprime meltdown and the subsequent Great Recession, many studies have examined the role of executive compensation in banks. Several develop theoretical frameworks that link executive compensation, regulation of compensation, and risk-taking in banks (Thanassoulis, 2012; Bénabou and Tirole, 2016; Bolton, Meran, and Shapiro, 2015; Thanassoulis and Tanaka, 2018; Kolm, Laux, and Lóránth, 2017; Gietl and Haufler, 2018). On the empirical side, Fahlenbrach and Stulz (2011) investigate the role of bank CEOs' incentives before the crisis and show that banks with CEOs whose incentives were more tightly linked to shareholder wealth performed worse during the crisis: Those CEOs did not decrease their equity holdings and subsequently experienced large losses due to poor performance. Boyallian and Ruiz-Verdú (2017) complement this line of research by looking at how pre-crisis incentives and leverage interacted, showing that equity incentives were especially conducive to default risk in highly levered banks. Kolasinski and Yang (2017) illustrate that financial institutions whose CEOs had a higher fraction of short-term incentives before the crisis exhibited higher exposure to subprime mortgages and higher distress. Bhagat and Bolton (2014) find that managerial incentives led to excessive risk-taking and that poor bank performance was not the result of unforeseen risk. Efing et al. (2015), using payroll data from selected European countries, document that incentives in banks before the crisis were too high to be the result of an optimal trade-off between risk and return.[1] DeYoung et al. (2013) show that in the United States, more risk-taking incentives were provided to CEOs after regulatory constraints on growth opportunities of banks were lifted in the wake of the Financial Services Modernization Act deregulation in and around the year 1999. They report that as a result, both bank risk-taking and average (variable) pay of

[1] Efing et al. (2015, 2018) belong to a growing literature analyzing the labor market for bankers even below the executive level. For instance, Griffin, Kruger, and Maturana (2018) study whether fraudulent behavior by bankers is sanctioned by banks in terms of dismissals or worse job opportunities, though they find no evidence. Mukharlyamov (2016) exploits a large data set based on bankers' curricula vitae to study the relationship between banks' risk-taking and bankers' characteristics and mobility. See Mukharlyamov (2016) for further references on non-top executive employees, performance, and risk-taking in banks.

CEOs increased. Relatedly, Acharya, Litov, and Sepe (2017) find that higher elasticity of non-executive director compensation was correlated with higher bank risk and lower bank value in the pre-crisis period. Fahlenbrach, Prilmeier, and Stulz (2012) conclude that a bank's performance in the crisis of 1998 had strong predictive power on its performance in the recent crisis, which solidified the rise to persistence of that bank's risk culture. Using data from 2006-2014, Bennett, Gopalan, and Thakor (2016) report that banks link their compensation more to short-term metrics and do not appropriately adjust for leverage, providing a potential explanation for the observation that banks took greater risks before the financial crisis.

Closest to our paper are three studies focusing on the consequences of regulation of bankers' compensation. First, Cerasi, Deininger, Gambacorta, and Oliviero (2017) provide cross-country evidence on how bank CEOs' pay packages and turnover rates changed around the introduction of the Financial Stability Board (FSB) guidelines on compensation. Second, Abudy, Amiram, Rozenbaum, and Shust (2017) investigate the consequences of a cap on total compensation in the Israeli finance industry, finding evidence that this regulation helped reduce rent extraction. Third, Kleymenova and Tuna (2016) investigate banks' market reactions to the UK regulation on compensation and to the EU bonus cap. However, their analyses of the consequences for the bank CEO labor market (compensation structure and turnover) is restricted to the UK regulatory event. We contribute a comprehensive analysis of the unintended consequences of the EU bonus cap on the compensation and career choices of EU bank managers.[2] Moreover, we are the first to expand the analysis of the cap to non-CEO executives, who are of key importance for the decision-making process within banks and whose role is arguably as important as the CEO's with regard to the impact of regulations on banks' risk-taking behavior.

Our analysis also relates to the literature on long-term compensation plans. Recently, several studies have investigated these plans (Bettis, Bizjak, Coles, and Kalpathy, 2010, 2016; Li and Wang, 2016; Li, Wang, and Wruck, 2017). These plans have multiyear performance evaluation periods and are contingent on a variety of performance measures. One challenge is thus the ex ante valuation of these plans. We add to this strand of the literature by shedding light on the cap levels of executive compensation plans in EU banks. We also investigate whether the reform affected the fraction of deferred grants, which often consist of long-term compensation plans.

[2]Outside of the banking literature, our analysis is similar in spirit to Sandvik, Saouma, Seegert, and Stanton (2018), who study how a pay reduction affects employees' effort and turnover choices.

2 Regulation of compensation after the financial crisis

Many scholars believe short termism – especially in the form of excessive risk-taking – induced by high-powered compensation packages in the financial industry contributed to the recent financial crisis (e.g., DeYoung et al., 2013; Efing et al., 2015). In the wake of the crisis, this belief led to significant regulatory efforts aimed at mitigating the problem.

In 2009, the FSB published the Principles for Sound Compensation Practices with the goal of raising awareness that compensation systems are indeed related to risk management and risk governance. These principles can be divided into three clusters. The first establishes cornerstones on the governance of compensation and for the internal monitoring of compensation systems. The second cluster provides principles aligning compensation to risk-taking. Payouts from compensation systems should be risk-adjusted, penalize bad performance on various levels of the institution, and reflect the time horizon of risks in appropriate deferral schemes. In addition, the employee's role, position, and responsibility of the employee should be reflected by the mix of payouts in equity, equity-linked, and cash components. The third cluster of principles defines standards on the supervision and disclosure of compensation practices. Supervisors should review compensation systems continuously as part of their risk assessment of firms and take supervisory actions when deficiencies are identified. Information on compensation systems should also be made accessible to stakeholders to allow them to evaluate the compensation policies.

The European Capital Requirements Directive (CRD) III reflects the FSB principles.[3] It prescribes minimum levels of deferral and equity grants for identified staff at significant institutions to better link bankers' incentives to long-term bank performance and favor prudent risk-taking. At least 40% of variable compensation must be deferred for at least three years. Not less than half of variable compensation should be granted in a way that incentives are aligned with long-term interests of the credit institution (e.g., by granting share-linked compensation). The most well-known transposition into national law of CRD III is the UK Remuneration Code, which came into effect in 2010. Other transpositions (e.g., the German *Institutsvergütungsverordnung*) were enacted in the same year.

Finally, the CRD IV was introduced in 2013 and its rules on compensation became binding from 2014 onwards.[4] This regulation complements the original rules of the CRD III with the so-called *banker bonus cap*, which limits the ratio of variable-to-fixed compensation at 100%, or 200% if shareholders agree. The cap on this ratio can be further

[3] Directive 2010/76/EU.

[4] Directive 2013/36/EU. National regulators had to ensure compliance with the new regulation by the end of 2014, see https://www.eba.europa.eu/-/eba-discloses-probe-into-eu-bankers-allowances.

increased by discounting up to 25% of variable compensation that is deferred for at least five years.[5] To operationalize the discount rule in our analysis, in line with commentators' view of the cap (see, e.g., Reuters UK, 2013), we use a ratio of variable-to-fixed compensation of 250% as the threshold in our baseline tests.[6] According to the European Banking Authority (EBA), to be classified as fixed, compensation items must "be permanent, i.e. maintained over a period tied to the specific role and organisational responsibilities for which they are granted; pre-determined, in terms of conditions and amount; non-discretionary, non-revocable and transparent to staff".[7] The cap applies to senior managers, so-called material risk takers (e.g., traders), and internal supervisors. Moreover, the cap is binding for all banks at all levels of their corporate structure (i.e., both inside and outside the EU subsidiaries). Regulating the variable-to-fixed compensation ratio does not cap variable compensation at an absolute level. However, the costs a bank must bear to incentivize employees increase. For example, under a cap of 100%, for each euro a bank offers as a potential variable earning to an executive director, the bank must pay at least one euro as fixed pay, irrespective of his/her performance. Therefore, the bonus cap leads banks to internalize to a larger extent the potential costs of incentivization.

3 Regulation of compensation, managerial labor market, and bank outcomes

Several of the aforementioned attempts to regulate compensation in the financial sector focus on the structure of pay packages. The consequences of such regulatory efforts are likely to be multifaceted. The structure of executive compensation can indeed influence managerial actions – in terms of both exerted effort and risk appetite – as well as firms' ability to retain their managers. For example, compensation packages skewed toward the fixed component of pay may induce managers to exert less effort and make retaining highly skilled individuals more difficult, because they would benefit more from incentive pay. We first focus on the relationship between compensation structure and the retention of executives before discussing implications for bank performance and risk-taking later-on.

Compensation structure is especially likely to play an important role in determining executives' career trajectories in the financial industry. Philippon and Reshef (2012)

[5] The discount rate is a function of macroeconomic conditions and the specific features of the compensation plan of the director. See the EBA's Guidelines on the Applicable Notional Discount Rate for Variable Remuneration, EBA/GL/2014/01, p. 3.

[6] More restrictive thresholds for this ratio to define treatment do not affect our results.

[7] See https://www.eba.europa.eu/-/eba-discloses-probe-into-eu-bankers-allowances.

show that, particularly during times of deregulation, the financial industry is able to provide higher returns to skill than other industries. Célérier and Vallée (2017) relate this phenomenon to higher scalability of skill in the financial industry. In addition, skilled workers in the financial industry tend to be highly mobile. Van Boxtel (2017) discusses anecdotal evidence and provides a model endogenizing compensation structure and risk-taking in the presence of highly mobile workers. In his framework, banks only succeed in attracting skilled workers if they offer high-powered incentives, which in turn induce excessive risk-taking.

Executive compensation structure encompasses many different dimensions of managerial pay. It may relate to the level of pay, the fraction of debt vis-a-vis equity incentives, the maturity of pay components, or the like. We examine one particular facet of compensation structure, namely the relative importance of incentive pay with respect to fixed pay. For the reasons mentioned previously, changes in the importance of incentive pay relative to fixed pay are likely to be consequential for banks' ability to retain their executives. Hence, any regulatory effort aimed at constraining this particular dimension of compensation structure has the potential to affect the managerial labor market. We focus on one such shock, namely, the introduction of the EU banker bonus cap, which restricted maximum variable pay to 100% (or up to 250% under certain conditions) of fixed pay. The main goal of regulation is to limit what was perceived as excessive bank risk-taking in the years preceding the financial crisis.[8] Several commentators, however, have pointed out that such a measure could have far-reaching consequences on the banks' ability to retain their managers (Murphy, 2013b). Indeed, talented managers may suffer from a compensation structure tilted toward performance-insensitive pay and decide to leave the EU banking industry.

To understand the potential impact of the EU cap for the managerial labor market, it is useful to examine a stylized performance-based compensation plan resembling those in place at most EU banks. Variable compensation opportunities for executive directors are usually capped at a maximum level (see, e.g., Murphy, 2001; Bettis et al., 2016), which was the case for performance-based compensation plans at major EU banks even before the introduction of the bonus cap. Figure 1 visualizes the terminal payoff M_T of one such plan as a function of a given measure of performance A_T at time T.[9] Within the incentive

[8] Directive 2013/36/EU (preamble no. 65).

[9] Appendix Figure A.1 provides concrete examples of pre-EU cap performance-based compensation plans. Variable compensation at EU banks takes most commonly the form of bonuses and performance-based incentive plans. The payoff on variable compensation is linked to different key performance indicators (KPIs). KPIs generally include accounting- and market-based measure of equity or asset per-

zone ($X \leq A_T \leq Z$), directors participate in the bank's performance $\Pi = A_T - X$ at the participation rate p. The maximum variable compensation achievable by the executive V_{max} can be expressed as a fraction of fixed compensation ρF, where ρ represents the level of the cap ratio. At the end of a period, the compensation contract has the value:

$$M_T = F + \underbrace{(\rho F)/(Z - X)}_{p} \left[\max\{\underbrace{A_T - X}_{\Pi}, 0\} - \max\{A_T - Z, 0\} \right]. \tag{1}$$

The EU cap regulates the parameter ρ, limiting its value to ρ', which can be raised up to 250% under the conditions illustrated here.

Any discussion of the potential consequences of such a regulatory shock for the managerial labor market requires investigating *whether* and *how* banks complied with it. Consider again a compensation plan with payoff (1). Figure 2 relates an executive director's preferences to the possible adjustments in his/her compensation structure (fixed compensation vs. expected variable compensation $E_t\left[Var.\ comp.\right]$ as of time t) around the EU cap, considering the risk-averse case (solid red line) against the risk-neutral case (dotted black 45° line). Suppose that the maximum variable-to-fixed compensation ratio ρ in place before the EU cap does not comply with the new regulation (point O). Provided that banks comply with the new regulation in a timely manner, they can decide to play by the new rule and decrease the ratio to ρ' by implementing one of the following:

1. Decrease expected variable compensation while keeping fixed compensation unchanged (point A);
2. Increase fixed compensation while keeping expected variable compensation unchanged (point B); or
3. Rebalance both along the red line such that, for instance, the risk-averse executive director remains indifferent (point C).

These corner cases facilitate intuition concerning the possible effects of the EU cap on managerial mobility. If banks comply with the cap by following case 1 (2), we are likely

formance, but may also comprise "soft" metrics, such as employee satisfaction. In the case of Deutsche Bank, for instance, bonuses are linked to return on equity (ROE) and the performance-based incentive plan is instead linked to the so-called Relative Total Shareholder Return, which is a measure of stock return adjusted for the performance of selected peer banks (source: Deutsche Bank AG, Annual Report 2012, pp. 208-211). In the case of Barclays, besides traditional KPIs such as return on assets and loan loss rate, "sustanaibility metrics" – defined in the bank's "Citizenship Agenda" – are also taken into account (source: Barclays PLC, Annual Report 2011, p. 60). Due to the difficulty of measuring soft KPIs, our analysis of performance sensitivity of compensation in Section 6.2 focuses on equity performance.

to observe a surge (decrease) in the executive directors' voluntary turnover rate. If banks *indemnify* their executives, as in case 3, we do not expect to observe any change in the voluntary turnover rate.

Several factors are likely to enter an executive director's decision of whether to leave or stay at a given bank, such as his/her skills. A highly skilled manager, who benefits from performance-based compensation, may be likely to leave. A manager with general skills may also be prone to leave, because for him/her the costs of switching position are low. In other words, his/her human capital is less invested in the bank, which reduces the personal loss from moving to another bank or industry (see, e.g., Weinberg, 2001).

In addition to executive directors' characteristics, bank traits also play an important role. Banks may purposely decide not to indemnify certain managers either because they want them to leave or because they do not have the resources to retain them. This scenario became increasinlgy relevant for the banking sector in the wake of the financial crisis, considering that it entered a phase of decline and had experienced an outflow of skilled workforce even in the absence of the EU cap.

How banks reacted to the bonus cap and the consequences for the managerial labor market are ultimately empirical questions, which we investigate in the remainder of the paper. Such an analysis can shed light on the role of compensation structure in an industry characterized by a highly specialized yet mobile workforce.

Finally, it is also important to revisit what were arguably the main goals of the EU cap: the containment of excessive risk-taking at the bank level as well as a reduction of systemic risk so as to enhance the resilience of of the financial system towards economy-wide shocks. Again, the consequences of risk-taking depend on managers' characteristics and banks' preferences, and ability to comply with the cap. The standard argument for a risk-neutral manager is that incentive pay may favor risk-shifting by aligning managers to equity holders (see, e.g., John and John, 1993). Yet, the direction of the effect is not as clear-cut when other forces are taken into account. For instance, Ross (2004) shows that the net impact on risk-taking is only positive under certain assumptions. In the presence of bankers whose task is to manage a bank portfolio, lower incentives may be associated with lower effort exertion and, consequently, lower risk-adjusted returns (Martinez-Miera and Repullo, 2017). At the same time, Carlson and Lazrak (2010) argue that a risk-averse manager may take more risk as the ratio of fixed-to-variable pay increases. Another aspect likely to interact with executives' propensity to take risks is their personal portfolios' degree of diversification (Hall and Murphy, 2002). Thus, the regulator's goal of reducing bank risk, by altering the agency relationship between

managers and claimholders may conflict with the objectives of the latter. For instance, if incentive contracts are not only designed to keep operating leverage low but to overcome moral hazard of top executives, a reduction of incentive pay may increase agency costs and adversely affect bank performance. As a final step, we thus examine how the cap affected banks' various stakeholders (shareholders, creditors, and the general public). Our empirical analysis provides some evidence on the dynamics of bank risk-adjusted performance and risk-taking around the introduction of the EU cap as well as differential responses in measures of systemic and systematic risk of banks depending on their boards' exposure to the bonus cap.

4 Empirical approach

We use the introduction of the EU bank bonus cap in 2014 as a laboratory to examine how executive compensation structure affects banks' ability to retain their executives, performance, and risk-taking behavior. Throughout our analysis, we focus on the executive directors serving on the board – that is, those to whom the shareholders delegate the management of the bank.

The EU banker bonus cap was introduced at the same time across EU countries for all banks, which leaves us with no obvious counterfactual sample of unaffected banks against which to evaluate the consequences of the regulatory shock. To work around this issue, we implement a difference-in-differences approach, in which we define as *treated* those bank executive directors whose compensation package did not comply with the cap as of 2013. Bank executive directors with compliant compensation packages as of 2013 form our control group. Table A.1 vividly illustrates the rather dispersed nature of banks' business models that employed treated and untreated directors. Treated directors work both at financial intermediaries exhibiting dismal performance after the introduction of the bonus cap, such as Deutsche Bank, but also successful turnaround cases like that of Aareal Bank. Likewise, untreated directors serve at equally diverse banks in terms of very volatile and ultimately unsuccessful restructuring stories like the one of Dexia versus strategies that corresponded to fairly steady improvements of market value, such as the case exhibited by ING Groep.

To define the treated group in our baseline tests, we use the 250% threshold, which applies if (1) shareholders agree and (2) a specific discount rule is applied. We choose the heightened threshold to define the treatment group for two reasons. First, it allows us to minimize the number of false positives in our treatment group. Second, large banks,

such as those in our sample, are especially likely to seek approval for a threshold over 100%, which reduces concerns that our control group includes many executive directors that were actually directly affected by the cap.[10]

4.1 Turnover rate

We start by investigating the consequences of the EU bonus cap for managerial mobility. Given the concerns voiced on the potentially adverse impact of the cap on EU banks' ability to retain their managers (Murphy, 2013b), we are especially interested in executives who voluntarily left their banks either to take positions at other institutions or to retire early. Intuitively, by revealed preferences, if directors after the cap are worse (better) off, the number of voluntary turnovers should increase (decrease) after the EU banker bonus cap becomes effective. In this respect, the changes to compensation packages around the introduction of the cap unearthed in the second step of our analysis, as discussed subsequently, shed light on how attractive a director's current position is relative to his/her outside option.

We adopt a difference-in-differences design and estimate a linear probability model along the lines of Guo and Masulis (2015) for executive director turnover:

$$y_{ijt} = \beta_0 + \beta_1 Treatment\ intensity_j \times Post_t + \boldsymbol{\gamma x_{it}} + \boldsymbol{\theta z_{jt}} + \mathbf{1}\boldsymbol{\alpha_{jt}} + \epsilon_{ijt}. \qquad (2)$$

The unit of observation is director i at bank j in year t. Our dependent variable y_{ijt} is an indicator equal to 1 if a given executive director i leaves bank j in year t. A given executive director is classified as treated if his/her maximum variable-to-fixed compensation ratio exceeds the 250% threshold in 2013. Rather than using a binary treatment indicator, we exploit variation in compensation structure across treated directors. More specifically, the $Treatment\ intensity_i$ variable is (1) equal to 0 for our control group and (2) equal to the distance between ρ (maximum variable-to-fixed compensation) and 250% as of 2013 for treated directors. Thus, untreated directors have a treatment intensity of 0, while, for example, a director with a ρ of 300% as of 2013 has a treatment intensity of 0.5. Such an approach allows us to improve the precision of our estimates. Note also that $Treatment\ intensity_i$ is defined at the level of executive director- rather than at the bank-level, which allows us to focus on within-bank variation. In robustness tests, we

[10] See Figure 1 of European Banking Authority (2015). Overall, institutions that received approval for a threshold higher than 100% make up only 3%, but represent more than 50% of the banking system's total balance sheet.

also use a standard binary treatment indicator. $Post_t$ is an indicator variable equal to 1 from 2014 onward.

$\boldsymbol{x_{it}}$ is an array of director-level control variables such as age, a CEO indicator, professional experience, a retirement age indicator (1 if the director is older than 65 years), a female indicator, and tenure. $\boldsymbol{z_{jt}}$ comprises bank-level control variables such as size (natural logarithm of total assets), risk-adjusted performance as proxied by the lagged Sharpe ratio, number of executive directors serving on the board, and an indicator for CEO turnover. In contrast to the aformentioned self-explanatory control variables, professional experience requires further explanation. We measure it building on the method of Custódio, Ferreira, and Matos (2013); specifically, we rely on a principal component analysis of information on executive directors' employment history. This variable is key for our tests as it allows us to – at least indirectly – control for an executive director's outside option. Appendix Table A.2 provides background on its computation.

We estimate progressively more saturated specifications by including year and bank fixed effects, which, for simplicity, we denote by $\boldsymbol{\alpha_{jt}}$. In this way, we control for changes in aggregate conditions and unobservable time-invariant bank characteristics. Equation (2) corresponds to the most saturated specification. For ease of notation, we do not report noninteracted $Treatment\ intensity_i$, and $Post_t$ is absorbed by year fixed effects. We cluster standard errors at the bank level.

In our baseline estimations, we consider all the turnover events together. Because we do not restrict our sample to CEOs, distinguishing between forced and voluntary turnovers through news searches à la Jenter and Kanaan (2015) is infeasible due to the sparse media coverage that these events receive. The observed changes in the overall turnover rate tell us something about voluntary leaves only as long as, around the introduction of the EU bonus cap, no differential changes occurred across the treatment and the control group in (1) the forced turnover rate and (2) job-switching costs or preferences, conditions that are unlikely to hold.

We thus partially relax these strong assumptions by following the intuition of Jenter and Lewellen (2017). Rather than applying their estimation methodology, we simply analyze the turnover rate at different levels of performance. An executive director turnover taking place after a year of good performance is arguably unlikely to be a dismissal. In this way, we refine our estimates of the consequences of the EU bonus cap for banks' ability to retain their executives.

4.2 Compensation structure

The second step of our analysis is concerned with *how* banks adjust their executive directors' compensation packages to comply with the new regulation. The adjustment of compensation structure is key to understand how attractive a manager's outside option becomes after the introduction of the EU cap and, thus, the strength of his/her incentives to leave the bank. Put differently, we study whether banks indemnify directors for the loss in variable pay opportunities to gain insights into the observed patterns of executive turnover around the cap.

We rely on the same difference-in-differences design as in Equation (2). Dependent variables y_{ijt} include different measures of compensation, such as the level of fixed and (maximum) variable pay, the ratio of maximum variable compensation to fixed compensation, and expected pay. Director-level control variables comprise age, a CEO indicator, professional experience, and tenure. Bank-level control variables comprise size, number of executive directors serving on the board, and performance as proxied by ROE. In compensation regressions, our most saturated specification also includes director fixed effects.

4.3 Bank performance and risk-taking

Compensation structure is also of key importance in a manager's incentives to exert effort and take risk. Such incentives have repercussions on the interests of the bank's various stakeholders, such as shareholders, creditors, and the general public. In the last step of our analysis, we explore the evolution of performance and risk-taking (idiosyncratic, systematic, and systemic) around the introduction of the EU cap. Again, we follow a difference-in-differences approach similar to Equation (2). Our outcome variables y_{jt} comprise Sharpe ratio, credit default swap (CDS) spreads, and measures of both systemic and systematic risk taking. Most notably, we conduct our analysis at the bank level, because we do not observe individual directors' performance and risk-taking. Thus, we use the bank level treatment intensity variable $Treated_j$, which is the average treatment intensity of executive directors serving on a bank's board as of the enforcement of the EU cap. In this way, treatment intensity refers to the same directors that are in the post-treatment sample in director-level regressions.

4.4 Identification challenges

In our empirical analysis, we face two major issues. The first is selection bias. For instance, highly skilled executive directors are more likely to receive high-powered incentives and are thus more likely to be in our treatment group. Although we (1) control for covariates that are likely to capture managers' skills and risk appetite as well as banks' ability to retain human capital and (2) perform standard diagnostic tests, we cannot rule out that treatment assignment remains to some extent nonrandom in our difference-in-differences design. Indeed, especially managers' skill is intrinsically elusive.

To address the lack of a clear counterfactual in the context of EU bonus cap introduction, we examine the sensitivity of our results to alternative treatment and control group definitions. First, we build an alternative control group of top executives from the largest US banks. Using these executives as an alternative control group complements our baseline specification, where we rely on nontreated EU bankers. This enriches our analysis for two main reasons: (1) US banks' executives are not directly affected by the cap, and (2) this allows us to compare the EU banks where our treated directors are employed to similar US institutions in terms of size and business model. More specifically, compensation packages of treated directors might be more similar to top executives' pay at large US banks than to those in place at other European banks. Indeed, the difference in CEO pay between US and non-US CEOs is moderate when comparing CEO compensation of firms with similar characteristics across countries (Fernandes, Ferreira, Matos, and Murphy, 2013). Hence, the use of the US control group may also alleviate concerns about directors' self-selection into treatment. Despite these apparent advantages, the US control group suffers from one key limitation, namely that we are not able to measure executives' payoff schedule in a fully comparable way to the EU case. Because of this, we still rely on EU untreated directors as the control group in our baseline tests.

Second, we use a standard binary treatment indicator $Treated_i$, equal to 1 for treated directors, and 0 otherwise. Finally, to compute $Treatment\ intensity_i$, we replace the 250% threshold for the maximum variable-to-fixed compensation ratio with the baseline 100% threshold. Although this method comes at the cost of having more false positives, it allows us to consider a treatment group that is larger and arguably more comparable to the control group.

The second challenge for our empirical analysis relates to confounding events. Obvious suspects in this respect are the other post-financial crisis regulatory events discussed in Section 2. Although not introduced before the EU bonus cap, the adjustment to these

other reforms may take place over an extended period of time, thus overlapping and interacting with the EU bonus cap. Therefore, we augment our bank-level specifications with country-by-year fixed effects, which absorb any confounding factor stemming from non-synchronous business cycle conditions or from cross-country differences in the timing of regulatory shocks (e.g., in the implementation of EU directives). A specific, potentially confounding event is the European debt crisis that hit banks to different degrees, depending on their exposures to sovereign debt. To address concerns that this is actually driving our results on the bank-level, we implement a falsification test in which we replace *Treatment intensity* with a measure of the bank's exposure to sovereign debt of peripheral countries.

5 Data

5.1 Sources of bank and executive variables

We use a panel of EU banks with available information on executive directors' compensation over the 2010-2016 period. We obtain information on boards of directors and directors' characteristics from BoardEx. We exclude supervisory directors from our sample and focus on executive directors, thus restricting our analysis to employees directly involved in the management of the bank. Accounting data are from Bureau van Dijk's Bankscope for 2010-2015 and Orbis Bank Focus for 2016. Stock market and CDS spread data are from Thomson Reuters's Datastream. Systemic risk measures are obtained from the V-Lab at New York University's Volatility Institute. Sovereign debt exposure data are from the EBA Transparency Exercise of 2011. To construct an alternative control group based on top executives from the largest 25 US banks, we then obtain compensation data from Standard and Poor's Execucomp, and accounting and stock price data from CRSP-Compustat merged (CCM).

We manually collect information on postevaluation grants and on the structure of compensation at EU banks from publicly available remuneration reports. Collecting these data by hand allows us to precisely measure the *maximum* variable-to-fixed compensation ratio, which is the quantity regulated by the EU bonus cap. We track the evolution of this ratio in the years around the introduction of the EU bonus cap. This feature of our data set allows finer-grained investigation than commercial databases allow, considering that they only report *granted* or *realized* variable compensation. Appendix Table A.1 provides the list of EU banks available in BoardEx for which we found compensation data, distinguishing them according to whether they have at least one treated executive

director (treated banks) or no treated executive directors (non-treated banks). For each of them, we provide information on the number of treated and non-treated directors serving on the board to illustrate the degree of within-bank variation in compensation schemes. The list of 25 US banks used for alternative control group is also provided.

Note that the collected data comprises top management but not middle management to whom the cap might also apply if they qualify as material risk-takers, such as traders (see, e.g., European Banking Authority, 2013). Data on non-executive employees in general, and their compensation in particular, is strictly confidential in virtually all jurisdictions and even within individual banks. But access to, for example, regulatory reporting would allow future research implement more data-intensive approaches like a regression discontinuity design around the relevant threshold. This approaches is unfortunately an infeasible empirical strategy in our more limited setting that relies on manually-collected, public information.

The final data set analysis contains 880 executive-bank-year observations from 35 banks. Table 1 reports summary statistics for the main director- and bank-level variables, which are winsorized at the 1st and 99th percentiles and defined in detail in Appendix Table A.3. The variables are distinguished between directors belonging to the treatment group (Panel A) and the control group (Panel B) as well as between the period before (2010–2013) and after (2014–2016) the introduction of the EU bonus cap. According to our baseline treatment definition (250% threshold), there are 26 treated executive directors from seven distinct banks in our sample. Treated directors, as one would expect, are characterized by overall higher levels of compensation, receive more performance-based pay, and are employed at banks that are larger and more profitable. Yet, Panel C shows that changes in director- and bank-level variables between 2010 and 2013 across the treatment and the control group are not significantly different. Likewise, Figure 3 shows selected variables (total assets, stock returns, volatility, and Sharpe ratio) and suggests that these differences are to a large extent time invariant before 2013. The plotted variables are on parallel trends up to the introduction of the EU bonus cap. A partial exception is represented by stock returns, but the differences between treatment and control groups are economically small. Panel D of Table 1 shows tests for the difference between the mean change in the treatment and control groups for the main variables. The reported estimates suggest that treated directors exhibit a significant increase in their turnover rate. At the same time, the fixed compensation significantly increases for treated directors around the introduction of the EU cap. The opposite holds for maximum variable compensation. The combined pattern of compensation structure changes thus

points to banks indemnifying their executives for the EU cap. In the following subsections, we revisit this prima facie evidence in a regression framework where we are able to account for variables that potentially explain these differences in turnover rates, such as bank performance measures.

5.2 Post-turnover career trajectories of bank executive directors

Before proceeding with the analysis, it is worth exploring where bank executive directors go after leaving their positions. To this end, we manually collect data on career trajectories after a turnover from news stories and professional networking websites. Focusing on banks for which treatment status is defined, we identify 90 turnover events (47 at listed banks).

Table 2 groups directors by post-turnover employment category. We are able to retrieve this information for 68.89% of departing directors (61.70% at listed banks).[11] Of this subset, 22.22% (21.28% at listed banks) of directors continue as executive directors at another bank or a nonbank company, and 22.22% (17.02% at listed banks) take positions as senior managers or partners, become self-employed, or work as advisors. Among this subset, 6.67% (4.26% at listed banks) become advisors to the bank at which they left the board, but without board representation, and 8.89% (4.26% at listed banks) stay active only as supervisory board members or as advisors.

Overall, considering that executive positions constitute the most prestigious job category, it is fair to say that most departing directors face worse employment conditions after turnover. Put differently, these data constitute a piece of evidence that directors in our sample do not voluntarily leave banks to look for better employment opportunities.

6 Results

First, we investigate executive directors' turnover around the introduction of the EU bonus cap. Second, we move to the analysis of changes in executive compensation structure around such a regulatory shock. Then, we explore the evolution of bank performance and risk-taking and provide several additional tests in the end.

[11] For the other directors, we find either no information or explicit information that they ended their career (e.g., due to age or health reasons).

6.1 Turnover rate

We examine the evolution of the executive turnover rate around the introduction of the EU bonus cap. We expect to observe a surge in (voluntary) turnovers after the enforcement of the EU bonus cap that reveal preferences of those executive directors that are worse off under the new regulatory regime.

The literature has mostly focused on the turnover of executives, especially CEOs (e.g., Jenter and Kanaan, 2015), but recently the analysis has been extended to nonexecutive directors as well (Bates, Becher, and Wilson, 2016). We restrict our attention to executive directors i.e., directors that have managerial duties and are thus more comparable to a CEO than supervisory directors.

Table 3 shows the results from difference-in-differences tests around the introduction of the EU bonus cap. Columns 1, 2, and 5 include all the executive directors, whereas the remaining columns exclude CEOs and control for CEO turnover. The latter specification is meant to account for management shake-ups, which often coincide with CEO turnovers (Pan, Wang, and Weisbach, 2016). In columns 1 to 4, we use as the dependent variable an indicator variable equal to 1 for any turnover. We observe a statistically significant increase of the turnover rate of treated directors in the post-EU bonus cap period. The result becomes statistically insignificant when we account for bank fixed effects and management shake-ups (column 4), which are unlikely to reflect director-specific career prospects. This result, however, speaks to the ability of banks to retain their executives inasmuch treated and non-treated directors experience similar changes in their forced turnover rate and job-switching costs around the regulatory shock.

Thus, in columns 5 and 6, we take a different route and focus on turnover events in the presence of below-median bank performance. We find that the frequency of these turnover events increases significantly for treated directors. We analyze the relationship between turnover and bank risk-adjusted performance for treated and nontreated directors in Figure 4. It confirms that the surge in the turnover rate in the treated group is confined to bank-years characterized by a poor performance. Turnovers taking place in those periods are likely to be the result of either good executives "abandoning the sinking ship" or improved bank governance (i.e., stricter discipline by the board). Whereas we are not able to rigorously distinguish between forced and voluntary turnovers at times of poor performance – although the surge in turnover-performance sensitivity shown below supports the governance narrative–, turnovers at well-performing banks are particularly likely to originate from executives' choices (i.e., to be voluntary turnovers). Our empirical

strategy aims to tease out any differential change in turnovers that reflect these choices. And the results presented in Table 3 and Figure 4 suggest that this was hardly the case.

Yet, given the increase in the turnover rate in bad treated bank-years, it is possible that some underperforming banks have been unable to retain their best directors (especially CEOs) following the introduction of the cap. Our next set of results seeks to shed light on the question if (1) an increase in forced turnovers and/or (2) a loss of talented managerial labor force are plausible drivers of such an increase in the turnover rate. Provided the bonus cap produces a shift toward a safer compensation structure, executives' total compensation may become less exposed to poor performance. Thus, banks may use forced turnovers as a substitute to discipline directors for weak performance, leading to the observed higher turnover rate at treated banks with poor performance. If so, we would expect a positive differential effect on the performance sensitivity of turnover events in the presence of below-median bank performance. Appendix Table A.5 reports triple difference-in-difference regressions that analyze the role of risk-adjusted performance for such turnover events. We find some evidence that turnover sensitivity to risk-adjusted performance increases.

We further explore executive turnovers by means of triple difference-in-differences specifications. In Appendix Table A.6, we include interactions with proxies for executive directors' skill, which are aimed at capturing the attractiveness of their outside option and, thus, the ease of leaving their current position. In Panel A, we add a triple interaction with the indicator variable *High experience*, which is equal to 1 if our measure of professional experience à la Custódio et al. (2013) is above its median. In Panel B, we measure an executive director's skill according to his/her compensation in the pre–EU bonus cap period. In other words, we assume that the best directors are also the highest paid in the bank. In columns 1 and 2, we use the indicator variable *Top total pay*, which is equal to 1 if the director is the best paid (or the second best paid) on the board in terms of total compensation (for boards with at least five directors). In columns 3 and 4, we use an indicator variable computed in the same way but based on variable compensation (*Top var. pay*). We do not detect any statistically significant pattern across different degrees of professional experience or compensation levels. These findings further reinforce the idea that executives' voluntary turnovers do not become more likely after the introduction of the EU bonus cap.[12]

The lack of apparent adverse effects of the cap in terms of human capital retention

[12]We obtain similar results if we distinguish between turnovers taking place in periods of poor and good performance (Appendix Table A.4).

is also corroborated by Appendix Table A.7, where we informally compare the characteristics of leaving directors with those of newly appointed directors in the post-cap period. Whereas incoming directors are younger and slights less experienced than those who leave, these patterns do not appear to be more pronounced at treated institutions.

To sum up, the cap does not appear to be linked to an increase in director turnover at well-performing banks. By contrast, we observe a surge in the turnover rate by treated directors at underperforming banks. This possibly stems from (1) stronger shareholder discipline through forced turnovers and/or (2) skilled directors leaving poorly performing banks. The increase in turnover-performance sensitivity coupled with the absence of a higher attrition rate for highly skilled managers seems to point to channel (1). To put it differently, we do not find consistent evidence of banks' inability to retain their executives following the EU bonus cap.

6.2 Compensation structure

The results in the preceding section suggest that executive directors are not worse off under the bonus cap, as reflected by the absence of a surge in turnovers, at least at well-performing banks. Next, we investigate whether the dynamics of compensation structure adjustment around the cap are consistent with such a pattern in turnover.

A visual inspection of compensation structure around the introduction of the EU bonus cap confirms that EU banks complied with the new regulation in a timely manner. Figure 5 depicts the maximum variable-to-fixed compensation ratio for the treated and the control groups. For both, we plot the ratio before the EU cap against the ratio after the EU cap. Given our treatment definition, the treated group's ratio exceeds 250% in the pre-EU cap period, ranging from just above the threshold up to approximately 700%. After the introduction of the cap, the maximum variable-to-fixed compensation ratio goes below 250% for every treated director. Consistently, the regression line in the upper-left quadrant (treated directors) is steeper than the 45° line. By contrast, the regression line in the lower-left quadrant (control group) essentially coincides with the 45° line, corroborating the idea that the control group's compensation structure does not change systematically around the EU cap.

Given this prima facie evidence, we conduct a formal regression analysis. We estimate equation (2), using maximum variable-to-fixed compensation ratio, realized post-evaluation variable compensation, fixed compensation, and maximum variable compensation as dependent variables. For each dependent variable, we consider three progressively

more saturated specifications: (1) controlling for bank and director characteristics and year fixed effects, (2) including bank fixed effects, and (3) including director fixed effects. Table 4 reports the results of our estimation. Panel A focuses on the maximum variable-to-fixed compensation ratio (columns 1 – 3), i.e., the quantity directly regulated by the EU bonus cap, and post-evaluation variable compensation (columns 4 – 6). For both measures, in each specification we observe a large and statistically significant decrease for the treated group. The parameter estimates of roughly –1 for maximum variable-to-fixed suggest no overshooting, on average, in terms of decreasing variable compensation. At the same time, we observe an effective decrease of variable grants, that is, directors' variable compensation grant levels appear to be indeed affected by the reform.

Panel B analyzes fixed compensation (columns 1 – 3) and maximum variable compensation (columns 4 – 6). Treated directors received substantially higher fixed compensation following the EU bonus cap. By contrast, maximum variable compensation exhibits a large and statistically significant decrease.

To corroborate the validity of our difference-in-differences tests, Figure 6 plots different measures of compensation (fixed and variable compensation, maximum variable-to-fixed compensation ratio, and equity rate) around the introduction of the cap for treated and control groups. The evolution of these measures – with the exception of realized variable compensation – confirms the parallel trend assumption, with the divergence between treated and nontreated directors taking place only starting in 2014. With regard to realized variable compensation, however, the bottom left-hand graph of Figure 6 does not condition on bank performance, which may blur the interpretation. It is also worth noting that the adjustment to the new regulation takes place to a large extent in the first year and we do not observe convergence between treated and nontreated directors afterward.

In summary, these results point to (1) a timely enforcement of the EU bonus cap and (2) to a long-lasting adjustment to the regulation taking place through both an increase in fixed compensation and a decrease in maximum variable compensation. Put differently, compensation contracts appear to have been redesigned according to a scheme consistent with unchanged directors' utility (point C in Figure 2).

Table 5 more rigorously tests the conjecture that banks design post–EU bonus cap contracts that leave executive directors' utility unchanged around the introduction of the cap. More specifically, we take the perspective of a risk-neutral director and test whether his/her expected utility (i.e., expected compensation) changes around the introduction of the cap. To measure expected utility, we use the ratio of variable grants over maximum

variable grants as a proxy for the probability to earn variable compensation. We call this measure goal achievement rate. We then compute expected pay as the sum of fixed compensation and maximum variable times the goal achievement rate. We estimate equation (2) using expected compensation as a dependent variable. In columns 1 – 4, the goal achievement rate is computed over the pre-EU bonus cap period. Columns 1 and 2 rely on a measure of expected compensation based on the director-level goal achievement rate, whereas columns 3 and 4 are based on the board-level achievement rate. In columns 5 – 8, to account for possible changes in managerial effort induced by the cap, we repeat the same tests but compute the goal achievement rate over the post-EU bonus cap period. Treated directors do not exhibit any statistically significant change in expected pay at conventional levels (except in column 5, where the effect is negative and significant but only at the 10% level). Thus, at least from the perspective of a risk-neutral manager, banks seem to indeed offer contract adjustments that do not make managers worse off around the introduction of the EU bonus cap. One possible interpretation of this result is that banks adjust contracts in such a way that their ex ante costs of compensation stay at the same level. However, sufficiently risk-averse and undiversified directors may even be better off under the regulation-compliant contracts.[13]

We also analyze the sensitivity of compensation to bank performance around the introduction of the EU bonus cap by means of triple difference-in-differences specifications. Appendix Table A.8 focuses on the sensitivity of variable compensation-to-maximum variable compensation – namely directors' goal achievement rate – to stock return (columns 1 – 3) and the Sharpe ratio (columns 4 – 6). By focusing on the goal achievement rate, we investigate whether it is harder for an executive director to achieve a percentage of his bonus plan, rather than a euro amount. Changes in performance sensitivity and risk-adjusted performance sensitivity of treated executive directors' compensation are statistically insignificant.

In addition to this formal test on pay-for-performance sensitivity, we study changes in KPIs of bonus plans at treated banks by looking at their compensation reports around the introduction of the EU bonus cap. Both the weights and the range of KPIs in these plans remain largely unchanged. This result suggests that banks complied with the cap

[13]Our measure offers an upper bound of expected utility but a lower bound for the differential change in expected utility linked to a decrease of variable compensation, given that most executive directors are arguably risk averse. Unreported results obtained under the assumption of risk-averse directors underpin this argument. To compute the expected utility of risk averse managers, we follow Hall and Murphy (2002), who investigate the difference between the cost of compensation to firms and the safety equivalent of compensation plans to risk averse managers and find large differences for plausible parametrizations.

just by reducing the face value of variable compensation, and not by altering KPIs or their weighting within the compensation plans.

Finally, in Table 6 we estimate difference-in-differences specifications for the fraction of compensation deferred by executive directors (columns 1 – 3), and the equity rate (columns 4 – 6). We generally observe an increase in both the deferred compensation rate and the equity rate around the introduction of the cap. Higher deferrals and equity compensation stem from (1) fixed allowances that are used to increase fixed compensation and (2) stronger reliance on long-term compensation plans. Both link directors' compensation to bank performance in the middle- to long-run. Taking the perspective of the average treated executive director (*Treatment intensity*$= 4.2 - 2.5 = 1.7$, based on Panel A of Table 1) and looking at columns 3 and 6, the differential increase around the cap is of $3.6\% \times 1.7 = 6.12\%$ for the deferral rate and $4.3\% \times 1.7 = 7.31\%$ for the equity rate. Stronger reliance on long-term compensation plans could also indicate that banks want to exploit the 25% discount rule for variable compensation, which, in turn, allows them to grant up to 250% of fixed pay in a year. Whereas the change in the deferral and equity rate is sizable, it is unlikely to have a major impact on the implementation of the regulation. If we assume that banks' goal is to circumvent the cap, our estimates above translate into a discount on variable compensation of only $6.12\% \times 0.25 = 1.53\%$ and $7.31\% \times 0.25 = 1.82\%$ through deferrals and equity grants, respectively.

6.3 Bank performance and risk-taking

Banks are highly interconnected institutions, in which the inherently different objectives of multiple interest groups interact and possibly conflict. The EU bonus cap, by changing the managers' compensation structure, alters the agency relationship between banks' managers and these interest groups.

A prominent distinction is between shareholders and creditors, who both have direct claims on the asset value of the bank. Shareholders and creditors have different objective functions. Shareholders are residual claimants, that is, their claims are junior relative to creditors', which makes them keen on risk-taking, thus creating conflicts especially if the bank is approaching distress. We thus examine the performance of equity and debt claims around the introduction of the EU cap.

This traditionally assumed conflict between shareholders and creditors gives only a partial picture of the nexus of interests within banks. The presence of explicit and implicit public guarantees on banks' debt, in the form of deposit insurance or too-big-too-fail

incentives, may reduce creditors' incentives to monitor and curb risk-taking. Thus, the general public – as represented by regulatory and supervisory bodies – is a major stakeholder in banks. If a bank encounters financial problems, the public sector is likely to step in through deposit insurance and bailouts, bearing the deadweight costs of distress. These costs are particularly high in the case of a generalized banking crisis. From the perspective of the general public, it is thus of interest to evaluate systemic risk implications of the EU cap. Systemic risk, indeed, is the risk that a bank is affected by an initial default of another institution through a connection in the financial system.

In Table 7, we conduct a difference-in-differences analysis around the introduction of the EU bonus cap for different bank-level variables capturing the motives of the various stakeholders involved. In Panel A, we focus on the shareholders' and creditors' perspective. To proxy for shareholders' objectives, we use risk-adjusted stock returns (i.e., the Sharpe ratio) which accounts for changes in both risk and return. The results in column 1 point to a decrease in risk-adjusted returns for treated banks, which suggests that the reform did not strengthen shareholders' position in the bank. The results in columns 2 and 3 indicate that the decrease of risk-adjusted stock returns is mainly driven by an increase in return volatility rather than by a decrease in returns.

To capture creditors' stakes, we consider five year CDS spreads as a proxy for default risk. In column 4, we use the excess CDS spread of a bank with respect to the corresponding sovereign CDS spread as the dependent variable.[14] The evidence suggests that treated banks became riskier than their untreated peers.

Although the increase in risk-taking seems at odds with the original intention of the EU bonus cap, it is important to investigate whether systemic risk exhibits a similar behavior. The regulator, indeed, is mostly concerned with this risk dimension, because during banking crises, the general public bears the highest costs for rescuing banks. In Panel B of Table 7, we specify measures of systemic risk and systematic risk. For the former, we consider each bank's systemic risk contribution and long-run marginal expected shortfall (SRISK% and LRMES, see Acharya, Pedersen, Philippon, and Richardson, 2016; Brownlees and Engle, 2017). SRISK% (column 1) measures the bank's fraction of the capital shortfall that the entire financial system would endure during a crisis. LRMES (column 2) represents the expected equity loss faced by the bank in the event of a severe crisis.[15] We approximate systematic risk using the bank's market beta and correlation

[14]This measure provides the most conservative estimate of the increase in credit risk. We obtain stronger results when using CDS spreads not adjusted for the local sovereign debt's spreads.

[15]For further details on the computation of these measures, see: https://vlab.stern.nyu.edu/help/risk_summary_en.html.php?gmes.

(columns 3 and 4). Treated banks experience a statistically significant increase in all these risk measures (only the correlation is insignificant).

Given that the EU bonus cap's primary goal was to curb risk-taking, this result is all the more remarkable. Table 8 seeks to unveil possible drivers of the increase in risk, especially the systemic aspect. First, in columns 1 and 2 we analyze the deposits-to-liabilities ratio, a measure that captures to what extent banks rely on retail as opposed to wholesale funding. Higher reliance on wholesale short-term funding is associated with higher systemic risk (Huang and Ratnovski, 2011; López-Espinosa, Moreno, Rubia, and Valderrama, 2012). We find consistently that treated banks turn more to this source of funding following the cap. Second, in columns 3 and 4 we specify interbank assets as the dependent variable to gauge whether treated banks aim to increase their systemic importance in a "too-many-to-fail" sense (see, for example Brown and Dinc, 2009). The decline in this admittedly crude measure of connectivity suggests, however, that the increase in systemic risk was not channeled via higher exposure to other players on the interbank market. Finally, we analyze a more general measure of risk-taking, namely the bank's exposure to corporate loans (columns 5 and 6) as opposed to safer assets, such as residential mortgages or liquid securities. Consistent with treated banks becoming riskier after the cap, the ratio of corporate loans over total asset increases significantly.

Our findings on bank-level risk-taking are in line with the view on weakened effort exertion due to lower performance pay (Martinez-Miera and Repullo, 2017), as well as with Carlson and Lazrak (2010), who hypothesize that an increase in safe compensation might serve as an insurance to risk-averse executives, allowing them to take more risks. The same mechanism might be at work here because of the increase in fixed compensation relative to variable compensation mandated by the EU cap. Moreover, the surge in risk is also consistent with a story about higher fixed labor costs increasing operating leverage (Murphy, 2013b) – remember that the cap extends to so-called material risk-takers, who can be well below the executive level.

These results, together with those on managerial turnover, paint a mixed picture of the EU bonus cap. Whereas it did not lead to any obvious outflow of managerial labor force from the EU banking industry, it also appears to be associated with a deterioration in banks' risk profile, i.e., the dimension the regulator aimed to curb with the cap.

6.4 US executives as an alternative control group

So far, we have compared treated to untreated directors at EU banks around the introduction of the cap. Whereas we define *Treatment intensity* at the the director-level, it is still possible – and Table 1 shows it is indeed the case – that most treated directors are from large EU banks, while smaller EU institutions in our sample seldom award directors compensation packages with a maximum variable-to-fixed ratio above 250% in the pre-cap period. As a consequence, although the director-level results appear unlikely to be driven by anything else than the bonus cap, it is still possible that de facto we are comparing large to small institutions and capturing a shock that affected these two groups of institutions differentially.

To address this concern, we form an alternative control group based on top executives from large US banks. More specifically, we identify banks in Execucomp following Boyallian and Ruiz-Verdú (2017) and rank them by asset size as of 2013. We focus on the largest 25 banks. Execucomp generally reports the five most paid executives for each firm. We include all of them in our control sample and obtain data on their turnover events and compensation packages, as well as on bank-level variables.

The US banks in the alternative control sample have similar size and business model to the EU ones from which treated directors are drawn, meaning that they are arguably exposed to similar risks. Moreover, while affected by the same international regulations (such as the FSB's guidelines on compensation), large US banks are not directly affected by the EU cap, which makes them a suitable control group. However, one important limitation of this alternative control group is that Execucomp allows us to observe variable compensation in its granted or realized form, but does not report the maximum variable compensation. Because of this, the baseline analysis is implemented using EU banks' untreated directors.

Table 9 shows estimates from difference-in-differences specifications using data from large US banks to form the control sample. In Panel A, we analyze executive turnover rates around the introduction of the cap. As in the baseline analysis, we observe an increase in the turnover rate of treated directors in the post-EU bonus cap period (columns 1 and 2), driven by turnover events taking place in periods of poor bank performance (column 3 and 4). Instead, the change in turnover events in periods of good performance is again insignificant (columns 5 and 6), which reinforces our finding that the cap did not lead to a surge in voluntary turnovers.

In Panel B, we estimate compensation structure regressions. In line with the results

above, we find a positive and significant increase in measures of fixed compensation (columns 1 and 2), coupled with a significant decline in measures of variable compensation (columns 3 – 5). In other words, EU treated directors appear to have been indemnified relative to their peers at US banks around the introduction of the cap.

Finally, in Panel C and Panel D we re-estimate difference-in-differences specifications on bank performance and risk-taking, using the same dependent variables as above. We are able to confirm all the results described in Section 6.3, although some results turn insignificant. Only the result on correlation changes sign, becoming significantly negative.

6.5 Additional tests

This section presents tests aimed at assessing the sensitivity of our results to an important confounding event, to more saturated specifications, and to alternative treatment and control group definitions.

Our bank-level results are admittedly more indirect than those at the director-level, also because the cap affects not only executives, but all the material risk-takers as well. It is thus important to verify how sensitive these results are to confounding events. The alternative US control sample in Section 6.4 mitigates concerns about the confounding effect of FSB's guidelines on compensation of 2009, but does little to address the identification challenge posed by the European debt crisis. Indeed, US banks were arguably only marginally exposed to EU peripheral sovereigns.

Therefore, we devise a falsification test in which we replace *Treatment intensity* with *Peripheral exposure*, a measure of bank exposure to the sovereign debt of Greece, Ireland, Italy, Portugal, and Spain. To this end, we use data on bank sovereign debt holdings from the EBA Transparency Exercise of 2011, which was the first time this information was disclosed to the public. If in the baseline analysis we are indeed just capturing the lingering effects of the European debt crisis, we will observe the same patterns in bank performance and risk-taking also in this case.

Table 10 reports estimates of the falsification test. In Panel A, neither equity return and risk measures (columns 1 – 3) nor CDS spreads (column 4) exhibit a significant change around the cap introduction for banks highly exposed to peripheral sovereigns. Panel B illustrates that banks exposed to the European debt crisis do not experience any significant change in systemic and systematic risk after 2013. All in all, no clear pattern emerges from these results, which corroborates the interpretation of the baseline findings in the light of the introduction of the cap.

While important, the FSB's guidelines and the European debt crisis are hardly the only confounding events that took place around the introduction of the cap. To deal more comprehensively with this problem, we augment the baseline bank-level specifications with country-year fixed effects in Appendix Table A.9. Thereby, we absorb any variation in the business cycle or in the regulatory environment across countries (e.g., differences in the timing of the implementation of EU directives). Reassuringly, the baseline results on risk-taking do not change (except for the effect on the Sharpe ratio that turns insignificantly positive).

Next, we rely on a binary treatment indicator (based on the 250% threshold) rather than on our baseline treatment intensity variable. In Appendix Table A.10, we re-estimate the most saturated difference-in-differences specifications for turnover (Panel A) and compensation structure (Panel B). Our results remain generally robust.

Finally, we broaden our treatment definition to include all the executive directors with a maximum variable-to-fixed compensation ratio above 100% as of 2013 (i.e., the baseline threshold put forward by the EU bonus cap). On the one hand, such a treatment definition may return several false positives because banks have the opportunity to increase the threshold up to 250%, provided they obtain shareholders' approval and apply the discount rule to deferred compensation. On the other hand, our treatment definition based on the 250% may miss several treated executive directors at banks that decided not to raise the threshold relative to 100% or raise it to a level below 250%. Moreover, by using the 100% threshold, we improve the covariate balance between the treated and the control samples. In this case, we rely again on the treatment intensity variable. Appendix Table A.11 shows regression estimates for turnover (Panel A) and compensation structure (Panel B). Our results continue to hold.

7 Conclusion

Bankers' compensation has been subject to significant regulatory activity following the Great Recession, generally with the goal of reducing excessive risk-taking. Yet, the banking sector is characterized by (1) higher returns to skill than other industries and (2) a highly mobile workforce. As a result, any effort aimed at regulating executive pay in such a sector may have important unintended consequences on the managerial labor market. More specifically, it can adversely affect banks' abilities to retain their most skilled managers. Concurrently, the consequences of regulation of compensation for managerial risk-taking behavior are far from obvious and depend on a host of factors, such

as managers' risk preferences, their time horizon, and the complex interactions among different pay components.

We examine the interplay between executive compensation structure, managerial career trajectories, and risk-taking in the banking sector by using the introduction of the EU bonus cap in 2013 as a laboratory. The EU cap limits the maximum variable-to-fixed compensation ratio of executive directors in EU banks. Our empirical design relies on a difference-in-differences approach, in which we define our treatment group as executive directors whose compensation structure as of 2013 did not comply with the cap and our control group as executive directors with compensation packages compliant with the cap as of 2013. We find no evidence that banks lose their ability to retain their most skilled managers after introducing the cap. We consistently show that banks comply with the regulation by offering their executive directors higher fixed compensation and lower maximum variable compensation, which can be interpreted as a form of indemnification to executives for the introduction of the cap.

At the same time, bank-level evidence suggests that treated banks exhibit lower risk-adjusted returns and higher risk-taking propensities. This is in line with a theory predicting that an increase in the ratio of fixed-to-variable compensation might lead to risk-averse managers taking more risks as well as with the intuition that less incentivized managers may exert less effort in monitoring the risks arising from their portfolio of assets. Importantly, the deterioration of risk profiles is not confined to indicators of idiosyncratic and diversifiable risk, but also extends to gauges of banks' systemic risk contributions.

In summary, although our testing framework does not allow for clear causal statements, the results suggest that concerns about the potential adverse impact of the cap on EU banks' ability to attract skilled managers may have been overstated. However, the EU cap's effectiveness at curbing excessive risk-taking in the banking sector appears to be at best questionable.

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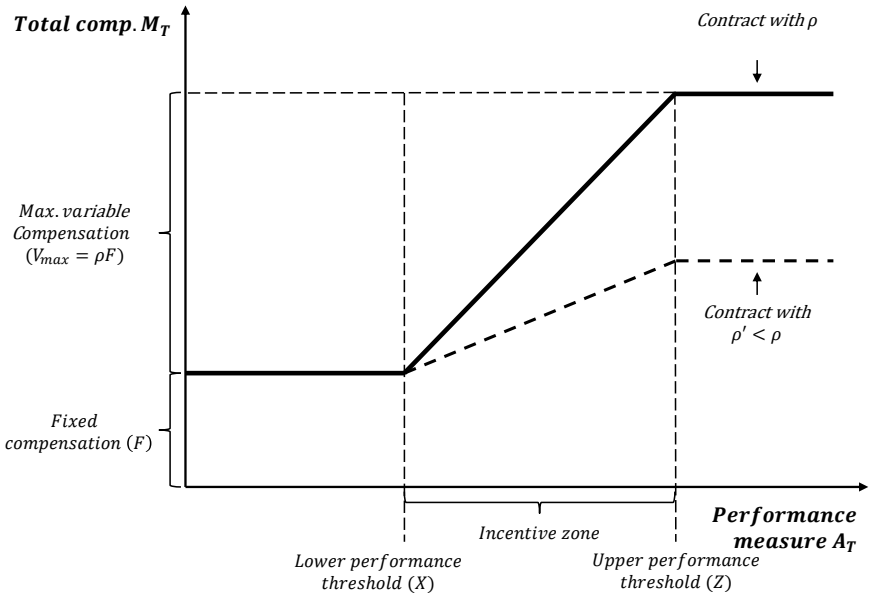


Figure 1: A stylized performance-based compensation plan
This figure shows the terminal payoff M_T of a stylized performance-based compensation plan as a function of a given measure of performance A_T at time T. The executive director participates in the bank's performance $\Pi = A_T - X$ at the participation rate p within the incentive zone ($X \leq A_T \leq Z$). ρ is the ratio of the maximum variable compensation achievable by the executive V_{max} and fixed compensation F. Such a ratio is the quantity regulated by the EU bonus cap.

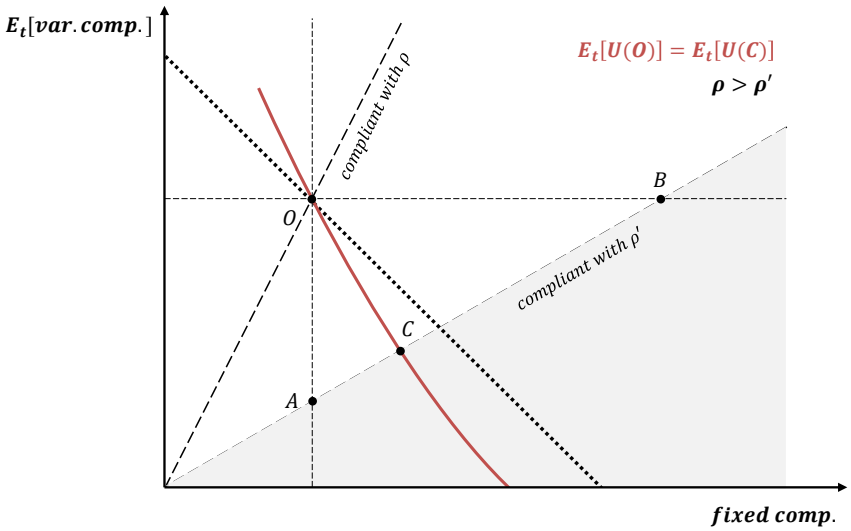


Figure 2: Adjustment schemes of executive compensation structure in reaction to the EU bonus cap
This figure visualizes how the bank can adjust executive directors' compensation packages to comply with the EU bonus cap. Consider an executive director with an initial maximum variable-to-fixed compensation ratio ρ (point O), which is higher than the limit imposed by the EU bonus cap (i.e., ρ'). The solid red (dotted black 45°) line represents the indifference curve of a risk-averse (risk-neutral) executive director. The bank can adjust the director's compensation structure and comply with the regulation by implementing one of the following schemes: (1) Decreasing expected variable compensation while keeping fixed compensation unchanged (point A); (2) increasing fixed compensation while keeping expected variable compensation unchanged (point B); or (3) rebalancing both along the indifference curve (red line) such that for the risk-averse director $E_t\left[U(O)\right] = E_t\left[U(C)\right]$ (point C).

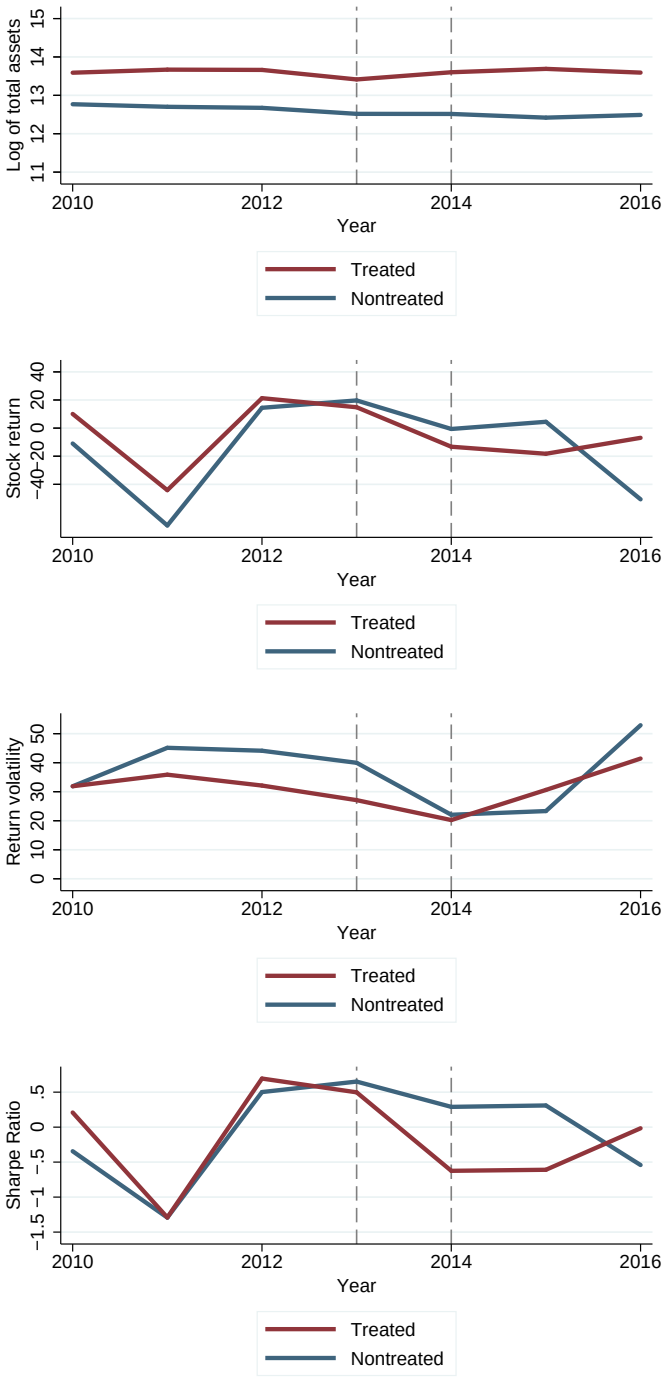


Figure 3: Evolution of selected bank characteristics around the introduction of the EU bonus cap
This figure shows the evolution of the average size (natural logarithm of total assets), stock return, stock return volatility, and Sharpe ratio around the introduction of the EU bonus cap for a sample of EU banks. The red line represents treated banks (i.e., banks that have at least one executive director whose compensation structure is noncompliant with the EU bonus cap as of 2013; maximum variable-to-fixed compensation ratio>250%). The blue line represents the control group (i.e., banks in which all the executive directors have a compliant compensation structure as of 2013). The dashed vertical lines denote the points in time at which the EU bonus cap was introduced (2013) and at which it became binding (2014).

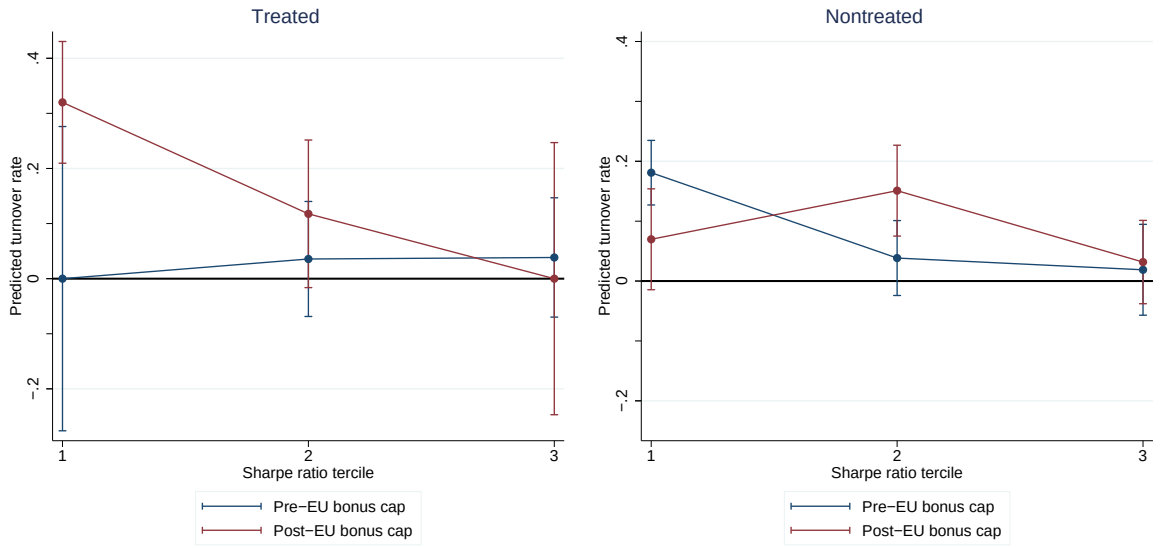


Figure 4: Prediction of turnover rate
This figure shows the predicted turnover rate at different terciles of the Sharpe ratio from linear probability models. The left plot refers to treated executive directors (i.e., those whose compensation structure is non-compliant with the EU bonus cap as of 2013; maximum variable-to-fixed compensation ratio>250%). The right plot refers to untreated executive directors. Blue lines indicate predicted turnover rates before the introduction of the EU bonus cap (2010-2013), whereas red lines indicate predicted turnover rates after the introduction of the EU bonus cap (2014-2016). Vertical bars indicate 95% confidence intervals.

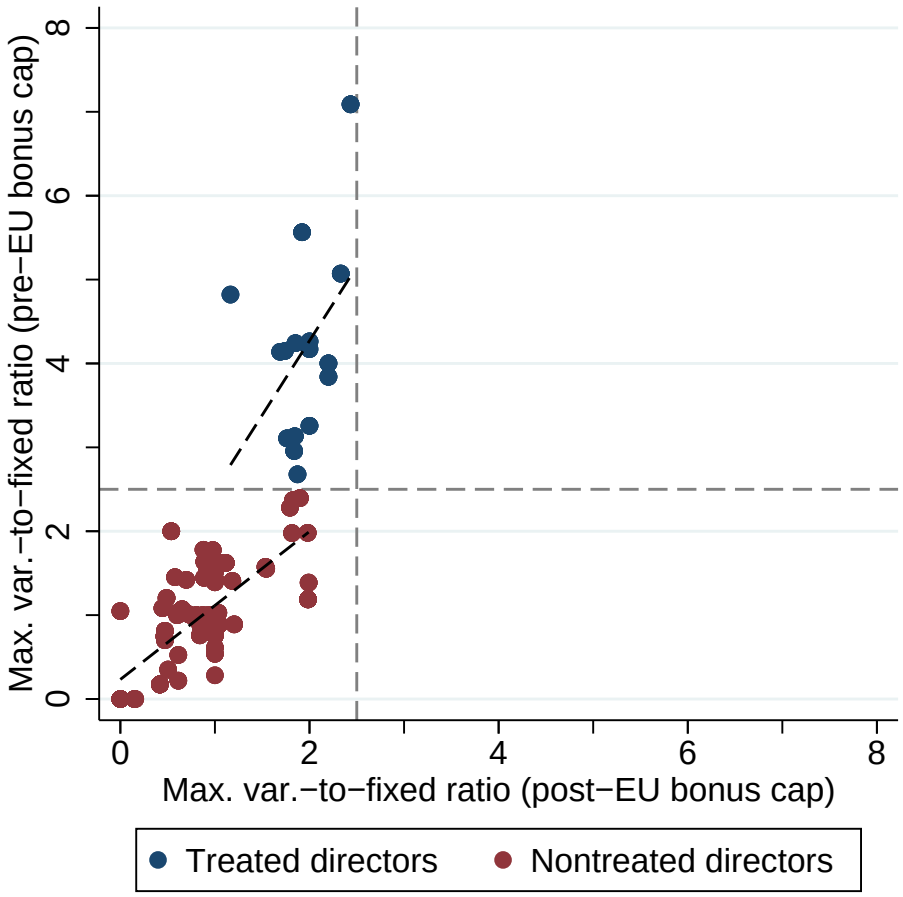


Figure 5: Adjustment of compensation structures to the EU bonus cap
This figure shows the maximum variable-to-fixed compensation ratio for treated and nontreated executive directors at EU banks before (median over 2010–2013) and after (median over 2014–2016) the introduction of the EU bonus cap. Blue dots represent treated directors (i.e., those whose compensation structure was noncompliant with the EU bonus cap as of 2013; maximum variable-to-fixed compensation ratio>250%). Red dots represent nontreated directors (i.e., those whose compensation structure is compliant with the EU bonus cap as of 2013). The bold dashed lines are regression lines for treated and nontreated directors. The vertical and horizontal dashed lines represent the 250% limit on the maximum variable-to-fixed compensation ratio imposed by the EU bonus cap.

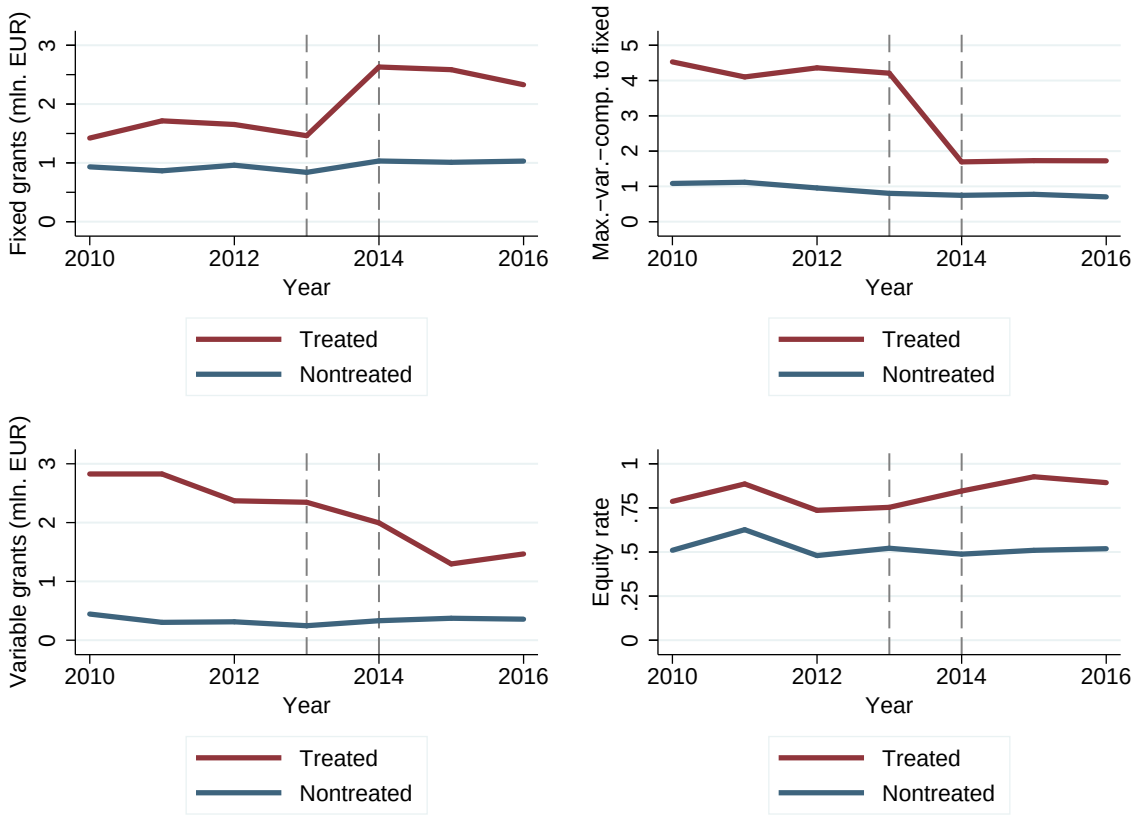


Figure 6: Evolution of compensation structure around the introduction of the EU bonus cap
This figure shows the evolution of the executive directors' fixed compensation, maximum variable compensation-to-fixed compensation ratio, variable compensation, and equity rate around the introduction of the EU bonus cap for a sample of EU banks. The red line represents treated executive directors (i.e., those whose compensation structure is non-compliant with the EU bonus cap as of 2013; maximum variable-to-fixed compensation ratio>250%). The blue line represents nontreated executive directors. The dashed vertical lines denote the points in time at which the EU bonus cap was introduced (2013) and at which it became binding (2014).

Table 1: Summary statistics
This table shows summary statistics for a sample of EU banks over 2010–2016. Panel A reports summary statistics for treated directors (i.e., those with a maximum variable-to-fixed compensation ratio exceeding 250% as of 2013). Panel B reports summary statistics for nontreated directors. Panel C reports differences over the pre-treatment period, i.e., between 2013 and 2010 for treated and non-treated directors, as well as the difference-in-differences. Panel D reports average differences between 2016–2014 and 2010–2013 for treated and non-treated directors, as well as the difference-in-differences. The p-values (in parentheses) are computed from t-tests with standard errors clustered by bank. Refer to Appendix Table A.3 for variable definitions.

Panel A: Treated executive directors

	2010–2013				2014–2016			
	N	Average	S.E.	Median	*N*	Average	S.E.	Median
Director characteristics:								
Turnover	76	0.039	0.196	0.000	54	0.259	0.442	0.000
Prof. experience	58	0.601	1.592	0.286	47	0.476	1.686	0.173
Director age	58	51.621	4.258	51.000	47	54.043	4.841	53.000
Compensation structure:								
Fixed comp. (thd. EUR)	76	1,557.490	688.425	1,593.886	54	2,552.254	1,002.944	2,550.332
Var. comp. (thd. EUR)	76	2,536.265	1,760.074	2,324.568	54	1,629.560	1,744.292	1,109.735
Max. var. comp. (thd. EUR)	76	6,515.969	3,141.780	6,540.022	54	4,565.473	2,536.659	4,368.267
Bank-level information:								
Total assets (bln. EUR)	28	1,256.405	720.567	1,588.305	21	1,172.084	671.638	1,112.372
ROA	28	0.218	0.406	0.220	21	0.133	0.371	0.120
ROE	28	3.621	6.613	5.400	21	2.018	6.229	1.970
Stock return	28	4.837	23.723	0.072	21	-2.798	15.189	-0.129
Stock return volatility	28	33.066	10.842	35.295	21	28.402	11.981	23.214
Sharpe ratio	28	0.135	1.120	0.229	21	-0.347	0.764	-0.459
Log 5-year excess CDS spread	24	1.273	0.467	1.275	18	1.527	0.560	1.426
Peripheral exposure	20	0.177	0.099	0.173	15	0.177	0.100	0.173
SRISK%	28	19.793	19.069	15.555	21	20.590	21.176	14.050
LRMES	28	53.442	8.163	55.865	21	47.753	6.256	48.560
Beta	28	1.525	0.335	1.600	21	1.283	0.239	1.300
Corr.	28	0.536	0.085	0.530	21	0.468	0.083	0.450
CEO turnover	28	0.107	0.315	0.000	21	0.143	0.359	0.000

Panel B: Nontreated executive directors

	2010–2013				2014–2016			
	N	Average	S.E.	Median	*N*	Average	S.E.	Median
Director characteristics:								
Turnover	541	0.094	0.292	0.000	371	0.108	0.311	0.000
Prof. experience	479	0.000	1.393	-0.274	325	0.083	1.600	-0.349
Director age	466	54.266	8.453	52.000	317	56.063	7.707	54.000
Compensation structure:								
Fixed comp. (thd. EUR)	541	893.771	592.509	734.714	366	1,024.406	638.711	926.000
Var. comp. (thd. EUR)	541	311.650	639.064	26.806	366	353.427	605.060	180.143
Max. var. comp. (thd. EUR)	406	956.684	1,391.619	598.571	365	795.969	1,057.024	470.712
Bank-level information:								
Total assets (bln. EUR)	103	492.866	467.507	319.540	81	468.027	493.963	252.921
ROA	103	-0.018	0.887	0.210	81	0.217	0.484	0.300
ROE	103	-2.859	29.377	4.980	81	4.115	7.626	5.580
Stock return	73	-1.379	39.548	0.086	56	-1.316	32.670	0.083
Stock return volatility	54	39.548	15.290	37.802	45	31.202	20.167	23.978
Sharpe ratio	54	-0.001	1.130	0.139	44	0.095	0.943	0.241
Log 5-year excess CDS spread	61	1.126	0.760	1.267	50	1.265	0.816	1.423
Peripheral exposure	78	0.275	0.334	0.096	59	0.295	0.348	0.162
SRISK%	67	32.465	29.098	20.510	50	30.396	30.551	20.390
LRMES	67	51.890	13.471	54.560	50	44.457	11.435	45.375
Beta	67	1.515	0.600	1.540	50	1.187	0.369	1.185
Corr.	67	0.472	0.128	0.480	50	0.395	0.130	0.415
CEO turnover	103	0.097	0.298	0.000	83	0.060	0.239	0.000

Panel C: Pre-treatment trend analysis (2010 vs. 2013)

	Δ Treated	Δ Nontreated	Δ(Δ)
Director characteristics:			
Turnover	0.1154	0.2198	-0.1044
	(0.4002)	(0.0000)	(0.4002)
Prof. experience	-0.5388	-0.0204	-0.5184
	(1.3094)	(0.9198)	(0.3896)
Director age	1.1905	5.2045	-4.0140
	(0.2210)	(0.0000)	(0.2210)
Compensation structure:			
Fixed comp. (thd. EUR)	40.8166	-108.0169	148.8335
	(0.6762)	(0.1782)	(0.4980)
Var. comp. (thd. EUR)	-481.3145	-202.9902	-278.3243
	(0.4627)	(0.0810)	(0.3817)
Max. var. comp (thd. EUR)	-284.9957	-491.9229	206.9272
	(0.8411)	(0.0919)	(0.7492)
Bank-level information:			
Total assets (bln. EUR)	-132.5636	-129.6727	-2.8909
	(1.4187)	(0.4249)	(0.9938)
ROA	-0.2171	-0.4929	0.2757
	(0.5841)	(0.0210)	(0.5631)
ROE	-4.6050	-12.5659	7.9609
	(0.5619)	(0.0280)	(0.5339)
Stock return	-0.6272	19.1029	-19.7301
	(0.4445)	(0.0810)	(0.3635)
Stock return volatility	-6.2125	2.7419	-8.9545
	(0.7462)	(0.5074)	(0.2388)
Sharpe ratio	0.3516	0.9953	-0.6437
	(0.2647)	(0.0026)	(0.2621)
Log 5-year excess CDS spread	0.7717	0.4566	0.3151
	(0.6056)	(0.0813)	(0.5243)
Peripheral exposure	-0.0359	0.0551	-0.0910
	(1.2188)	(0.5461)	(0.6727)
SRISK%	-0.3474	0.6565	-1.0039
	(1.8991)	(0.9434)	(0.9557)
LRMES	-1.9081	-4.6921	2.7840
	(0.8889)	(0.1966)	(0.6923)
Beta	-0.0655	-0.1901	0.1246
	(0.7953)	(0.1608)	(0.6345)
Corr.	-0.0374	-0.0781	0.0407
	(0.6243)	(0.0432)	(0.5812)
CEO turnover	0.1429	0.1613	-0.0184
	(0.9546)	(0.0386)	(0.9159)

Panel D: Difference-in-differences

	Δ Treated	Δ Nontreated	Δ(Δ)
Director characteristics:			
Turnover	0.2198	0.0135	0.2062
	(0.5073)	(0.5069)	(0.0004)
Prof. experience	-0.1250	0.0832	-0.2082
	(0.9465)	(0.4401)	(0.5064)
Director age	2.4219	1.7970	0.6249
	(0.7046)	(0.0017)	(0.7029)
Compensation structure:			
Fixed comp. (thd. EUR)	968.3273	172.0457	796.2816
	(0.0017)	(0.0017)	(0.0000)
Var. comp. (thd. EUR)	-929.9578	49.5790	-979.5368
	(0.5074)	(0.5074)	(0.0000)
Max. var. comp (thd. EUR)	-2,028.5067	-167.3626	-1,861.1441
	(0.2551)	(0.2551)	(0.0000)
Bank-level information:			
Total assets (bln. EUR)	-88.0011	-51.8884	-36.1127
	(1.3962)	(0.5439)	(0.8523)
ROA	-0.0946	0.2315	-0.3260
	(0.1507)	(0.0163)	(0.1344)
ROE	-1.7590	6.6193	-8.3784
	(0.2132)	(0.0201)	(0.1931)
Stock return	-7.8034	-1.0028	-6.8006
	(1.3975)	(0.8569)	(0.5406)
Stock return volatility	-4.3646	-8.4395	4.0750
	(0.4563)	(0.0044)	(0.4519)
Sharpe ratio	-0.4643	0.0602	-0.5245
	(0.9002)	(0.7564)	(0.1438)
Log 5-year excess CDS spread	0.2454	0.1324	0.1130
	(0.9731)	(0.3103)	(0.6628)
Peripheral exposure	-0.0076	0.0264	-0.0340
	(1.3689)	(0.6005)	(0.7684)
SRISK%	0.6126	-0.2722	0.8848
	(1.8756)	(0.9536)	(0.9220)
LRMES	-5.7141	-7.5813	1.8673
	(0.6259)	(0.0002)	(0.6257)
Beta	-0.2437	-0.3305	0.0868
	(0.5771)	(0.0001)	(0.5770)
Corr.	-0.0693	-0.0759	0.0066
	(0.8670)	(0.0003)	(0.8667)
CEO turnover	0.0317	-0.0397	0.0714
	(0.7651)	(0.3265)	(0.4386)

Table 2: Career trajectories of bank executive directors after a turnover
This table shows information on the employment of bank executive directors after a turnover (up to one year after leaving the board). We collected data through through searches of news stories and professional networking websites. Column 1 and 2 cover all executive director turnovers at banks for which treatment status is defined. Columns 3 and 4 focus on the subsample of listed banks. Odd (even) columns report the absolute (relative) number of directors by post-turnover employment category. If multiple positions are found, the position is classified according to this hierarchy: (1) executive position, (2) management position, (3) supervisory position, and (4) politics and regulation.

	All banks		Listed banks	
	#	%	#	%
Executive position	20	22.22%	10	21.28%
Exec. dir. at a bank	12	13.33%	5	10.64%
Exec. dir. at a non-bank	8	8.89%	5	10.64%
Management position	20	22.22%	8	17.02%
Self-employed	6	6.67%	3	6.38%
Advisor (to the same bank)	6	6.67%	2	4.26%
Advisor (elsewhere)	4	4.44%	2	4.26%
Senior management position	4	4.44%	1	2.13%
Supervisory director or non-exec. director	8	8.89%	2	4.26%
Politics and regulation	1	1.11%	1	2.13%
No information on further employment	28	31.11%	18	38.30%
No information on career path afterwards	21	23.33%	16	34.04%
Explicit information on retirement	7	7.78%	2	4.26%
Others	13	14.44%	8	17.02%
None of the above	12	13.33%	7	14.89%
Died in office	1	1.11%	1	2.13%

Table 3: Executive turnover
This table reports estimates from difference-in-differences regressions (linear probability models) for turnover of executive directors around the introduction of the EU bonus cap of 2013. The sample covers executive directors of EU banks between 2010 and 2016. In columns 1 to 4, the dependent variable is *Turnover*, an indicator variable equal to 1 if the director leaves the board of the bank in a given year. In columns 5 and 6, the dependent variable is *Turnover (poor perf.)*, an indicator variable equal to 1 if the director leaves the board of the bank and the bank's ROE is below the median in a given year. Treated executive directors are those whose maximum variable-to-fixed compensation ratio exceeds 250% as of 2013. *Treatment intensity* is (1) equal to 0 for directors in the control group and (2) equal to the distance between ρ (maximum variable-to-fixed compensation) and 250% as of 2013 for treated directors. *Post* is an indicator variable equal to 1 from 2014 onward. All specifications include bank and director control variables (natural logarithm of total assets, number of executive directors serving on the board, lagged Sharpe ratio, director age, a retirement age indicator, a CEO indicator, professional experience, tenure, and a female indicator) as well as year fixed effects. Except for columns 3 and 4 all specifications also include bank fixed effects. Data in odd columns include all executive directors. Data in even columns exclude CEOs and control for *CEO turnover*, an indicator variable equal to 1 if the bank's CEO is replaced in a given year, rather than for the CEO indicator. The t-statistics (in parentheses) are computed from standard errors clustered by bank. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively. Refer to Appendix Table A.3 for variable definitions.

Dependent variable:	Turnover				Turnover (poor perf.)	
	(1)	(2)	(3)	(4)	(5)	(6)
Treat. int.	-0.007	-0.023	-0.006	-0.023	-0.012	0.008
	(-1.17)	(-1.28)	(-0.70)	(-1.02)	(-1.09)	(0.50)
Post × Treat. int.	0.045**	0.048**	0.034*	0.027	0.054**	0.037*
	(2.40)	(2.08)	(2.01)	(1.29)	(2.36)	(1.95)
Bank and director controls	X	X	X	X	X	X
Year fixed effects	X	X	X	X	X	X
Bank fixed effects		X		X	X	X
Full sample	X	X			X	
Ex-CEO			X	X		X
Mean(y)	0.096	0.096	0.110	0.111	0.078	0.089
S.D.(y)	0.295	0.295	0.314	0.314	0.269	0.286
R^2	0.167	0.223	0.182	0.244	0.234	0.261
N	500	499	381	380	499	380

Table 4: Compensation structure
This table reports estimates from difference-in-differences regressions for compensation structure of executive directors around the introduction of the EU bonus cap of 2013. The sample covers executive directors of EU banks over the years between 2010 and 2016. In Panel A, the dependent variables are *Maximum variable compensation to fixed* (columns 1 – 3) and *Variable compensation* (columns 4 – 6). In Panel B, the dependent variables are *Fixed compensation* (columns 1 – 3) and *Maximum variable compensation-to-fixed* (columns 4 – 6). The two panels follow the same structure. Treated executive directors are those whose maximum variable-to-fixed compensation ratio exceeds 250% as of 2013. *Treatment intensity* is (1) equal to 0 for directors in the control group and (2) equal to the distance between ρ (maximum variable-to-fixed compensation) and 250% as of 2013 for treated directors. *Post* is an indicator variable equal to 1 from 2014 onward. All specifications include bank and director control variables (natural logarithm of total assets, ROE, number of executive directors serving on the board, director age, a CEO indicator, professional experience, and tenure) as well as year and bank fixed effects. Columns 3 and 6 include director fixed effects. The *t*-statistics (in parentheses) are computed from standard errors clustered by bank. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively. Refer to Appendix Table A.3 for variable definitions.

Panel A: Effectiveness of the bonus cap regulation

Dependent variable:	Max.-var.-comp. to fixed			Variable compensation		
	(1)	(2)	(3)	(4)	(5)	(6)
Treat. int.	1.268***	0.923***		852.785***	634.795***	
	(5.98)	(4.20)		(11.95)	(5.42)	
Post × Treat. int.	-1.008***	-1.009***	-0.946***	-672.274***	-661.932***	-658.906***
	(-6.14)	(-5.75)	(-6.75)	(-3.48)	(-4.37)	(-4.21)
Bank and director controls	X	X	X	X	X	X
Year fixed effects	X	X	X	X	X	X
Bank fixed effects		X	X		X	X
Director fixed effects			X			X
Mean(y)	1.185	1.187	1.203	553.121	553.121	556.980
S.D.(y)	1.238	1.239	1.249	1,078.022	1,078.022	1,080.785
R^2	0.641	0.825	0.859	0.478	0.713	0.777
N	754	753	734	866	866	860

Panel B: Changes in compensation structure after the bonus cap

Dependent variable:	Fixed compensation			Max. variable compensation		
	(1)	(2)	(3)	(4)	(5)	(6)
Treat. int.	136.240***	-124.386		2,317.748***	1,676.805***	
	(3.29)	(-0.84)		(12.49)	(9.19)	
Post × Treat. int.	312.721**	327.873***	331.925***	-1,027.553***	-1,049.634***	-945.509***
	(2.37)	(3.03)	(2.87)	(-7.23)	(-8.57)	(-7.62)
Bank and director controls	X	X	X	X	X	X
Year fixed effects	X	X	X	X	X	X
Bank fixed effects		X	X		X	X
Director fixed effects			X			X
Mean(y)	1,097.188	1,097.188	1,103.125	1,624.259	1,626.163	1,661.127
S.D.(y)	762.868	762.868	761.825	2,500.710	2,501.825	2,523.622
R^2	0.456	0.698	0.807	0.671	0.813	0.895
N	866	866	860	754	753	734

Table 5: Expected utility from compensation packages

This table reports estimates from difference-in-differences regressions for expected compensation of executive directors around the introduction of the EU bonus cap of 2013. The sample covers executive directors of EU banks between 2010 and 2016. The dependent variable is *Expected utility* for a risk-neutral executive director as measured by the sum of fixed compensation and maximum variable compensation times the goal achievement rate. In columns 1 – 4 (5 – 8), the goal achievement rate is computed as the ratio of pre(post)–EU bonus cap variable grants over pre(post)–EU bonus cap maximum variable grants. Columns 1, 2, 5, and 6 are based on the director-level goal achievement rate. Columns 3, 4, 7, and 8 are based on the board-level goal achievement rate. Treated executive directors are those whose maximum variable-to-fixed compensation ratio exceeds 250% as of 2013. *Treatment intensity* is (1) equal to 0 for directors in the control group and (2) equal to the distance between ρ (maximum variable-to-fixed compensation) and 250% as of 2013 for treated directors. *Post* is an indicator variable equal to 1 from 2014 onwards. All specifications include bank and director control variables (natural logarithm of total assets, ROE, number of executive directors serving on the board, director age, a CEO indicator, professional experience, and tenure) as well as year and bank fixed effects. Even columns include director fixed effects. The t-statistics (in parentheses) are computed from standard errors clustered by bank. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively. Refer to Appendix Table A.3 for variable definitions.

Dependent variable:	Expected pay, pre-probabilities				Expected pay, post-probabilities			
	Director-level prob.		Board-level prob.		Director-level prob.		Board-level prob.	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treat. int.	629.646***		516.029***		640.182***		587.977***	
	(5.02)		(3.35)		(3.68)		(4.38)	
Post × Treat. int.	-56.274	-62.094	-67.096	-49.295	-474.584*	-481.029	-392.647	-398.771
	(-0.30)	(-0.31)	(-0.43)	(-0.29)	(-1.71)	(-1.68)	(-1.66)	(-1.68)
Bank and director controls	X	X	X	X	X	X	X	X
Year fixed effects	X	X	X	X	X	X	X	X
Bank fixed effects	X	X	X	X	X	X	X	X
Director fixed effects		X		X		X		X
Mean(y)	1,844.484	1,876.137	1,842.392	1,874.288	1,851.688	1,885.764	1,839.916	1,871.297
S.D.(y)	1,801.510	1,808.878	1,768.650	1,775.403	1,762.273	1,768.972	1,729.891	1,735.814
R^2	0.809	0.904	0.810	0.896	0.791	0.871	0.786	0.873
N	636	621	636	621	641	625	645	630

Table 6: Deferred and equity compensation
This table reports estimates from difference-in-differences regressions for compensation structure of executive directors around the introduction of the EU bonus cap of 2013. The sample covers executive directors of EU banks between 2010 and 2016. The dependent variables are *Deferral rate* (columns 1 – 3) and Equity rate (columns 4 – 6). Treated executive directors are those whose maximum variable-to-fixed compensation ratio exceeds 250% as of 2013. *Treatment intensity* is (1) equal to 0 for directors in the control group and (2) equal to the distance between ρ (maximum variable-to-fixed compensation) and 250% as of 2013 for treated directors. *Post* is an indicator variable equal to 1 from 2014 onwards. All specifications include bank and director control variables (natural logarithm of total assets, ROE, number of executive directors serving on the board, director age, a CEO indicator, professional experience, and tenure) and year fixed effects. Column 2 and 5 include bank fixed effects. Columns 3 and 6 include director fixed effects. The t-statistics (in parentheses) are computed from standard errors clustered by bank. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively. Refer to Appendix Table A.3 for variable definitions.

Dependent variable:	Deferral rate			Equity rate		
	(1)	(2)	(3)	(4)	(5)	(6)
Treat. int.	0.010	0.008		0.062*	-0.009	
	(0.44)	(1.13)		(1.92)	(-1.28)	
Post × Treat. int.	0.040***	0.029	0.036*	0.035*	0.036***	0.043**
	(2.88)	(1.56)	(1.73)	(1.83)	(2.94)	(2.60)
Bank and director controls	X	X	X	X	X	X
Year fixed effects	X	X	X	X	X	X
Bank fixed effects		X	X		X	X
Director fixed effects			X			X
Mean(y)	0.680	0.680	0.683	0.565	0.566	0.567
S.D.(y)	0.221	0.221	0.222	0.301	0.302	0.303
R^2	0.138	0.636	0.676	0.186	0.880	0.892
N	421	419	409	421	419	409

Table 7: Bank performance and bank risk
This table reports estimates from difference-in-differences regressions for bank performance and risk-taking around the introduction of the EU bonus cap of 2013. The sample covers EU banks between 2010 and 2016. Panel A considers bank performance and measures of equity and credit risk. The dependent variables are *Sharpe ratio* (column 1), *Stock return* (column 2), *Stock return volatility* (column 3), and *Log 5-year excess CDS spreads* (column 4). Panel B considers measures of systemic risk and systematic risk. The dependent variables are *SRISK%*, *LRMES*, *Beta*, and *Correlation*. *Treatement intensity* is the average treatment intensity of directors within a bank as of 2014 (based on those directors for whom *Post* × *Treated* = 1 in director-level regressions). *Post* is an indicator variable equal to 1 from 2014 onward. All specifications include year and bank fixed effects. The *t*-statistics are given in parentheses. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively. Refer to Appendix Table A.3 for variable definitions.

Panel A: Bank performance and idiosyncratic bank risk

Dependent variable:	Sharpe ratio (in %)	Stock return (in %)	Stock return volatility (in %)	Log 5-year excess CDS spread
	(1)	(2)	(3)	(4)
Post × Treat. int.	-0.283*	-5.578	5.343**	0.118**
	(-1.69)	(-0.90)	(2.55)	(2.07)
Year fixed effects	X	X	X	X
Bank fixed effects	X	X	X	X
Mean(y)	-0.004	-6.275	34.207	1.112
S.D.(y)	1.035	44.423	16.445	0.741
R^2	0.528	0.647	0.706	0.901
N	145	145	145	118

Panel B: Measures of systemic risk and systematic risk

	Systemic risk		Systematic risk	
Dependent variable:	SRISK%	LRMES	Beta	Corr.
	(1)	(2)	(3)	(4)
Post × Treat. int.	2.230*	3.846***	0.145***	0.010
	(1.91)	(3.06)	(2.95)	(1.01)
Year fixed effects	X	X	X	X
Bank fixed effects	X	X	X	X
Mean(y)	25.868	50.540	1.423	0.480
S.D.(y)	26.452	11.094	0.418	0.109
R^2	0.965	0.774	0.754	0.843
N	138	138	138	138

Table 8: Funding structure and loan policy
This table reports estimates from difference-in-differences regressions for funding structure and loan policy around the introduction of the EU bonus cap of 2013. The sample covers EU banks between 2010 and 2016. The dependent variables are *Deposits over total liabilities* (columns 1 and 2), ln *(Interbank assets)* (column 3 and 4), and *Corporate loans over total assets* (columns 5 and 6). *Treatement intensity* is the average treatment intensity of directors within a bank as of 2014 (based on those directors for whom *Post* × *Treated* = 1 in director-level regressions). *Post* is an indicator variable equal to 1 from 2014 onward. All specifications include year and bank fixed effects. Even columns include also country-year fixed effects. The *t*-statistics are given in parentheses. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively. Refer to Appendix Table A.3 for variable definitions.

Dependent variable:	Deposits over total liabilities		ln (Interbank assets)		Corporate loans over total assets	
	(1)	(2)	(3)	(4)	(5)	(6)
Post × Treat. int.	-0.020*	-0.032*	-0.028	-0.261**	0.017***	0.016**
	(-1.94)	(-1.74)	(-0.44)	(-2.17)	(3.00)	(2.44)
Year fixed effects	X	X	X	X	X	X
Bank fixed effects	X	X	X	X	X	X
Country-year fixed effects		X		X		X
Mean(y)	0.438	0.432	10.390	10.472	0.118	0.117
S.D.(y)	0.158	0.157	1.612	1.716	0.077	0.069
R^2	0.924	0.949	0.972	0.982	0.938	0.970
N	145	120	145	120	81	64

Table 9: US bank executives as the control group

This table reports estimates from difference-in-differences regressions around the introduction of the EU bonus cap of 2013. The dependent variables are executive turnover (Panel A), measures of executive compensation structure (Panel B, see Appendix Table A.3 for the definition of the different measures of fixed and variable compensation), measures of bank-level performance and risk-taking (Panel C), and measures of systemic risk and systematic risk (Panel D). The treatment sample covers executive directors of EU banks fulfilling the conditions laid down below. The control sample covers the top executives from the largest 25 US banks as of 2013. The sample period is 2010-2016. Treated executive directors are those EU banks' directors whose maximum variable-to-fixed compensation ratio exceeds 250% as of 2013. In Panel A and Panel B, *Treatment intensity* is (1) equal to 0 for directors in the control group and (2) equal to the distance between ρ (maximum variable-to-fixed compensation) and 250% as of 2013 for treated directors. In Panel C and Panel D, *Treatement intensity* is the average treatment intensity of directors within a bank as of 2014 (based on those directors for whom $Post \times Treated = 1$ in director-level regressions). *Post* is an indicator variable equal to 1 from 2014 onward. All specifications correspond to the most saturated ones in Table 3, Table 4, and Table 7. The t-statistics (in parentheses) are computed from standard errors clustered by bank. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively. Refer to Appendix Table A.3 for variable definitions.

Panel A: Turnover

Dependent variable:	Turnover				Turnover (poor perf.)	
	(1)	(2)	(3)	(4)	(5)	(6)
Treat. int.	-0.027***	-0.066***	-0.031***	-0.054***	-0.037***	-0.011
	(-2.85)	(-8.52)	(-3.02)	(-7.11)	(-6.63)	(-1.10)
Post × Treat. int.	0.046	0.046*	0.026	0.029	0.048*	0.030
	(1.69)	(1.90)	(0.91)	(1.12)	(1.83)	(1.04)
Bank and director controls	X	X	X	X	X	X
Year fixed effects	X	X	X	X	X	X
Bank fixed effects		X		X	X	X
Full sample	X	X			X	
Ex-CEO			X	X		X
Mean(y)	0.115	0.115	0.128	0.128	0.050	0.053
S.D.(y)	0.319	0.319	0.334	0.334	0.219	0.223
R^2	0.038	0.067	0.039	0.065	0.104	0.108
N	1,011	1,011	837	837	1,011	837

Panel B: Compensation

Dependent variable:	Measures of fixed comp.		Measures of var. comp.		
	(1)	(2)	(3)	(4)	(5)
Post × Treat. int.	262.998**	282.529**	-903.012***	-191.430***	-184.426***
	(2.70)	(2.23)	(-8.59)	(-3.95)	(-6.37)
Bank and director controls	X	X	X	X	X
Year fixed effects	X	X	X	X	X
Bank fixed effects	X	X	X	X	X
Director fixed effects	X	X	X	X	X
Mean(y)	1,207.325	749.951	3606.167	680.438	682.819
S.D.(y)	907.029	484.977	3,362.821	1,297.230	1,295.042
R^2	0.759	0.832	0.897	0.880	0.878
N	1,010	1,010	1,010	1,010	1,010

Panel C: Bank performance and risk-taking

Dependent variable:	Sharpe ratio (in %)	Stock return (in %)	Stock return volatility (in %)	Log 5-year excess CDS spread
	(1)	(2)	(3)	(4)
Post × Treat. int.	-0.137	-4.192	1.738***	0.117***
	(-1.56)	(-1.46)	(2.91)	(3.39)
Year fixed effects	X	X	X	X
Bank fixed effects	X	X	X	X
Mean(y)	0.711	14.873	24.800	4.181
S.D.(y)	1.238	35.163	10.254	0.638
R^2	0.570	0.434	0.711	0.783
N	218	218	218	117

Panel D: Measures of systemic and systematic risk

Dependent variable:	Systemic risk		Systematic risk	
	SRISK%	LRMES	Beta	Corr.
	(1)	(2)	(3)	(4)
Post × Treat. int.	1.085***	0.171	0.003	-0.012***
	(4.99)	(0.44)	(0.23)	(-2.68)
Year fixed effects	X	X	X	X
Bank fixed effects	X	X	X	X
Mean(y)	6.180	43.167	1.131	0.586
S.D.(y)	12.580	8.820	0.320	0.107
R^2	0.975	0.830	0.816	0.857
N	218	218	218	218

Table 10: Bank performance and risk-taking (falsification test)
This table reports estimates from difference-in-differences regressions for bank performance and risk-taking around the introduction of the EU bonus cap of 2013, replacing the bank's *Treatment intensity* used in Table 7 with *Periph. exposure*, a measure based on its exposure to the European debt crisis. The sample covers EU banks between 2010 and 2016. Panel A considers bank performance and measures of equity and credit risk. The dependent variables are *Sharpe ratio* (column 1), *Stock return* (column 2), *Stock return volatility* (column 3), and *Log 5-year excess CDS spreads* (column 4). Panel B considers measures of systemic risk and systematic risk. The dependent variables are *SRISK%*, *LRMES*, *Beta*, and *Correlation*. *Periph. exposure* is the bank's exposure to the sovereign debt of peripheral countries (Greece, Ireland, Italy, Portugal, and Spain) relative to its total sovereign debt holdings. *Post* is an indicator variable equal to 1 from 2014 onward. All specifications include year and bank fixed effects. The t-statistics are given in parentheses. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively. Refer to Appendix Table A.3 for variable definitions.

Panel A: Bank performance and idiosyncratic bank risk

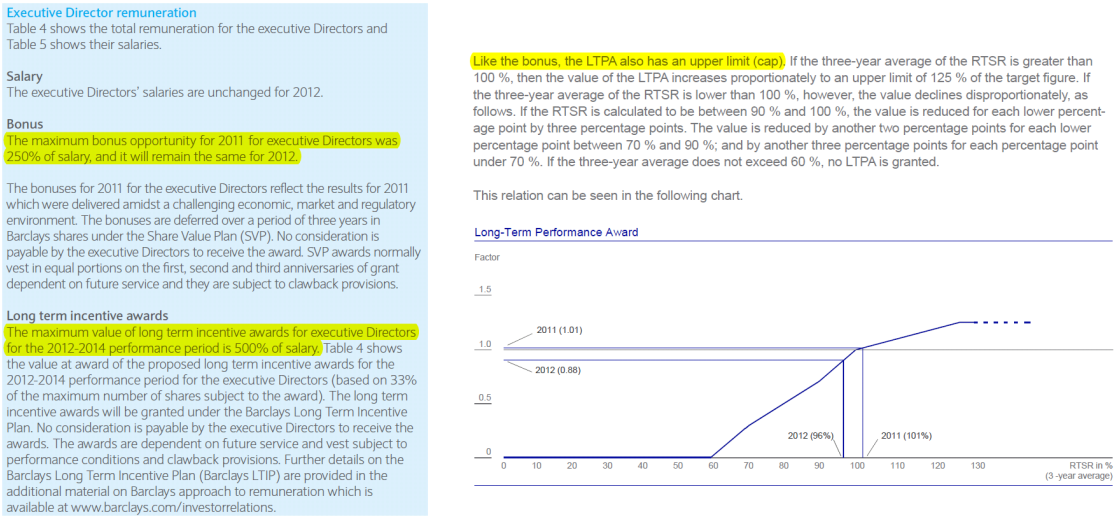
Dependent variable:	Sharpe ratio (in %)	Stock return (in %)	Stock return volatility (in %)	Log 5-year excess CDS spread
	(1)	(2)	(3)	(4)
Post × Periph. exposure	0.509	16.635	1.161	-0.076
	(1.46)	(1.29)	(0.22)	(-0.52)
Year fixed effects	X	X	X	X
Bank fixed effects	X	X	X	X
Mean(y)	-0.021	-3.932	35.342	1.200
S.D.(y)	1.015	39.479	15.435	0.758
R^2	0.583	0.619	0.587	0.881
N	125	125	125	173

Panel B: Measures of systemic risk and systematic risk

	Systemic risk		Systematic risk	
Dependent variable:	SRISK%	LRMES	Beta	Corr.
	(1)	(2)	(3)	(4)
Post × Treat. int.	1.781	2.023	0.102	0.015
	(0.48)	(0.67)	(0.79)	(0.72)
Year fixed effects	X	X	X	X
Bank fixed effects	X	X	X	X
Mean(y)	35.394	52.403	1.487	0.513
S.D.(y)	25.499	8.786	0.364	0.083
R^2	0.958	0.771	0.752	0.880
N	97	97	97	97

Appendix for

"Effectiveness and (In)Efficiencies of Compensation Regulation: Evidence from the EU Banker Bonus Cap"



Executive Director remuneration
Table 4 shows the total remuneration for the executive Directors and Table 5 shows their salaries.

Salary
The executive Directors' salaries are unchanged for 2012.

Bonus
The maximum bonus opportunity for 2011 for executive Directors was 250% of salary, and it will remain the same for 2012.

The bonuses for 2011 for the executive Directors reflect the results for 2011 which were delivered amidst a challenging economic, market and regulatory environment. The bonuses are deferred over a period of three years in Barclays shares under the Share Value Plan (SVP). No consideration is payable by the executive Directors to receive the award. SVP awards normally vest in equal portions on the first, second and third anniversaries of grant dependent on future service and they are subject to clawback provisions.

Long term incentive awards
The maximum value of long term incentive awards for executive Directors for the 2012-2014 performance period is 500% of salary. Table 4 shows the value at award of the proposed long term incentive awards for the 2012-2014 performance period for the executive Directors (based on 33% of the maximum number of shares subject to the award). The long term incentive awards will be granted under the Barclays Long Term Incentive Plan. No consideration is payable by the executive Directors to receive the awards. The awards are dependent on future service and vest subject to performance conditions and clawback provisions. Further details on the Barclays Long Term Incentive Plan (Barclays LTIP) are provided in the additional material on Barclays approach to remuneration which is available at www.barclays.com/investorrelations.

Like the bonus, the LTPA also has an upper limit (cap). If the three-year average of the RTSR is greater than 100 %, then the value of the LTPA increases proportionately to an upper limit of 125 % of the target figure. If the three-year average of the RTSR is lower than 100 %, however, the value declines disproportionately, as follows. If the RTSR is calculated to be between 90 % and 100 %, the value is reduced for each lower percentage point by three percentage points. The value is reduced by another two percentage points for each lower percentage point between 70 % and 90 %; and by another three percentage points for each percentage point under 70 %. If the three-year average does not exceed 60 %, no LTPA is granted.

This relation can be seen in the following chart.

Long-Term Performance Award

Figure A.1: Examples of performance-based compensation plans
This figure reports examples of performance-compensation plans in place at EU banks before the introduction of the EU bonus cap. The plan on the left was given by Barclays to its executive directors in 2011 (source: Barclays PLC, Annual Report 2011, p. 58). The plan on the right was given by Deutsche Bank to its executive directors in 2012 (source: Deutsche Bank AG, Annual Report 2012, p. 211). Yellow highlight is added in both cases.

Table A.1: List of banks

Banks with treated directors	Treat. dir.-years	Untr. dir.-years
AAREAL BANK AG	8	20
BARCLAYS PLC	12	0
DEUTSCHE BANK AG	38	0
HSBC HLDGS PLC	14	7
LLOYDS BANKING GROUP PLC (Lloyds TSB Group PLC prior to 01/2009)	15	0
ROYAL BANK OF SCOTLAND GROUP PLC	10	4
STANDARD CHARTERED PLC	33	0
Banks without treated directors	Treat. dir.-years	Untr. dir.-years
ABN AMRO Group NV	0	50
BANCO COMERCIAL PORTUGUES SA	0	35
BANCO SABADELL SA	0	17
BANCO SANTANDER SA (Banco Santander Central Hispano SA prior to 08/2007)	0	32
BANK OF CYPRUS GROUP	0	12
BANKINTER SA	0	17
BNP PARIBAS	0	32
BAYERN LB	0	36
COMMERZBANK AG	0	54
COOPERATIEVE CENTRALE RAIFFEISEN-BOERENLEENBANK BA	0	37
DANSKE BANK A/S	0	35
DEUTSCHE POSTBANK AG	0	33
DEXIA SA	0	11
DZ BANK AG	0	47
ERSTE GROUP BANK AG	0	28
GRUPPO BANCA CARIGE SPA	0	21
Groupe BPCE SA	0	22
HELABA LANDESBANK HESSEN THUERiNGEN	0	43
ING GROEP NV	0	20
INTESA SANPAOLO SPA	0	51
KBC GROUP NV	0	39
KFW GROUP	0	31
LANDESBANK BERLIN AG	0	32
LANDESBANK BAADEN-WUERTTEMBERG AG	0	30
MEDIOBANCA SPA	0	24
SOCIETE GENERALE SA	0	25
SVENSKA HANDELSBANKEN AB	0	6
UNIONE DI BANCHE ITALIANE SCPA	0	61

US banks in the alternative control group	Treat. dir.-years	Untr. dir.-years
AMERICAN EXPRESS CO	0	41
AMERIPRISE FINANCIAL INC	0	38
BANK OF AMERICA CORP	0	51
BANK OF NEW YORK MELLON CORP	0	47
CAPITAL ONE FINANCIAL CORP	0	41
CITIGROUP INC	0	47
COMERICA INC	0	47
E TRADE FINANCIAL CORP	0	51
FIFTH THIRD BANCORP	0	49
FIRST NIAGARA FINANCIAL GRP	0	38
FIRST REPUBLIC BANK	0	32
GOLDMAN SACHS GROUP INC	0	39
HUDSON CITY BANCORP INC	0	29
HUNTINGTON BANCSHARES	0	52
JPMORGAN CHASE & CO	0	46
KEYCORP	0	46
MORGAN STANLEY	0	44
NEW YORK CMNTY BANCORP INC	0	35
NORTHERN TRUST CORP	0	42
PNC FINANCIAL SVCS GROUP INC	0	43

SCHWAB (CHARLES) CORP	0	43
STATE STREET CORP	0	42
SUNTRUST BANKS INC	0	42
U S BANCORP	0	42
WELLS FARGO & CO	0	47

Table A.2: Principal component analysis of executive directors' employment history
We apply a principal component analysis to proxy for directors' professional experience. We choose five indicators generated from the BoardEx employment history as listed in Panel A. Panel B reports the explanatory ability of the different principal components. Our approach builds on Custódio et al. (2013), who use a principal component analysis to proxy general managerial skills. We depart from Custódio et al. (2013) by applying principal component analysis for each year separately. The results listed in the table correspond to 2015.

Panel A: Principal components of professional experience

	Component 1	Component 2	Component 3	Component 4	Component 5
Numb. exec. dir.	0.4429	0.2374	-0.5702	0.6441	-0.0864
Numb. of industries	0.3200	0.6496	0.6752	0.1399	0.0129
Numb. of firms	0.4831	0.2487	-0.3363	-0.6711	0.3760
Numb. of positions	0.5258	-0.3312	0.1299	-0.2237	-0.7395
Numb. of superv. dir.	0.4377	-0.5917	0.2984	0.2552	0.5515

Panel B: Eigenvalues and proportion explained (by principal components)

	Eigenvalue	Difference	Proportion expl.	Cumulative
Component 1	2.82033	1.89646	0.5641	0.5641
Component 2	0.92387	0.236646	0.1848	0.7488
Component 3	0.687224	0.277375	0.1374	0.8863
Component 4	0.409849	0.251123	0.0820	0.9683
Component 5	0.158726	–	0.0317	1.0000

Table A.3: Definition of variables
For variables used in tests relying on the US control group (see Table 9), additional information on the database and the variable definition is given [in brackets].

Variable	Databases	Definition
Director characteristics:		
Turnover	BoardEx [Execucomp]	Dummy variable indicating if a director leaves the board (1) or stays on the board(0). Note that we collected data on 2016 turnovers manually by checking banks' websites and news reports. [Executive turnover is set to one in the year after an executive has last been reported in Execucomp, and zero otherwise.]
CEO	Manually collected [Execucomp]	Dummy variable indicating if a director is the CEO of the bank (1) or not (0). We collected this information manually because BoardEx does not supply a variable indicating the CEO in a board. [Execucomp provides a CEO indicator.]
Professional experience	BoardEx	Variable derived from BoardEx data on executive directors' employment history by means of a principle component analysis similar to the one by Custódio et al. (2013). Relevant information includes number of executive directorships, number of industries, number of firms, number of positions, and number of supervisory directorships.
Director age	BoardEx [Execucomp]	Age of the director.
Retirement age	BoardEx [Execucomp]	Dummy variable that is one if a director is older than 65 years.
Female	BoardEx [Execucomp]	Dummy variable that is one if a director is female.
Compensation structure:		
Fixed compensation	Manually collected [Execucomp]	Sum of fixed compensation grants in a year (i.e., salary, pensions, other fixed compensation and fixed allowances). If banks do not report these subcategories, we take the aggregate value of fixed compensation. [For tests using the US control group, two different measures of fixed compensation are defined. Measure 1 is defined as (i) the one described above for EU executives, (ii) the sum of salary (`salary`), other components (`othcomp`), and pension contributions (`pension_chg`) for US executives. Measure 2 is defined as (i) the one described above minus pensions and other components for EU executives, (ii) salary for US executives.]
Variable compensation	Manually collected [Execucomp]	Sum of variable (postevaluation) grants in a year (i.e., grants that relate to bank performance of up to the reporting year). [For tests using the US control group, three different measures of variable compensation are defined. Measure 1 is defined as (i) the one described above for EU executives, (ii) the sum of bonus (`bonus`), option grants (`option_awards_fv`), and stock grants (`stock_awards_fv`) for US executives. Measure 2 is defined as (i) variable compensation granted in cash (both deferred and non-deferred) for EU executives, (ii) bonus for US executives. Measure 3 is defined as (i) variable compensation without long-term deferral (i.e., less than a year until realization of a grant) for EU executives, (ii) bonus for US executives.]
Maximum variable compensation	Manually collected	Maximum value of variable compensation that can be achieved within the reporting year.
Maximum variable compensation to fixed	Manually collected	Ratio of maximum variable compensation to fixed compensation. It is the ratio to which the bonus cap applies.
Deferral rate	Manually collected	Sum of deferred variable grants and deferred parts of fixed allowances over the sum of total variable compensation and total fixed allowances.
Equity rate	Manually collected	Sum of equity grants or grants that are equity-linked over the sum of total variable compensation and total fixed allowances.
Treatment intensity	Manually collected	Variable (1) equal to 0 for directors in the control group and (2) equal to the distance between ρ (maximum variable-to-fixed compensation) and 250% as of 2013 for treated directors. Treated executive directors are those whose maximum variable-to-fixed compensation ratio exceeds 250% as of 2013.
Treated	Manually collected	Dummy equal to 1 if an executive director has a maximum variable-to-fixed compensation ratio exceeding 250% as of 2013.

(Continued)

Table A.3: – *Continued*

Bank-level information:		
Firm size	Bankscope and Orbis Bank Focus [CCM]	Natural logarithm of total assets.
ROA	Bankscope and Orbis Bank Focus [CCM]	Return on average assets.
ROE	Bankscope and Orbis Bank Focus [CCM]	Return on average equity.
Stock return	Datastream [CCM]	Annual return on stock (total investment return).
Stock return volatility	Worldscope [CCM]	Standard deviation of monthly returns over the previous 12 months.
Sharpe ratio	Datastream [CCM]	Ratio of stock return over stock volatility.
Log 5-year excess CDS spread	Datastream	Log of 5-year CDS excess spread. The excess spread is the difference of the CDS spread of the bank and the CDS spread of the corresponding sovereign CDS spread (average over the last quarter of the year).
SRISK%	NYU V-Lab	Fraction of the whole financial sector's capital shortfall the bank would incur in the event of a crisis.
LRMES	NYU V-Lab	Expected fractional equity loss the bank would incur in the event of a crisis.
Beta	NYU V-Lab	Market beta of the bank based on the MSCI World Index.
Correlation	NYU V-Lab	Correlation of the bank's stock returns with the returns on the MSCI World Index.
Number of executive directors	BoardEx	Number of executive directors serving on the board. We take the gross number of observations per year on a board and subtract the sum of the turnovers of the respective year.
CEO turnover	BoardEx [Execucomp]	Dummy variable that indicates if the CEO leaves the board (1) or stays on the board (0). Note that we collected data on 2016 turnovers manually by checking banks' websites and news reports. We also manually collected who the CEO is because BoardEx does not supply a variable indicating the CEO in a board. [Execucomp provides a CEO indicator.]
Peripheral exposure	EBA	Ratio of the sum of a bank's sovereign debt exposure to peripheral countries (Portugal, Ireland, Italy, Portugal, and Spain) over a bank's total sovereign debt exposure. Data are from the 2011 EBA Transparency Exercise.

Table A.4: Executive turnover at poor and good performance (the role of managerial skills)
This table reports estimates from triple difference-in-differences regressions (linear probability models) for turnover of executive directors around the introduction of the EU bonus cap of 2013. The sample covers executive directors of EU banks over the years between 2010 and 2016. In columns 1 and 2 (3 and 4), the dependent variable is *Turnover (poor perf.)* (*Turnover (good perf.)*), an indicator variable equal to 1 if the director leaves the board of the bank and the bank's ROE is below (above) the median in a given year. Treated executive directors are those whose maximum variable-to-fixed compensation ratio exceeds 250% as of 2013. *Treatment intensity* is (1) equal to 0 for directors in the control group and (2) equal to the distance between ρ (maximum variable-to-fixed compensation) and 250% as of 2013 for treated directors. *Post* is an indicator variable equal to 1 from 2014 onward. Specifications in Panel A include a triple interaction term with *High exp.*, an indicator variable equal to 1 if *Professional experience* is above its median for a given director. Specifications in Panel B include a triple interaction term with *Top total pay* (columns 1 and 3), an indicator variable equal to 1 if the director is the highest paid (or the second highest paid) within the board in terms of total compensation (for boards with at least five directors), and *Top var. pay* (columns 2 and 4), an indicator variable computed in the same way but based on variable compensation. All specifications include bank and director control variables (natural logarithm of total assets, number of executive directors serving on the board, lagged Sharpe ratio, director age, a retirement age indicator, a CEO indicator, professional experience, tenure, and a female indicator), and bank and year fixed effects. Columns 1 and 2 of Panel A, and all columns of Panel B consider all executive directors. The other columns of Panel A exclude CEOs and control for *CEO turnover*, an indicator variable equal to 1 if the bank's CEO is replaced in a given year, rather than for the CEO indicator. The t-statistics (in parentheses) are computed from standard errors clustered by bank. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively. Refer to Appendix Table A.3 for variable definitions.

Panel A: Measuring skills through professional experience

Dependent variable:	Turnover (poor perf.)		Turnover (good perf.)	
	(1)	(2)	(3)	(4)
Post × Treat. int. × High exp.	0.045	0.030	0.029	0.049
	(0.71)	(0.47)	(1.03)	(0.85)
Bank and director controls	X	X	X	X
Year fixed effects	X	X	X	X
Bank fixed effects	X	X	X	X
Full sample	X		X	
Ex-CEO		X		X
Mean(y)	0.078	0.089	0.018	0.021
S.D.(y)	0.269	0.286	0.133	0.144
R^2	0.244	0.268	0.177	0.232
N	499	380	499	380

Panel B: Measuring skills through compensation

Dependent variable:	Turnover (poor perf.)		Turnover (good perf.)	
	(1)	(2)	(3)	(4)
Post × Treat. int. × Top total pay	0.022		-0.028	
	(0.63)		(-1.48)	
Post × Treat. int. × Top var. pay		0.005		-0.007
		(0.13)		(-0.31)
Bank and director controls	X	X	X	X
Year fixed effects	X	X	X	X
Bank fixed effects	X	X	X	X
Full sample	X	X	X	X
Mean(y)	0.085	0.085	0.020	0.020
S.D.(y)	0.279	0.279	0.139	0.139
R^2	0.249	0.243	0.181	0.179
N	459	459	459	459

Table A.5: Sensitivity of turnover to performance

This table reports estimates from triple difference-in-differences regressions (linear probability models) for turnover of executive directors around the introduction of the EU bonus cap of 2013. The sample covers executive directors of EU banks between 2010 and 2016. The dependent variable is *Turnover (poor perf.)*, an indicator variable equal to 1 if the director leaves the board of the bank and the bank's ROE is below the median in a given year. Treated executive directors are those whose maximum variable-to-fixed compensation ratio exceeds 250% as of 2013. *Treatment intensity* is (1) equal to 0 for directors in the control group and (2) equal to the distance between ρ (maximum variable-to-fixed compensation) and 250% as of 2013 for treated directors. *Post* is an indicator variable equal to 1 from 2014 onward. *Treatment intensity* and *Post* are interacted with bank risk-adjusted performance as measured by lagged *Sharpe ratio*. All specifications include bank and director control variables (natural logarithm of total assets, number of executive directors serving on the board, lagged Sharpe ratio, director age, a retirement age indicator, a CEO indicator, professional experience, tenure, and a female indicator) and year fixed effects. Columns 2 and 4 also include bank fixed effects. Data in columns 1 and 2 include all executive directors. Data in columns 3 and 4 exclude CEOs and control for *CEO turnover*, an indicator variable equal to 1 if the bank's CEO is replaced in a given year, rather than for the CEO indicator. The t-statistics (in parentheses) are computed from standard errors clustered by bank. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively. Refer to Appendix Table A.3 for variable definitions.

Dependent variable:	Turnover (poor perf.)			
	(1)	(2)	(3)	(4)
Post × Treat. int. × Sharpe ratio (lag)	-0.063*	-0.054	-0.076**	-0.058
	(-2.06)	(-1.12)	(-2.22)	(-1.19)
Controls	X	X	X	X
Time fixed effects	X	X	X	X
Bank fixed effects		X		X
Whole sample	X	X		
Ex-CEO			X	X
Mean(y)	0.078	0.078	0.089	0.089
S.D.(y)	0.268	0.269	0.285	0.286
R^2	0.176	0.240	0.202	0.267
N	500	499	381	380

Table A.6: Executive turnover (the role of managerial skills)
This table reports estimates from triple difference-in-differences regressions (linear probability models) for turnover of executive directors around the introduction of the EU bonus cap of 2013. The sample covers executive directors of EU banks between 2010 and 2016. The dependent variable is *Turnover*, an indicator variable equal to 1 if the director leaves the board of the bank in a given year. Treated executive directors are those whose maximum variable-to-fixed compensation ratio exceeds 250% as of 2013. *Treatment intensity* is (1) equal to 0 for directors in the control group and (2) equal to the distance between ρ (maximum variable-to-fixed compensation) and 250% as of 2013 for treated directors. *Post* is an indicator variable equal to 1 from 2014 onward. Specifications in Panel A include a triple interaction term with *High exp.*, an indicator variable equal to 1 if *Professional experience* is above its median for a given director. Specifications in Panel B include a triple interaction term with *Top total pay* (columns 1 and 2), an indicator variable equal to 1 if the director is the highest paid (or the second highest paid) within the board in terms of total compensation (for boards with at least five directors), and *Top var. pay* (columns 3 and 4), an indicator variable computed in the same way but based on variable compensation. All specifications include bank and director control variables (natural logarithm of total assets, number of executive directors serving on the board, lagged Sharpe ratio, director age, a retirement age indicator, a CEO indicator, professional experience, tenure, and a female indicator) and year fixed effects. Columns 1 and 2 of Panel A, and columns 1 and 3 of Panel B consider all executive directors. The other columns exclude CEOs and control for *CEO turnover*, an indicator variable equal to 1 if the bank's CEO is replaced in a given year, rather than for the CEO indicator. Columns 2 and 4 of Panel A and all columns of Panel B include bank fixed effects. The t-statistics (in parentheses) are computed from standard errors clustered by bank. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively. Refer to Appendix Table A.3 for variable definitions.

Panel A: Measuring skills through professional experience

Dependent variable:	Turnover			
	(1)	(2)	(3)	(4)
Post × Treat. int. × High exp.	0.044	0.074	0.040	0.079
	(0.57)	(0.90)	(0.49)	(0.81)
Bank and director controls	X	X	X	X
Year fixed effects	X	X	X	X
Bank fixed effects		X		X
Full sample	X	X		
Ex-CEO			X	X
Mean(y)	0.096	0.096	0.110	0.111
S.D.(y)	0.295	0.295	0.314	0.314
R^2	0.174	0.232	0.188	0.253
N	500	499	381	380

Panel B: Measuring skills through compensation

Dependent variable:	Turnover			
	(1)	(2)	(3)	(4)
Post × Treat. int. × Top total pay	-0.006	-0.021		
	(-0.15)	(-0.40)		
Post × Treat. int. × Top var. pay			-0.002	-0.004
			(-0.04)	(-0.07)
Bank and director controls	X	X	X	X
Year fixed effects	X	X	X	X
Bank fixed effects	X	X	X	X
Full sample	X		X	
Ex-CEO		X		X
Mean(y)	0.105	0.121	0.105	0.121
S.D.(y)	0.306	0.326	0.306	0.326
R^2	0.233	0.257	0.230	0.253
N	459	348	459	348

Table A.7: Characteristics of leaving directors and new directors over the post-EU bonus cap period
This table shows summary statistics for directors leaving their bank (columns 1 to 4) and directors that are newly employed (columns 1 to 4) in the post period, i.e. in the years 2014–2016. Panel A reports summary statistics for directors at treated banks (i.e., those where at least one director has a maximum variable-to-fixed compensation ratio exceeding 250% as of 2013). Panel B reports summary statistics for directors at nontreated banks. Refer to Appendix Table A.3 for variable definitions.

Panel A: Directors at treated banks

	Leaving Directors				New Directors			
	N	Mean	S.E.	Median	*N*	Average	S.E.	Median
Director age	11	55.182	5.193	54.000	17	52.176	5.503	51.000
Professional experience (pca)	11	-0.086	1.060	-0.212	17	-0.206	2.034	-0.984
Female	11	0.000	0.000	0.000	17	0.176	0.393	0.000
Number of ED positions held	12	2.167	1.115	2.500	17	2.294	1.687	2.000
Number of SD positions held	12	4.500	4.189	3.500	17	2.882	4.742	2.000
Number of previous sectors	12	1.333	0.492	1.000	17	1.647	0.931	1.000
Number of previous firms	12	4.250	1.913	4.000	17	4.529	2.918	4.000

Panel B: Directors at untreated banks

	Leaving Directors				New Directors			
	N	Average	S.E.	Median	*N*	Average	S.E.	Median
Director age	35	57.086	8.315	55.000	51	53.431	9.003	51.000
Professional experience (pca)	36	0.128	1.490	-0.247	53	-0.578	1.314	-0.786
Female	36	0.056	0.232	0.000	53	0.208	0.409	0.000
Number of ED positions held	31	2.226	1.454	2.000	52	2.173	1.630	2.000
Number of SD positions held	31	4.129	4.145	3.000	52	2.269	3.069	1.000
Number of previous sectors	31	1.194	0.477	1.000	52	1.135	0.397	1.000
Number of previous firms	31	5.194	2.613	5.000	52	4.827	2.662	4.000

Table A.8: Sensitivity of compensation to performance and risk
This table reports estimates from triple difference-in-differences regressions for goal achievement of executive directors around the introduction of the EU bonus cap of 2013. The sample covers executive directors of EU banks between 2010 and 2016. The dependent variable is the realized variable compensation-to-maximum variable compensation ratio, *Variable compensation-to-maximum variable compensation*. Treated executive directors are those whose maximum variable-to-fixed compensation ratio exceeds 250% as of 2013. *Treatment intensity* is (1) equal to 0 for directors in the control group and (2) equal to the distance between ρ (maximum variable-to-fixed compensation) and 250% as of 2013 for treated directors. *Post* is an indicator variable equal to 1 from 2014 onward. The estimated specifications include a triple interaction term with *Stock return* (columns 1 – 3) and with *Sharpe ratio* (columns 4 – 6). All specifications include bank and director control variables (natural logarithm of total assets, ROE, number of executive directors serving on the board, director age, a CEO indicator, professional experience, and tenure) and year fixed effects. Columns 2 and 5 include bank fixed effects. Columns 3 and 6 include director fixed effects. The t-statistics (in parentheses) are computed from standard errors clustered by bank. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively. Refer to Appendix Table A.3 for variable definitions.

Dependent variable:	Var. comp.-to-max. var. comp.					
	(1)	(2)	(3)	(4)	(5)	(6)
Post × Treat. int. × Stock return	0.001	0.001	0.001			
	(0.51)	(0.79)	(0.65)			
Post × Treat. int. × Sharpe ratio				0.014	-0.008	-0.010
				(0.44)	(-0.25)	(-0.32)
Controls	X	X	X	X	X	X
Time fixed effects	X	X	X	X	X	X
Bank fixed effects		X	X		X	X
Director fixed effects			X			X
Mean(y)	0.353	0.354	0.364	0.353	0.354	0.364
S.D.(y)	0.318	0.318	0.317	0.318	0.318	0.317
R^2	0.177	0.531	0.588	0.179	0.526	0.583
N	424	422	406	424	422	406

Table A.9: Bank-level results and country-year fixed effects
This table reports estimates from difference-in-differences regressions for bank performance and risk-taking around the introduction of the EU bonus cap of 2013. The sample covers EU banks between 2010 and 2016. Panel A considers bank performance and measures of equity and credit risk. The dependent variables are *Sharpe ratio* (column 1), *Stock return* (column 2), *Stock return volatility* (column 3), and *Log 5-year excess CDS spreads* (column 4). Panel B considers measures of systemic risk and systematic risk. The dependent variables are *SRISK%*, *LRMES*, *Beta*, and *Correlation*. *Treatement intensity* is the average treatment intensity of directors within a bank as of 2014 (based on those directors for whom *Post* × *Treated* = 1 in director-level regressions). *Post* is an indicator variable equal to 1 from 2014 onward. All specifications include year, bank, and country-year fixed effects. The *t*-statistics are given in parentheses. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively. Refer to Appendix Table A.3 for variable definitions.

Panel A: Bank performance and idiosyncratic bank risk

Dependent variable:	Sharpe ratio (in %)	Stock return (in %)	Stock return volatility (in %)	Log 5-year excess CDS spread
	(1)	(2)	(3)	(4)
Post × Treat. int.	0.088	-0.232	8.347**	0.376***
	(0.33)	(-0.02)	(2.27)	(5.87)
Year fixed effects	X	X	X	X
Bank fixed effects	X	X	X	X
Country-year fixed effects	X	X	X	X
Mean(y)	-0.096	-9.483	35.007	1.022
S.D.(y)	1.000	45.201	17.245	0.705
R^2	0.745	0.816	0.835	0.974
N	120	120	120	97

Panel B: Measures of systemic risk and systematic risk

	Systemic Risk		Systematic Risk	
Dependent variable:	SRISK%	LRMES	Beta	Corr.
	(1)	(2)	(3)	(4)
Post × Treat. int.	6.486***	6.513***	0.226***	0.017
	(5.13)	(3.06)	(2.87)	(0.87)
Year fixed effects	X	X	X	X
Bank fixed effects	X	X	X	X
Country-year fixed effects	X	X	X	X
Mean(y)	16.827	49.890	1.395	0.482
S.D.(y)	16.913	10.972	0.401	0.110
R^2	0.979	0.859	0.855	0.880
N	114	114	114	114

Table A.10: Binary treatment indicator

This table reports estimates from difference-in-differences regressions for turnover and compensation structure of executive directors around the introduction of the EU bonus cap of 2013. The sample covers executive directors of EU banks between 2010 and 2016. The dependent variables are executive turnover (Panel A) and different measures of executive compensation structure (Panel B). *Treated* is an indicator variable equal to 1 if an executive director has a maximum variable-to-fixed compensation ratio exceeding 250% as of 2013. *Post* is an indicator variable equal to 1 from 2014 onward. All specifications correspond to the most saturated ones in Table 3, Table 4, and Table 5. The t-statistics (in parentheses) are computed from standard errors clustered by bank. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively. Refer to Appendix Table A.3 for variable definitions.

Panel A: Turnover

Dependent variable:	Turnover		Turnover (poor perf.)		Turnover (good perf.)	
	(1)	(2)	(3)	(4)	(5)	(6)
Post × Treated	0.189**	0.179**	0.201***	0.198**	-0.011	-0.019
	(2.71)	(2.28)	(3.19)	(2.73)	(-0.44)	(-0.51)
Year fixed effects	X	X	X	X	X	X
Bank fixed effects	X	X	X	X	X	X
Full sample	X		X		X	
Ex-CEO		X		X		X
Mean(y)	0.096	0.111	0.078	0.089	0.018	0.021
S.D.(y)	0.295	0.314	0.269	0.286	0.133	0.144
R^2	0.231	0.252	0.244	0.270	0.164	0.204
N	499	380	499	380	499	380

Panel B: Compensation

Dependent variable:	Fixed comp.	Var. comp.	Max. var. comp.	Max. var. ratio	Exp. comp. (board, pre)	Exp. comp. (board, pre and post)
	(1)	(2)	(3)	(4)	(5)	(6)
Post × Treated	1,100.098***	-851.628	-1,709.273**	-2.550***	641.267*	252.705
	(8.95)	(-1.02)	(-2.24)	(-7.54)	(1.97)	(0.40)
Bank and director controls	X	X	X	X	X	X
Year fixed effects	X	X	X	X	X	X
Bank fixed effects	X	X	X	X	X	X
Director fixed effects	X	X	X	X	X	X
Mean(y)	1,103.125	556.980	1,661.127	1.203	1,674.818	1,674.424
S.D.(y)	761.825	1,080.785	2,523.622	1.249	1,485.227	1,450.007
R^2	0.823	0.734	0.882	0.860	0.896	0.871
N	860	860	734	734	621	630

Table A.11: Alternative treatment threshold

This table reports estimates from difference-in-differences regressions for turnover and compensation structure of executive directors around the introduction of the EU bonus cap of 2013. The sample covers executive directors of EU banks between 2010 and 2016. The dependent variables are executive turnover (Panel A) and different measures of executive compensation structure (Panel B). Treated executive directors are those whose maximum variable-to-fixed compensation ratio exceeds 100% as of 2013. *Treatment intensity (100%)* is (1) equal to 0 for directors in the control group and (2) equal to the distance 100% as of 2013 for treated directors. *Post* is an indicator variable equal to 1 from 2014 onward. All specifications correspond to the most saturated ones in Table 3, Table 4, and Table 5. The t-statistics (in parentheses) are computed from standard errors clustered by bank. Significance at the 10%, 5%, and 1% level is indicated by *, **, and ***, respectively. Refer to Appendix Table A.3 for variable definitions.

Panel A: Turnover

Dependent variable:	Turnover		Turnover (poor perf.)		Turnover (good perf.)	
	(1)	(2)	(3)	(4)	(5)	(6)
Post × Treat. int. (100%)	0.051**	0.042*	0.049**	0.040**	0.002	0.001
	(2.78)	(2.06)	(2.80)	(2.24)	(0.44)	(0.20)
Year fixed effects	X	X	X	X	X	X
Bank fixed effects	X	X	X	X	X	X
Full sample	X		X		X	
Ex-CEO		X		X		X
Mean(y)	0.096	0.111	0.078	0.089	0.018	0.021
S.D.(y)	0.295	0.314	0.269	0.286	0.133	0.144
R^2	0.231	0.251	0.240	0.265	0.166	0.214
N	499	380	499	380	499	380

Panel B: Compensation

Dependent variable:	Fixed comp.	Var. comp.	Max. var. comp.	Max. var. ratio	Exp. comp. (board, pre)	Exp. comp. (board, pre and post)
	(1)	(2)	(3)	(4)	(5)	(6)
Post × Treat. int. (100%)	258.393***	-384.800**	-616.323***	-0.700***	85.591	-68.416
	(4.04)	(-2.29)	(-3.96)	(-14.63)	(0.74)	(-0.42)
Bank and director controls	X	X	X	X	X	X
Year fixed effects	X	X	X	X	X	X
Bank fixed effects	X	X	X	X	X	X
Director fixed effects	X	X	X	X	X	X
Mean(y)	1,103.125	556.980	1,661.127	1.203	1,674.818	1,674.424
S.D.(y)	761.825	1,080.785	2,523.622	1.249	1,485.227	1,450.007
R^2	0.815	0.761	0.892	0.871	0.892	0.871
N	860	860	734	734	621	630